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In-school asthma management and physical activity: children's perspectives

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Abstract

OBJECTIVE—Regular physical activity (PA) is an important component of pediatric asthma management. No studies have examined how in-school asthma management influences PA from children's perspectives. The aim of this study was to explore children's perceptions of the impact of in-school asthma management on PA.

METHODS—Qualitative interviews with 23 inner-city minority children with asthma (ages 8–10 yrs; 12 girls, 11 boys) were conducted in 10 Bronx, New York elementary schools. Sampling continued until saturation was reached. Interviews were recorded, transcribed and independently coded for common themes.

RESULTS—Interviews produced five themes representing students' perceptions about 1) asthma symptoms during in-school PA; 2) methods to control asthma episodes during school PA; 3) methods to prevent asthma episodes during school; 4) limited accessibility of asthma medications; and 5) negative feelings about asthma and medication use. The majority of students experienced asthma symptoms while performing PA during school. Primary methods of managing asthma symptoms were sitting out during activity, drinking water, and visiting the nurse. Students lacked awareness or adherence to action plans to prevent or control asthma. Students reported limited access to medication during school and feelings of embarrassment and/or concerns of teasing when medicating in front of others.

CONCLUSIONS—Our results indicate inappropriate in-school management of asthma symptoms, poor asthma control, lack of accessible medication, and stigma around publicly using asthma medication. Thus, students often missed or were withheld from PA. Interventions to improve in-school asthma care must consider ways to address these issues.

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Declaration of Interest

The authors have no conflicts of interest, financial or personal arrangements to declare. The authors alone are responsible for the content and writing of the paper.

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Keywords

exercise; barriers; inner-city; elementary school students; school-based asthma care; qualitative research

INTRODUCTION

Asthma is the leading cause of school absences and accounts for three times more lost school days than any other cause (1,2). Asthma disproportionately burdens low-income African-American and Hispanic children residing in inner cities such as the Bronx in New York City (3). In the Bronx, hospitalization rates are about five times higher and rates of death from asthma are about three times higher than the national average (4,5).

Regular physical activity (PA) and sports participation are important components of pediatric asthma management (6) and have been correlated with improved physical and cardiopulmonary fitness (7,8). PA has also been associated with decreased severity of asthma symptoms, reduced school absenteeism and improved quality of life among children with asthma (9–11). Despite these benefits, children with asthma have lower levels of PA, fitness, and sports participation than children without asthma (12–14). Given that children spend more than half of their waking hours at school, the school environment represents a critical opportunity for youth with asthma to engage in PA.

Previous studies suggest that care for children with asthma in schools is often disorganized (15,16). Poor organizational structure around asthma may result in inadequate asthma management due to the lack of 1) appropriate treatment of exercise-induced asthma and 2) accessibility to asthma medications. It is likely that inadequate in-school asthma management is a key barrier to children's participation in PA. Thus, it is important to identify barriers that may preclude children with asthma from participating in PA at school.

Multiple studies investigating how asthma is managed in schools have focused on various aspects such as control and prevention, treatment, staff knowledge, and communication (15, 17–19). All of these studies surveyed school staff to determine the effectiveness of asthma management. We found no studies that reported children's perspectives on in-school asthma management and how it relates to PA. Previous qualitative studies have focused on children's perspectives on barriers to asthma care, medication use, and disease self-management (20–22). However, these studies did not focus on school level barriers to PA. One qualitative study evaluating healthy adolescent perceptions of socioecologic barriers to PA identified school policies as a main barrier to PA (23). More research is needed to examine the perspective of children with asthma on school level barriers to PA. Some insights into these barriers using qualitative research methods may guide the development of targeted school-based interventions.

This study represents work from a larger project to design a school-based intervention to address barriers to PA in children with asthma. The larger project included interviews with all stakeholders, such as school personnel, children with asthma and their parents, to identify barriers at multiple levels to guide intervention development. The primary purpose of this

qualitative study was to explore children's perceptions of how in-school asthma management impacts PA. Therefore, analyses and discussions focus on reports from children's perspectives.

METHODS

We conducted a qualitative study using individual interviews with children with asthma. The New York City Department of Education (NYC DOE) and the university's Institutional Review Board (IRB) Committees approved this study.

