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Medication use, sleep, and caregiver smoking status among urban children with asthma

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ABSTRACT

Objective: Children living in urban settings from low-income, minority families are at a high risk for experiencing asthma morbidity. Environmental tobacco smoke (ETS, i.e., secondhand) exposure, typically from caregiver smoking, has been associated with increased quick-relief medication use and child nocturnal awakenings due to increased asthma symptoms as well as worse sleep quality in children with asthma. This study investigated the moderating role of caregiver smoking status on the association between quick-relief medication use and child's sleep quality in urban children with persistent asthma. **Methods:** Fifty-four urban children with persistent asthma and their primary caregivers completed a baseline research session. Caregivers then completed ecological momentary assessment surveys via smartphones twice daily for two weeks in which smoking behaviors, child quick-relief medication use, and child's sleep quality were assessed. **Results:** Twenty caregivers (37%) reported smoking at least one day across the two-week period. The caregiver smoking status significantly moderated the association between quick-relief medication use and child's sleep quality after controlling for child age and monthly household income. The caregiver smoking status exacerbated the association between quick-relief medication use and child's sleep quality, such that more medication usage was associated with worse sleep quality. **Conclusions:** Findings suggest that in urban families with a caregiver who smokes, more daily quick-relief medication use may put children at an increased risk for worse sleep quality. The effects of ETS exposure on child's sleep quality in addition to child asthma symptoms should be an integral part of discussions between pediatric healthcare providers and families of children with asthma.

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Introduction

Pediatric asthma is a major public health concern that disproportionately affects racial and ethnic minority children and children living in low-income, urban areas. African American and Latino children are more frequently treated in the emergency department (ED) for asthma-related care than Caucasian children [1]; children living in urban settings also experience higher rates of asthma morbidity [2]. Reasons for these pediatric asthma disparities are multi-factorial and include factors related to the individual (e.g., illness management), environment (e.g., allergens), the healthcare system (e.g., insurance), and the provider (e.g., interactions with patients [2]).

Tobacco smoke exposure and pediatric asthma

Exposure to environmental tobacco smoke (ETS, i.e., secondhand smoke exposure) is associated with a greater risk of negative asthma outcomes and is of particular concern for children with asthma living in urban settings and

low-income homes [3,4]. Children living in urban environments may be exposed to more ETS than other children due to living in close proximity to others and in public housing [5]. African American race, lower income, and lower parental educational attainment have also been associated with more tobacco smoke exposure in children with asthma [6].

Children with asthma who are exposed to ETS also have higher rates of quick-relief medication use (i.e., rescue inhaler use [7, 8]). Often, children with poorly controlled asthma may use more quick-relief medication due to exacerbations of symptoms [9]. More quick-relief medication use can be an indication of worse asthma severity and has been associated with poorer daytime functioning (e.g., more missed school and negative education consequences [10]). In a longitudinal study of children (7–12 years) with asthma, children were more likely to use quick-relief medication on the day after being exposed to ETS [11]. Thus, children with asthma who are exposed to ETS may be at a risk for increased

quick-relief inhaler use presumably to manage resultant symptoms.

Sleep, tobacco smoke exposure, and pediatric asthma

In addition to increased rates of quick-relief inhaler use, ETS has also been linked to worse sleep quality among children with asthma. Exposure to ETS at home has been associated with more nocturnal asthma symptoms (e.g., cough, shortness of breath, etc.), especially among inner-city children [12], which can lead to more awakenings and worse sleep quality [13, 14]. Morkjaroenpong et al. [12] found that inner-city children with moderate to high levels of ETS exposure were thrice more likely to awaken at night due to nocturnal asthma symptoms. Overall, ETS exposure appears to be more prevalent in urban homes; children with asthma may have more sleep disturbances and higher tobacco smoke exposure levels.

Caregiver smoking behaviors

To date, much of the literature on caregiver smoking in children with asthma has been focused on smoking cessation interventions [15–17], which may subsequently minimize ETS exposure in children. Retrospective reports from a motivational interviewing intervention for caregivers of urban children with asthma to reduce ETS found that 32% of the caregivers smoked outside only, 51% smoked outside and inside, and 12% smoked inside mostly [18]. Another study similarly found that 45% of the caregivers of children with asthma smoked outside only, 48% smoked outside and inside, and 8% smoked indoors only, primarily in their own bedroom [19]. Missing from these retrospective reports of caregiver smoking behaviors is a description of these experiences on a day-to-day basis, as well as how often the child was present while the caregiver was smoking.

