Spirometric findings among school-aged First Nations children on a reserve: A pilot study

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BACKGROUND: Asthma and chronic obstructive pulmonary disease (COPD) are increasing concerns for First Nations peoples in Canada. Although hospital utilization for asthma and COPD among First Nations peoples has been increasing, the prevalence of asthma or wheezing is comparable to national averages.

OBJECTIVES: A pilot study was conducted to determine the prevalence of impaired lung function in school-aged First Nations children.

PATIENTS AND METHODS: A First Nations community in northern Alberta was selected to participate. Consent forms and a school health survey were completed by parents or guardians. Children with consent completed spirometry at school, and results were compared with predicted values.

RESULTS: A total of 36 children participated (response rate 70.6%). Of these, 19.4% of parents reported that their child had received a physician diagnosis of asthma at some point in their life, only 28.6% had a parental report of still having asthma. Parents smoked in 73.1% of the children’s homes. The mean (± SD) percentage of forced expiratory volume in 1 s (FEV1) over forced vital capacity (FVC) was 82.6%±6.9% (94.4%±0.08% of predicted). Evidence of airflow obstruction was found in 25% of the children. Parental report of the child ever having asthma was associated with impaired lung function (OR 3.20; P=0.033). Children in a home with reported mold exposure were less likely to have impaired lung function (OR 0.68; P=0.030).

CONCLUSIONS: Many children in this study already have established airflow obstruction and may be at increased risk for asthma or COPD. Exposure to mold appeared to be protective. Further research is needed to evaluate the lung health concerns of this population.

Key Words: Airflow obstruction; Asthma; First Nations children

Respiratory problems are common among First Nations children in Canada (1). For largely unknown reasons, they appear to be at an increased risk of developing lower respiratory tract infections (2,3) and have higher rates of hospitalization for bronchitis compared with other children (4,5). The risks of chronic respiratory disorders are also increased among First Nations children. They have rates of emergency visits for asthma and bronchitis that are approximately two times that of non-First Nations children (6). First Nations children also have higher rates of hospitalizations for asthma and wheezing (7,8). Interestingly, despite the increased health service utilization for asthma and bronchitis among First Nations children, the prevalence of self-reported asthma or wheezing is similar to national averages (9). The prevalence of allergy and atopy appears to be lower among native children than the rest of the population (10).

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45
It is not known whether airflow obstruction, a cardinal feature of asthma, is indeed more common in the First Nations community, or whether the increased hospital utilization merely reflects a problem with access to primary care and continuity of care. Because there is a paucity of spirometric data from the First Nations community, we conducted a pilot study among school-aged First Nations children in Alberta to determine the prevalence of impaired lung function in this community.

PATIENTS AND METHODS

A small, rural First Nations community in northern Alberta was selected to participate in this pilot project. The community chosen was selected because it represented a typical First Nations community in Alberta. It is a relatively remote community and is located on a First Nations reserve (11). Approximately one-half of the residents of this band reside on the reserve and 36.2% of the population is under the age of 19 years. This community is fairly representative of all First Nations reserves, because provincially, 62.8% of First Nations reside on a reserve, and 45.6% of the overall First Nations population are under the age of 19 years (11).

There is only one grade school in this community, and all children from this school were asked to take part in the study. All children from grades one to nine were given a study packet containing an information letter, a consent form and a school health survey for their parents or guardian. A representative of the study later visited the homes of these children to ensure that all parents and guardians had received the packet and to address their concerns. After receipt of informed consent, a trained and certified respiratory therapist performed spirometry using the Spiromate AS-600 (Riko Medical & Scientific Instrument, USA) on all study participants according to the standards of the American Thoracic Society (12). A prediction equation was used based on values generated from a white population in the United States to determine the expected forced expiratory volume in 1 s (FEV1) and forced vital capacity (FVC) values for the study participants (13). We defined impaired lung function as an FEV1 to FVC ratio below the lower limit of normal based on Hankinson’s equation (13). The testing was conducted in the winter months over a three-day period. The child’s parent or guardian filled out the survey. Descriptive statistics and SAS software (SPSS Inc, USA) were used to analyze the data. Continuous variables are expressed as mean ± SD, unless otherwise indicated. Ethical approval was obtained from the University of Alberta Health Research Ethics Board, and support was also given from the regional health authority responsible for the community.