Participants

Ten public elementary schools in the Bronx, New York were enrolled. Participating schools had comparable student socioeconomic and demographic factors based on information from the NYC DOE 2010–2011 Annual School Reports (24): 1) 89–99% of students were eligible for free lunch, 2) 48%–53% male, and 3) 62%–78% Hispanic and 20%–38% African American. Asthma prevalence in some Bronx elementary schools is up to 20% (25).

Due to the Health Insurance Portability and Accountability Act of 1996 (HIPAA) Privacy and Security Rules, schools were not permitted to disclose names of students with asthma. Therefore, each school identified 4–5 students with physician-diagnosed asthma through school health records. A total of 41 letters (in English and Spanish) informing parents or legal guardians of the study were sent home with these students. Parents interested in their child participating in the study were instructed to contact the principal investigator via phone. Additional recruitment efforts included investigator presence at dismissal and school health fairs and workshops to invite study participation. Eligibility to participate in the study was assessed over the phone.

Study inclusion criteria consisted of the following: 1) child between 8 and 10 years old who had physician-diagnosed asthma and 2) child experienced asthma symptoms in the past 12 months. Children were excluded if they had learning disabilities that would prevent them from contributing appropriate data or had chronic medical conditions prohibiting participation in PA. All children spoke English.

Instruments

At enrollment, parents reported on their children's age, gender, ethnicity/race, asthma symptoms and prescribed medications. We asked parents about child's day- and night-time asthma symptoms, interference with normal activity, frequency of short-acting beta₂-agonist use over the past 4 weeks as well as number of exacerbations requiring oral systemic corticosteroids. We then used National Heart, Lung, and Blood Institute (NHLBI) guidelines to categorize each child's asthma severity or control based on these parent-reported data and information about prescribed medications (6).

Height and weight of each student were collected for comparisons across themes given the relationships between asthma and obesity and PA and obesity. Height was measured to the nearest 0.25 inch and weight was measured to the nearest 0.1 pound using a digital scale (Tanita electronic physician scale, WB-300, Tokyo, Japan) on the day of the interview. We

calculated body mass index (BMI) percentile using each child's weight, height, age, and gender. In accordance with national guidelines, we defined "normal weight" as a BMI between 5th and less than the sex-specific 85th percentile on the CDC's 2000 BMI-for-age growth charts, "overweight" as a BMI at or above the 85th percentile but less than the 95th percentile, and "obese" as a BMI at or above the 95th percentile (26).

Procedure

Parents signed informed consent for child participation and students signed assent on the day of the interview. Individual interviews were conducted by one author (MR) between December 2010 and June 2011. Most interviews took place at the school after school hours and averaged 35 minutes in duration. An interview guide was developed to cover concepts such as in-school PA and asthma symptoms, in-school asthma management, and attitudes towards asthma medications. The interview guide was pilot-tested with two children with asthma (ages 8 and 9 years) who had participated in another community-based asthma study in the Bronx, NY.

The pilot-tested interviews were transcribed and evaluated for ease of understanding of questions. The interview guide was revised based on feedback from pilot interviews. We asked children about the following: 1) in-school PA during Physical Education (PE) class or outdoor recess; 2) how they feel during exercise and if there was anything that would stop them from running or playing sports; 3) times they had to go to the school nurse for their asthma; and 4) how they feel about taking asthma medications. Interviews were conducted until thematic saturation was reached. Saturation was defined as the point at which no new information or themes were observed in the data (27). Students received a small toy after the interview.

Data Analysis

All interviews were audio-recorded with permission from the caregivers and students and transcribed verbatim. Three representative transcripts were read independently by two coders to create separate codebooks with operational definitions. The coders discussed and reconciled discrepancies and developed a master codebook. All interview transcripts were independently coded using the master codebook. Thematic and content analysis was used to analyze interview data (28). Thematic content analysis identified themes related to specific phrases or types of behavior. Content analysis assessed the number of children who responded in certain ways and the importance of themes based on the frequency with which they were identified. Emerging themes were discussed and agreed upon by both authors. Qualitative analysis software (NVivo 9, QSR International Pty Ltd, Melbourne, Australia) (29) was used to organize, sort, and code the data. Our findings were corroborated through feedback received during presentations to the school community.