Ecological momentary assessment (EMA)

One way to improve upon existing studies assessing ETS, child's sleep, and caregiver smoking through retrospective self-report measures is by incorporating EMA. Retrospective reports are often subject to recall biases that limit the accuracy of the information being reported, as well as social desirability biases [20]. EMA is broadly defined as a methodology used to obtain repeated, daily assessments of a person in their natural environment. EMA is often advantageous over retrospective reports in that it can minimize the effects of social desirability and retrospective recall issues by incorporating shorter recall periods [21]. In fact, a recent study reported that caregivers

of children with asthma may be more likely to underreport smoking behaviors to healthcare providers as compared to caregivers of children without asthma [22]. EMA is one way to ascertain a more accurate report of smoking behaviors, such as if and where caregivers of children with asthma are smoking. Furthermore, EMA may improve ecological validity by collecting information from people in their natural environments, as they go about their daily lives [21]. Limited research has focused on implementing EMA with low-income, urban families of children with asthma. Studies that have implemented EMA with urban families have focused primarily on assessing stressors or adherence along with symptoms in adolescents [23, 24]. The current study used EMA delivered via a smartphone with caregivers of children with asthma 7–12 years. This younger age range is of particular interest in the study of ETS exposure on asthma morbidity given that younger children are more likely to experience prolonged exposure to ETS [3].

Current study

The primary aim of this study was to examine how caregiver smoking status may affect the association between quick-relief medication use and child's sleep quality using daily EMA reports from caregivers. Given that increased quick-relief usage may be an indication of increased asthma symptoms, we hypothesized that more quick-relief medication use would be associated with worse child's sleep quality. We also expected that this association would be stronger among children who have a primary caregiver that smokes. Finally, we described daily smoking behaviors (e.g., frequency, location, smoking in the presence of child, etc.) collected through daily EMA reports of the subset of primary caregivers who smoked.

Methods

Participants

Data were part of a larger study which focused on examining the daily burden associated with caring for a child with asthma among urban caregivers (*citation blinded for review*). Potentially eligible children were identified through the electronic health records of patients in an area health system. Identified participants were contacted by phone and screened for interest and eligibility. Children were included if they were between 7 and 12 years of age, had persistent asthma, and lived in an urban area as verified by zip codes comprising to Richmond City, which has a high population density per square mile. In line with NHLBI guidelines [25], children met persistent asthma criteria by having a current controller medication

prescription or by endorsing at least one of the following: (1) daytime symptoms two or more times a week in the last four weeks, (2) nighttime symptoms three or four times a week in the last four weeks, (3) quick-relief medication use two or more times a week in the last four weeks, (4) activity limitation due to asthma symptoms in the last four weeks, or (5) an oral steroid prescription two or more times in the past year. Primary caregivers needed to speak English and identify as African American, Caucasian, or Latino. The inclusion of families from African American, Caucasian, and Latino backgrounds is consistent with the growing body of literature focused on pediatric asthma disparities [2, 26]. Families were excluded if the child had an additional pulmonary disease, developmental delay, or severe psychiatric or other medical illness. Eighty-seven families were screened eligible for the study. Of these 87 eligible families, 26 (30%) did not complete the initial research session due to multiple missed visits or lack of interest in the study. Of the 61 families that consented and completed the initial research session, seven families (11%) had incomplete data for this study and were not included.

Procedures

Institutional Review Board approval was obtained prior to the start of this study. Children and caregivers completed an initial research session, which took place either in a research office or in the family's home depending upon family preference. Written informed consent from caregivers and assent from children were obtained prior to the administration of questionnaires. Two research assistants (RAs) administered a series of questionnaires to caregivers and children separately.

Once questionnaires were completed, caregivers were trained to use the survey application on a smartphone provided to them for the two-week monitoring period. The smartphones were Samsung Galaxy Stellar phones and calling and text-messaging features were disabled. RAs demonstrated how to use the smartphones to complete EMA surveys with caregivers. Caregivers selected an alarm schedule, which was programmed into the phone to prompt them to complete surveys twice a day. Two surveys (morning and evening) were completed each day for two weeks. At the end of the monitoring period, RAs retrieved the smartphones from family homes. Families were compensated for their time.

Data from smartphones were automatically uploaded to a server once a survey was completed in the field. In addition, the same data from the surveys were saved to the smartphones as a backup. Once the smartphones were collected, the survey data were downloaded from the phone and uploaded to the server to ensure that all data were retrieved. After all data were secured on the server,

data were deleted from the smartphones and the survey application was reinstalled for the next participant.