RESULTS

In total, 36 out of a possible 51 children (70.6%) participated in the study. The mean age of the participants was 11.2±1.9 years; two-thirds of the cohort were girls. On average, 1.7±2.7 days of school were missed due to illness in the month before the survey; 73.1% of the children lived in a house in which one or more adults smoked. Maternal smoking was observed in 63.9% of the children’s homes, while paternal smoking was present in 61.1% of the study subjects’ homes. In 44.4% of the cases, other adults living in the same house as the child smoked. The average age of the home in which the children resided was 11.6±8.3 years, and 19.4% stated there was mold in their homes.

The average FEV1 of the study participants was 2.49±0.59 L (97.3%±10.9% of predicted), and the average FVC was 3.01±0.67 L (102.7%±10.0% predicted). The percentage of FEV1 over FVC was 82.6%±6.9% (94.4%±0.08% of predicted). Of these children, 25% had spirometric evidence of airflow obstruction (ie, FEV1 to FVC ratio below the lower limit of predicted using Hankinson’s equation [13]), and 31% of children had maximum midexpiratory flows below 80%. Parental reports of asthma were present for 20% of children, but of these, 71.4% felt that their children had “outgrown” their asthma. The average age at which the diagnosis of asthma was made was 1.6±1.5 years; 19.4% of the children were reported to be wheezy. On average, children in this study had experienced 2.2±0.7 bouts of a “cold” in the previous year.

The clinical characteristics of the cohort – divided according to whether the subjects had impaired lung function – are shown in Table 1. Interestingly, although a majority of parents with children who had a history of asthma felt that their children had “outgrown” their asthma and no longer had symptoms of asthma, parental reports of “ever having asthma” were strongly associated with impaired lung function (OR 3.20; 95% CI 1.15 to 8.88; P=0.033 compared with those without a parental report of asthma). On the other hand, children who resided in a house in which molds were reported were less likely to have impaired lung function (OR 0.68; 95% CI 0.53 to 0.88; P=0.030). A significant association was not observed between lung function and other variables, including parental smoking (OR 1.22; P=0.354), daycare use (OR 0.70; P=0.156) or sex (OR 1.00; P=1.00) (Figure 1).

DISCUSSION

In the present study, one-quarter of the school-aged First Nations children surveyed had spirometric evidence of airflow obstruction. Indeed, overall, the percentage of FEV1 over FVC was only 82.6%, indicating that many young children in this
Airflow obstruction in First Nations children

![Airflow obstruction in First Nations children](image)

Figure 1) The risk of airflow obstruction among school-aged First Nations children associated with parental reports of mold exposure and of ever having had asthma. The reference group was children without a history of mold in the house or ever having had asthma. Parental reports of the child ever having had asthma were associated with airflow obstruction, while parental reports of mold in the house were associated with protection.

CONCLUSIONS

A segment of the Canadian population - the First Nations people - has received little attention in the lung health literature due to the belief that they have lower rates of respiratory illness. However, it is apparent that this is an area requiring additional research to determine further the extent of airflow obstruction in First Nations children. The present study found that in a small sample of First Nations children, 25% had objective evidence of airflow obstruction, although only a small proportion of their parents (approximately 5% of the sample) felt that they still had asthma. Importantly, 73% of children resided in homes where one or both of their parents smoked. Therefore, interventions aimed at smoking cessation for parents and at preventing First Nations children from initiating smoking would be valuable additions to the public health services in these communities (10). In addition, the impact of exposure to common environmental agents such as mold in the home needs to be explored. Future research with this population is needed to confirm the results of this pilot study.
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