RESULTS

Participant Characteristics

Twenty-five students were screened and met inclusion criteria. Interviews with two participants were not completed due to reaching thematic saturation prior to scheduling their

interviews. Twenty-three students with asthma between the ages of 8 and 10 years participated in the individual interviews (Table 1). Majority of students were of Hispanic descent, which is representative of both the study schools and the general population of the Bronx (30). The mean age was 9.29 ± 0.78 years. Fifty-two percent of the children were female. Of the 14 students who were prescribed controller asthma medications by their physicians, most ($n=13$) had “not well-controlled” or “very poorly controlled” asthma as per NHLBI Guidelines (6). Fifty-six percent of the participants were overweight or obese.

Interview Themes

Five themes emerged throughout the interviews related to the in-school management of students' asthma symptoms and their direct or indirect impact on PA. Predominant themes included: 1) asthma symptoms during in-school PA; 2) methods to control asthma episodes during school PA; 3) methods to prevent asthma episodes during school; 4) limited accessibility of asthma medications; and 5) negative feelings about asthma and medication use.

Asthma Symptoms during In-School PA

Students reported limited access to scheduled PA in their schools. In particular, students indicated PE class being offered only 1–2 times per week. Despite limited access to scheduled PA, many students (17/23) experienced asthma symptoms while performing PA during the school day. The most common symptoms were shortness of breath, trouble breathing, coughing, wheezing, and chest pain. Students most commonly reported experiencing asthma symptoms during PE, followed by recess, and rarely while engaging in activities such as walking upstairs or running in the hallways.

- Child 9: “my asthma it really comes in, and it's like its squeezing myself in so it's like I can't run no more oh my gosh I'm breathing so hard that it's hard for me to really run a lot and that's really it.”

- Child 12: “Um, like when I play a lot I feel like I gotta stop because my asthma and I feel like coughing a lot or throwing up.”

Methods to Control Asthma Episodes during School PA

When discussing topics related to in-school asthma management, students primarily spoke about treating asthma symptoms when they presented rather than controlling or preventing symptoms before they occurred. The primary methods of controlling acute asthma symptoms occurring during recess or PE were a combination of stopping activity, sitting down, and taking a water break. Most students either asked for permission to sit out and/or take a water break, or they were actively instructed by their PE teacher to do so. Students felt sitting out would help them relax and get their symptoms under control while water would help improve or prevent their symptoms from occurring.

- Child 8: “I tell them that I have asthma. I have to drink this bottle of water when I don't feel that good and if I don't have this bottle of water I have to sit out.”

- Child 7: “...I was jumping and playing racquetball. And then, I started coughing. Then I told my teacher and then she told me to sit down.”

Another, yet less common, method of managing acute asthma symptoms induced by PA was taking medication. Most students who used medication to treat their asthma symptoms during PE asked the PE teacher either for permission to use the pump or go to the nurse's office. Rarely did the PE teacher suggest a student use medication to alleviate symptoms or actively send a child to the nurse. The majority of students who went to the nurse's office did so because the nurse maintained control of their medication as per school's policy. When students went to the nurse for medication, they rarely returned to class. The nurse's office was often in a different area of the school so by the time the student returned, class was over.

- Child 4: "Well, I was at gym. I was running a lot then. I told the gym teacher if I can go up to the first floor and get my pump, and then I can go downstairs and start running again... After that, I took my pump, I went downstairs. The running was over. I missed it, and I was kind of happy."

When students had immediate access to their medication, they were able to self-administer their medication and, in some cases, return to activity. Two students reported using their pumps immediately when they developed asthma symptoms during activity. One child was in basketball practice at the school and was able to return to practice after medicating. The other child was at recess and claimed to feel much better after using medication. Both of these students had their pumps with them during these incidences.

- Child 2: "My, my gym—my coach was making us do suicides, that's when we have to run to the court and back real fast so I couldn't breathe that good so he made me run ten laps around the court cuz I couldn't do it that good. But my teacher, my gym teacher, does know I have asthma, but sometimes like I don't need it sometimes, but um when I was dealing with that, I couldn't-like my chest was like, I could hear wheezing in it—it sounded like a squeaky toy. So, I sat on the bench and went in my pocket, my jeans, and got my asthma pump."

Methods to Prevent Asthma Episodes during School

Despite the majority of children reporting asthma-related symptoms during PA, students were either unaware or did not adhere to a formal asthma action plan to prevent, control, or treat such symptoms when they presented. The most common form of preventive asthma management was sitting out from activity. Only one student claimed to make a point to use his asthma pump the day of PE. Two students noted they were supposed to use their pumps before activity, but they either forgot to do so or forgot to take their pumps to school. Another student claimed the doctor did not specify for him to take medication prior to activity so the school did not have the necessary paperwork completed to allow him to do so.