Measures

Demographic questionnaire

During the initial session, caregivers completed a demographic questionnaire that included items about their race/ethnicity, age, marital status, monthly income, relationship to the child, household size, and questions about their child's age and race/ethnicity.

EMA surveys

Caregivers completed two EMA surveys a day: the morning survey and the evening survey.

Sleep question

The morning EMA survey included a question about the child's sleep quality from the night before: "Overall, how would you rate your child's sleep quality last night?" Caregivers responded on a four-point scale that ranged from 1 "very good" to 4 "very bad." This question was adapted from the Pittsburgh Sleep Quality Index [27], which defines sleep quality as a subjective rating of how well a person slept (i.e., did they wake up a lot, did they feel rested upon waking, etc.).

Smoking questions

The evening EMA survey assessed whether the caregiver smoked that day and where they smoked. Caregivers answered: "Did you smoke today?" (Yes/No) and "Was your child exposed to smoke today?" (Yes/No). If caregivers responded that they did smoke, they were then prompted with the question: "Where did you smoke today?" Respondents were given the following options and asked to mark all that applied: "In the house, same room as child; In the house, different room from child; In the car, child was in car; In the car, child was not in car; Outside (e.g., on the porch, at playground); Other location with child; Other location without child." These questions were adapted from the items asked in previous studies assessing child ETS exposure [28]).

Asthma medication questions

The evening EMA survey also assessed child asthma medication use. Caregivers were asked: "How many puffs of quick-relief (or rescue) medication (e.g., albuterol) did your child take today?" with the following response options: 0, 1, 2, 3, 4, or "More than 4." If caregivers selected "More than 4," they were prompted with the question: "You said your child took more than 4 puffs of a quick-relief or rescue medication today. Tap the box below and enter how many puffs your child took today." Questions

related to asthma medications were adapted from the Asthma Assessment Form [29].

Data analysis

Analyses were conducted using IBM SPSS Statistics, Version 22.0 software (IBM Corp., Armonk, NY, USA). If caregivers reported smoking one day or more during the two-week monitoring period, they were coded as smoking for all analyses. This study focused on the difference between children who have a primary caregiver who smokes and children who do not have a primary caregiver who smokes; therefore, data were collapsed across days to assess between group differences. An average score across the monitoring period of available EMA data for child's sleep quality and quick-relief medication use was calculated for each family. Average scores were used in all analyses. Given the smaller sample size, the Shapiro–Wilk test for normality was conducted. A *t*-test was conducted to determine differences in child's sleep quality and quick-relief medication use across the two groups (smoking vs. non-smoking). Based on prior literature [14, 30, 31], monthly household income, child age, and child sex were tested as covariates. Bivariate correlations were conducted to determine whether income and child age were associated with child's sleep quality. A *t*-test was conducted to determine if child's sleep quality differed across child sex.

In testing our primary aim, a hierarchical multiple regression analysis was used to examine the association between quick-relief medication use and child's sleep quality, controlling for covariates as appropriate. The caregiver smoking status was then tested as a moderator in the association between quick-relief medication use and child's sleep quality. Prior to moderation analyses, the independent variable was centered, the categorical moderator was coded (1 = smoking; 0 = non-smoking), and a product term was created from the centered variable and moderator [32]. Covariates were entered in the first step, the independent variable was entered in the second step, the moderator (caregiver smoking status) was entered in the third step, and the interaction term was entered in the last step. As described by Holmbeck [33], post hoc probing analyses were conducted for the significant interaction to determine which of the simple slopes differed from zero. Frequencies were run to determine how many caregivers smoked, where they smoked, and how many days they reported that their child was exposed to tobacco smoke.

Results

Descriptive statistics

Participants for this study included 54 children between 7 and 12 years ($M = 9.52$ years, $SD = 1.51$) and their

primary caregivers. Approximately 68.5% of the children were males, 88.9% were African Americans, and 64.8% reported a monthly household income of less than \$1999. Caregivers were between 22 and 64 years of age ($M = 38.07$ years, $SD = 9.19$) and 79.6% reported being the child's biological mother. See Table 1 for full participant demographics. Twenty caregivers (37%) reported smoking at least one day during their monitoring period and were designated as the “smoking” group.