- Child 11: "My mom writes a note...She writes something like [child's name] has asthma and it's acting up again so she can't play in the activity you are doing today."

- Child 22: "Well, well, actually, I keep forgetting to bring it [pump] to school, so that's when I just start sitting down instead of using the pump."

Limited Accessibility of Asthma Medications

Students' lack of clarity around the rules regarding their medication use at school limited the accessibility of medication prior to and/or during in-school PA. Less than half of students reported carrying their pumps with them at school. Of the students who did carry their pumps, a few claimed to forget to bring them to school. Some students reported keeping their medication in the nurse's office. A few students felt they were not allowed to have their pumps with them at school while one student claimed special permission was required in order to carry medication with them at school.

- Child 19: "Mm, I carried it to school once to give it to my nurse so she could hold on to it for the school year, so when I need to go to the nurse, she'll have my pump ready for me."

- Child 2: "Yes, I do [in response to carrying pump to school]. Sometimes. If I-- sometimes I forget it."

- Child 17: "No, I can't [in response to carrying pump to school]. I can't take it to school. We have to leave it at home."

Negative Feelings about Asthma and Asthma Medication

Students' feelings about asthma symptoms and treatment contributed to limited use of medication at school. Most students reported they did not like to use their asthma pumps in front of classmates. Students were embarrassed or nervous that others would tease them or say something negative towards them. The majority of students claimed they did not like to tell other classmates they had asthma. Students claimed to be embarrassed and/or feeling sad they had asthma. Others did not want to be bothered when using their medication or did not want another classmate to tell on them. Some claimed their parents did not allow them to use their pumps in front of other children.

Child 1: "Um, I feel, I feel sad [about using pump in front of classmates]. Because I'm scared that everybody's going to tease me."

Child 5: "No [in response to telling others about asthma]...Because, um, they might be calling you Asthma Boy or something, making you names, so...or who knows what they'll...I would never tell them that."

Comparisons of Themes for Gender and BMI status

Comparative analyses of themes between male versus female students and overweight/obese versus normal weight students did not reveal different trends among these subpopulations. Results indicated in-school asthma episodes affected both genders and weight categories equally. In addition, acute management of asthma during PA was consistent for both genders and weight categories. Since very few students reported chronic or preventive school management of asthma no differences were observed among subpopulations. Feelings of nervousness and embarrassment about taking medication in front of classmates were universal throughout the group and regardless of gender or weight category.

DISCUSSION

Regular PA is an important component of pediatric asthma management. However, children with asthma appear to have additional barriers to participating in PA. We found that most students experienced asthma symptoms with PA during the school day. It was unclear if shortness of breath with exercise that some students reported was due to asthma or deconditioning. However, almost every student attributed exercise-induced symptoms to asthma. Poor asthma control likely contributed to students experiencing symptoms during PA. In-school asthma management was often disjointed or ineffective, resulting in students sitting out from PA. Several factors contributed to poor asthma management in schools. Students were unaware or did not adhere to formal asthma action plans and rarely took preventive measures. Barriers to asthma medication delivery such as perceived social pressures or poor accessibility influenced students' ability and willingness to use medication in school.

We observed no differences among themes between boys versus girls and students who were overweight/obese versus students who were normal weight. Evidence suggests obesity rates are higher among children with asthma (31). Over half of our sample was overweight or obese. Higher obesity rates among children with asthma may be influenced by low participation in PA (32). Students who were overweight/obese and students who were normal weight both reported sitting out from PA when they experienced asthma symptoms. Given the complex relationship between asthma and obesity, meeting PA recommendations for children with asthma is critical. In-school asthma management programs must emphasize the importance of PA for its positive effects on asthma outcomes and the general health benefits associated with exercise.

Multiple studies investigating in-school asthma control and prevention reported that the majority of students did not have asthma action plans on file at school (18, 33). In addition, many teachers incorrectly believed children with asthma should avoid strenuous activity, and that asthma medication taken prior to activity would not help students during exercise (17). These results, while obtained by surveying school staff, resonate with our findings. Our findings further demonstrate how inadequate asthma management may have contributed to students sitting out from PA rather than enabling participation.

Our results indicated the most common ways to treat asthma symptoms occurring during PE was for children to sit down and relax, or get a drink of water. These results differed from another study that reported the most common treatment was for teachers to send students to the nurse (without specifying the need for medication) (17). The aforementioned study did not differentiate between PE teachers and classroom teachers. It is likely PE teachers in our study may have treated students' asthma symptoms differently because they had to consider if symptoms were due to deconditioning or asthma since many students reported shortness of breath as an asthma symptom. It is also possible PE teachers were not aware when children were experiencing asthma symptoms and thus allowed students to opt themselves out of PA rather than encouraged treatment.

Barriers to medication delivery and student feelings about medication may also impact in-school asthma management, further influencing PA. Previous studies have reported adolescent students with asthma are embarrassed to take medication in front of classmates, and they are concerned about bullying and teasing (21, 34). Previous findings also indicate students have limited access to medication because of school rules prohibiting them from carrying medication (21). Both of these problems were commonly expressed during our interviews, suggesting they are issues for younger children as well. Lack of easy access to medication or concerns of teasing likely contributed to children not using medication in school to prevent or control asthma symptoms.

Limitations of our study include a self-selected sample, which may not be fully representative of all students with asthma. Due to HIPAA rules, schools could not disclose names of students with asthma forcing us to rely on a self-selected sample. Additionally, we included students with documented asthma symptoms in the past 12 months, which is a broad timeframe. This may have impacted students' recall of asthma episodes and care at the schools. However, most of the students in our study easily recalled having asthma symptoms with PA during the school day. Conclusions about school management and activity levels are based on the student point of view. Students may not be fully aware of school policies for treating or managing asthma. Therefore, we cannot conclude policies for asthma management do not exist based on these data. Rather, the data suggest children are unaware of such policies and/or do not adhere to them. Lastly, these qualitative results suggest an existing relationship between in-school asthma management and children's PA participation; however, additional research is necessary to determine if this observed relationship is of causal nature.

Conclusions

Our findings suggest there are several ways to improve school asthma management and enable children with asthma to participate in PA. It is important for schools to educate and train staff about asthma symptoms and to carry out school policies around asthma management. Children with asthma likely need extra encouragement and additional reminders to take medication prior to PA and when symptoms present during PA. Effective preventive management can help children with asthma deal with challenges they face when being physically active. PE teachers could play a vital role in helping manage exercise-induced asthma symptoms by recognizing asthma symptoms when they present and initiating appropriate treatment.

Other elements of the school environment may also play an important role in asthma management. Schools may need to address the social environment around asthma and asthma medication to prevent teasing. In addition, medication should be more accessible for students prior to and during PE and recess. Children with asthma need more instruction about when it is appropriate to carry and use medication during the school day. Schools should also maintain personal asthma action plans for students to clarify treatment regimens for staff and improve the communication between schools, parents, and health care providers. Maintaining well-defined asthma policies and creating a supportive environment may be effective ways for schools to help children with asthma regularly participate in PA.

School-based interventions targeting asthma and PA need to address the identified barriers around asthma management in schools.

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Table 1

Sociodemographic Characteristics of Children with Asthma Attending Elementary Schools in the Bronx, NY (N=23).

Characteristic	N (%) [*]
Mean age, years (SD)	9.29 (0.78)
Female gender	12 (52.2)
Ethnicity	
Hispanic/Latino	20 (87.0)
Not Hispanic/Latino	3 (13.0)
Race	
African-American	6 (26.1)
White	2 (8.7)
More than one race	1 (4.3)
Unspecified	14 (60.9)
Weight Status	
Underweight	2 (8.7)
Normal Weight	8 (34.8)
Overweight	5 (21.7)
Obese	8 (34.8)
Grade	
3 rd grade	13 (56.5)
4 th grade	9 (39.1)
5 th grade	1 (4.3)
Asthma Severity ^{**}	
Mild Intermittent	6 (66.7)
Mild Persistent	2 (22.2)
Moderate Persistent	1 (11.1)
Severe Persistent	0
Asthma Control [†]	
Well Controlled	1 (7.1)
Not Well Controlled	12 (85.7)
Very Poorly Controlled	1 (7.1)

* Percentages may not equal to 100% due to rounding

** Asthma severity was assigned for students (N=9) who were not prescribed controller asthma medications by their primary care providers. Percentages were calculated based on N_{total}=9

† Asthma control was assigned for students (N=14) who had persistent asthma and were prescribed controller asthma medications by their primary care providers. Percentages were calculated based on N_{total}=14