Caregivers ($n = 54$) completed surveys at an average of 9.50 days ($SD = 3.82$) of the two-week monitoring period. The Shapiro–Wilk test of normality was non-significant for outcome variables (i.e., sleep quality). This test was also non-significant for the two groups (i.e., smoking and non-smoking). No significant differences were revealed by *t*-tests between the two groups (smoking and non-smoking) on average child's sleep quality or quick-relief medication use. Child age was correlated with child's sleep quality ($r = -.31$, $p = .022$) and was controlled for in subsequent analyses. In addition, there was a trend in the association between monthly income and child's sleep quality ($r = -.25$, $p = .063$). Given the established association between socioeconomic status (SES) and children's living/sleeping conditions, monthly income was also controlled for in subsequent analyses [29]. Quick-relief medication use and child's sleep quality did not differ significantly across child sex. Average quick-relief medication use ranged from 0 to 4.57 puffs a day ($M = 0.96$, $SD = 1.21$). Average child's sleep quality ranged from 1.00 to 2.86 ($M = 1.94$, $SD = 0.47$), with higher scores indicating worse sleep quality.

Moderation analysis

Quick-relief medication use significantly predicted child's sleep quality after controlling for child age and monthly household income ($b = 0.12$, 95% CI [0.01, 0.22], $t(50) = 2.48$, $p = .017$; $\Delta R^2 = 0.09$, $\Delta F(50) = 6.14$, $p = .017$), with more quick-relief medication associated with worse child's sleep quality. The caregiver smoking status significantly moderated the association between quick-relief medication use and child's sleep quality ($b = 0.23$, 95% CI [0.04, 0.42], $t(48) = 2.42$, $p = .019$; $\Delta R^2 = 0.08$, $\Delta F(48) = 5.86$, $p = .019$) after controlling for monthly income and child age. More medication usage was associated with worse sleep quality in children who had a primary caregiver that smoked (Figure 1). The simple slope for the smoking group regression line was significant ($b = 0.23$, 95% CI [0.08, 0.37], $t(50) = 3.19$, $p < .001$), whereas the simple slope for the non-smoking group regression line was not significant. These findings did not change with the removal of the two caregivers that reported smoking 20% or less of their monitoring period; therefore, results presented are with all caregivers.

Table 1. Caregiver and child demographics of total sample and subgroups.

Demographic items	Total sample <i>n</i> = 54	Smoking <i>n</i> = 20 (37%)	Non-smoking <i>n</i> = 34 (63%)	<i>p</i> -Value*
<i>Caregiver</i>				
Age, <i>M</i> years (SD)	38.07 (9.19)	37.70 (10.14)	38.29 (8.74)	.82
Race/ethnicity, <i>n</i> (%)				.27
African American/black	48 (88.9)	16 (80)	32 (94.1)	
Caucasian/white	4 (7.4)	2 (10)	2 (5.9)	
Mixed/multi-racial	1 (1.9)	1 (5)	0	
Other	1 (1.9)	1 (5)	0	
Relation to child, <i>n</i> (%)				.07
Biological mother	46 (79.6)	15 (75)	28 (82.4)	
Step or adoptive mother	3 (5.6)	0	3 (8.8)	
Biological father	6 (11.1)	5 (25)	1 (2.9)	
Grandmother	1 (1.9)	0	1 (2.9)	
Other	1 (1.9)	0	1 (2.9)	
Relationship status, <i>n</i> (%)				.37
Single	34 (63)	15 (75)	19 (55.9)	
Married	8 (14.8)	1 (5)	7 (20.6)	
Separated	6 (11.1)	2 (10)	4 (11.8)	
Divorced	4 (7.4)	2 (10)	2 (5.9)	
Widowed	2 (3.7)	0	2 (5.9)	
Education, <i>n</i> (%)				.23
Less than high school	10 (18.5)	6 (30)	4 (11.8)	
High school graduate	17 (31.5)	6 (30)	11 (32.4)	
Partial college or graduate	27 (50.0)	8 (40)	19 (55.9)	
Income (monthly), <i>n</i> (%)				.91
Less than \$1,000	21 (38.9)	8 (40)	13 (38.2)	
\$1,000–\$1,999	14 (25.9)	6 (30)	8 (23.5)	
\$2,000–\$3,999	15 (27.8)	5 (25)	10 (29.4)	
Greater than \$4,000	4 (7.4)	1 (5)	3 (8.8)	
Household size, <i>M</i> (SD)	4.37 (1.67)	4.40 (1.82)	4.35 (1.61)	.92
<i>Child</i>				
Age, <i>M</i> years (SD)	9.52 (1.51)	9.40 (1.23)	9.59 (1.67)	.64
Sex (male), <i>n</i> (%)	37 (68.5)	16 (80)	21 (61.8)	.16
Race/ethnicity, <i>n</i> (%)				.27
African American/black	48 (88.9)	16 (80)	32 (94.1)	
Caucasian/white	4 (7.4)	2 (10)	2 (5.9)	
Mixed/multi-racial	1 (1.9)	1 (5)	0	
Other	1 (1.9)	1 (5)	0	

Notes. Household size is the mean number of individuals including children at home.

**p*-value results are obtained from the analyses assessing differences in variables across smoking vs. non-smoking groups.

Description of caregiver smoking behaviors

Of the 20 caregivers who reported smoking, 13 (65%) reported smoking everyday of their monitoring period, with another two (10%) reportedly smoking more than

80% of the time. Only two (10%) caregivers reported smoking 20% or less of their monitoring period, one of which reported smoking at home. In addition, caregivers were asked where they smoked each day (could select multiple locations). Twelve caregivers (60%) reported smoking at multiple locations, seven (35%) reported smoking outside only, and one (5%) reported smoking in the house, different room from the child only (Table 2 for caregiver-reported smoking locations). Caregivers were

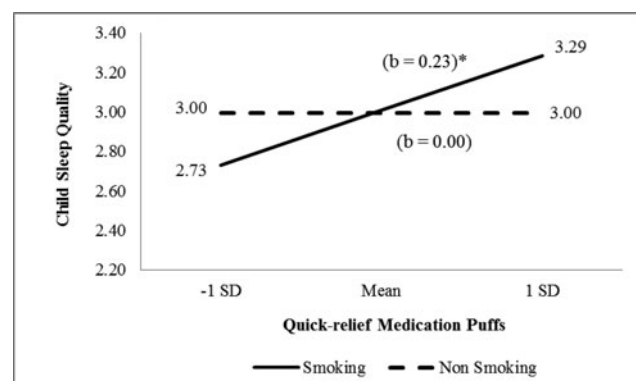


Figure 1. Regression lines for the association between quick-relief medication use and child's sleep moderated by the caregiver smoking status. Note. *b* = unstandardized regression coefficient (i.e., simple slope). **p* < .05.

Table 2. Caregiver-reported smoking locations (*N* = 20).

Smoking location descriptives	<i>N</i> (%)
Where did you smoke today?	
In the house – same room as child	3 (15)
In the house – different room from child	7 (35)
In the car – child was in car	3 (15)
In the car – child was not in car	9 (45)
Outside (e.g., on the porch, at playground)	18 (90)
Other location with child	2 (10)
Other location without child	11 (55)
Caregivers that reported smoking in multiple locations	12 (60)
Caregivers that reported smoking only outside	7 (35)
Caregivers that reported smoking in the house-different room from child only	1 (5)

also asked if their child was exposed to tobacco smoke. Among those who smoked, 10 (50%) reported that their child was not exposed to tobacco smoke all the days they reported smoking themselves. Only two caregivers (10%) reported that their child was exposed to tobacco smoke everyday they reported smoking themselves.

Discussion

Consistent with our hypothesis, we found that caregiver smoking status over a two-week period moderated the association between quick-relief medication use and sleep quality. Findings suggest that in urban families with a caregiver who smokes, children with asthma that use more daily quick-relief medication may be at an increased risk for worse sleep quality. Our findings are consistent with previous research that has also found an association between quick-relief medication use and ETS [7, 8], as well as research linking asthma and sleep quality [34]. For example, Schwartz et al. [11] found that ETS exposure on a given day was associated with more medication use the next day in children. Thus, ETS exposure may exacerbate children's asthma and inhibit their quality of sleep. For children with a primary caregiver who smokes, worse outcomes may be experienced on a continual basis due to chronic exposure to ETS. Importantly, although quick-relief medication use and sleep quality were associated in our full sample, these variables were not associated in children with a non-smoking caregiver. This finding may speak even further toward the importance of focusing on caregiver smoking behaviors in children with asthma; children who live with a caregiver that smokes may be at a greater risk for both worse sleep and asthma outcomes.

In describing caregiver smoking behaviors, we found that almost 40% of the caregivers of children with asthma reported smoking over the two-week monitoring period. Caregivers reported smoking in a variety of settings, most frequently outside or in a location without a child. Half of the caregivers who smoked reported that their child was not exposed to tobacco smoke everyday and that they reported smoking themselves. Several of these caregivers reported smoking outside only, which may suggest that they did not perceive their children as being exposed to tobacco smoke, such as on caregivers' clothing, if smoking occurred outside. In contrast, two caregivers reported that their children were exposed to tobacco smoke everyday and that they reported smoking themselves. Neither of these two caregivers reported smoking, while their children were present, but did report smoking at home. Gill et al. [35] found that even though parents reported not smoking at home, 70% of the children with asthma in their study had urinary cotinine concentrations that suggested ETS exposure within the last 24–36 hours.

Thus, even if the caregivers smoke outside, they can carry the particles in their breath, hair, or clothes and transfer them to indoor surfaces [36]. Additionally, smoke can enter homes through open windows and doors and pollute indoor surfaces. The current findings suggest that caregivers may need additional education about minimizing the impact of ETS exposure for their children with asthma.

Limitations

The present study had several limitations, including sample size, which limits the generalizability of our findings to children and caregivers not included in our sample. For instance, this study focused on the caregivers of children aged 7–12 and results may not be generalized to younger children or adolescents. Future research is needed to replicate our findings in larger samples to ensure that they are consistent in samples that may be more representative of the greater population of children with asthma living in urban centers. Our study was also limited by self-report measures of ETS, sleep, and quick-relief medication use. Although we used repeated assessments of child's sleep quality across a two-week period, one question was used to assess child's sleep quality. Future EMA studies should incorporate multiple questions to assess sleep quality. We were also limited in not being able to make comparisons between sleep quality of our cohort and other published reports based on inconsistencies in how child's sleep quality is assessed across studies (i.e., through the use of different self-report or objective measures).

Another limitation is that we did not specifically assess whether other people at home smoked and thus, our results may be an underestimate of ETS exposure at home. As previously noted [22], given the study's focus on childhood asthma, caregivers may have underreported their smoking habits and their children's ETS exposure. We also asked caregivers to report on tobacco smoking and were not able to determine how many reported on cigarette use vs. other smoked tobacco products (e.g., cigars). Finally, we did not assess whether children smoked or had ever tried smoking, which may be important to evaluate in a study of sleep and ETS.

Future directions and implications

The current study used EMA methodology to expand existing pediatric asthma research in urban families and better understand the association among caregiver smoking, child quick-relief medication use, and child's sleep quality. Specifically, this study capitalized on the real world and reduced retrospection aspects of EMA methodology and may provide a more accurate

portrayal of participants' lives than traditional retrospective self-report measures. Findings suggest several directions for future research. For instance, novel tobacco product use (e.g., electronic cigarettes, hookah, etc.) is on the rise among adults and assessment of these products among caregivers of children with asthma should be investigated [37]. As others have highlighted [38], utilizing EMA methodology could benefit the assessment of daily tobacco product use (i.e., What product? How many times? Where was the product used? and Was the child present?) and what the circumstances were when the caregiver smoked/used a tobacco product (i.e., What preceded the smoking event?). Knowledge of the tobacco products and timing of the consumption that caregivers use may help researchers design more tailored interventions for families with a caregiver that smokes.

Together, previous research and findings from the current study call for asthma education focused specifically on minimizing tobacco smoke exposure among urban families of children with asthma. Discussions between pediatric healthcare providers and families should focus on the possible effects of ETS exposure on child's sleep quality in addition to the known effects of secondhand smoke exposure on child asthma symptoms. As it stands now, it is not clear whether ETS exposure is an independent risk factor of poor sleep quality, or rather, the combination of ETS exposure and quick-relief medication use serves to worsen sleep quality. Further research is needed to determine the mechanism through which ETS exposure and quick-relief medication use impact child's sleep quality. Given that our study predominately included low-income, African American/Black families, future research and replication in children with asthma from similar backgrounds may be especially important.

Conclusion

The current study found that in children with asthma, ETS exposure from the primary caregiver had a moderating influence on the association between quick-relief medication use and sleep quality. Specifically, for children who had a caregiver that smoked, more quick-relief medication use was associated with worse sleep quality. Furthermore, approximately 40% of the caregivers reported smoking across their two-week monitoring period and reported smoking in a variety of settings. Findings suggest that in urban families with a caregiver who smokes, more daily quick-relief medication use may put children at an increased risk for worse sleep quality.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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