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The effects of asthma and bullying on suicidal behaviors among US adolescents

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Abstract

BACKGROUND—Positive associations between suicidal behaviors and asthma have been established in previous adolescent studies. Few studies consider social risk factors, such as bullying. This study involved an analysis of suicidal behaviors and asthma, but also includes an assessment of whether these relationships were modified by the co-occurrence of bullying.

METHODS—Data included 13,154 participants from the 2013 Youth Risk Behavior Survey (YRBS), collected by the US Centers for Disease Control and Prevention. Logistic regression models were constructed and summarized using odds ratios (ORs) and 95% confidence intervals (95% CI).

RESULTS—When comparing adolescents with asthma who were bullied at school to those who were not bullied at school, the odds of contemplating suicide were increased by nearly 2-fold (OR = 1.8, 95% CI = 1.5 – 2.3), and the odds of creating a suicide plan were 2.3 times higher (OR =

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Human Subjects' Approval Statement

The Medical University of South Carolina Institutional Review Board deemed this study not to be research involving human subjects.

2.3, 95% CI = 1.7 – 3.1). The odds of a suicide attempt and incurring an injury from a suicide attempt were also substantially increased. Similarly, increased odds of suicidal behaviors were observed for adolescents with asthma who were bullied electronically.

CONCLUSIONS—Having asthma and being bullied are both associated with increased odds of suicidal behaviors.

Keywords

asthma; bullying; suicidal ideation; adolescent; surveys and questionnaires

The United States (US) Centers for Disease Control and Prevention (CDC) reports the second leading cause of death in adolescents ages 12–19 years old in the US is suicide.¹ Among teenagers, risk factors for suicidal ideation and suicidal behaviors are quite varied and include demographics (older age, being male, Caucasian race) and other characteristics such as the presence of psychiatric disorders, mood disorders, substance abuse, family adversity, social alienation, and poor physical health.² The association between suicidal behaviors and bullying has also been well established in adolescents.^{3–7} Prior studies have investigated the extent to which suicidal behaviors are mutually impacted by bullying and factors such as age, sex, substance abuse, and sexual orientation.^{8–12} Research addressing the combined effects of being bullied and having asthma is limited.

In the 2012 National Health Interview Survey, 14% of US children 18 years old or younger reported ever being told that they had asthma.¹³ Several prior studies have linked asthma with suicidal behaviors.^{14–17} For example, a significant increase in the odds of suicidal ideation among those with asthma compared to those without asthma was found in a study consisting of 1285 US children ages 9–17 years old.¹⁸ One study of adolescents demonstrated that having asthma was associated with a higher likelihood of being bullied,¹⁹ a finding that was also shown in US children 18 years old or younger who completed the 2003 National Survey of Children's Health.²⁰ Other researchers further confirmed that there was an increased risk of bullying in high school students diagnosed with asthma in Florida.²¹

The interpersonal theory of suicide relates asthma, bullying, and suicidal behaviors in adolescents. This theory describes the impact of perceived burdensomeness and thwarted belongingness on adolescents' desire for suicide and capability to attempt suicide.^{22,23} The associated burden of asthma has been assessed through parent and child relationships and quality of life studies of children with asthma.^{24–26} In one study of US children with asthma had significantly lower quality of life and higher anxiety when their mother acted in a rejecting manner towards them and felt that caring for their child with asthma was a burden.²⁵ The significant results allowed the authors to establish an indirect pathway that linked together the burden of asthma, the anxiety and quality of life for the child with asthma, and the mother's rejecting behavior toward the child. The interpersonal theory of suicide has also been used to describe bullied adolescents. Self-reported belongingness of family and school were found to be significantly related to suicidal ideation in a study of 129 bullied adolescents.²⁷ In this same study, suicidal ideation was greatly associated with the

coexistence of higher perceived burdensomeness and lower belongingness of family in bullied adolescents.

The purpose of our study was to understand the association between the co-occurrence of asthma and being bullied with suicidal ideation and behaviors in US high school students. We hypothesized that having asthma and being bullied would both be found to be associated with suicidal ideation and behaviors. However, we also hypothesized that being bullied might be particularly harmful among asthmatic adolescents, indicative of a potential interaction between the two conditions.

METHODS

Participants

The study design was a cross sectional analysis of respondents to the 2013 Youth Risk Behavior Survey (YRBS), a nationwide survey administered biennially by the CDC designed to be representative of 9th–12th grade students in the US.²⁸ The purpose of the YRBS is to help monitor risky behaviors that contribute to leading causes of death, disability, and social problems. The original survey sample included 13,583 participants. Of these, a total of 429 participants were excluded from the analyses due to the fact that they did not respond to the questions on asthma or bullying.

Procedures

Survey respondents were classified as having asthma if they answered “yes” to the question: “Has a doctor or nurse ever told you that you have asthma?” Respondents were classified as having been bullied at school if they responded “yes” to the question: “During the past 12 months, have you ever been bullied on school property?” and respondents were classified as having been bullied electronically (cyberbullied) if they responded “yes” to the question: “During the past 12 months, have you ever been electronically bullied? (Include being bullied through e-mail, chat rooms, instant messaging, Web sites, or texting.)” The YRBS also included 4 questions pertaining to suicidal ideation and behaviors including:

- *Contemplation*: “During the past 12 months, did you ever seriously consider attempting suicide?”
- *Plan*: “During the past 12 months, did you make a plan about how you would attempt suicide?”
- *Attempt*: “During the past 12 months, how many times did you actually attempt suicide?”
- *Injury*: “If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?”

Data Analysis

Responses (yes/no) to the 4 suicide questions were treated as dependent variables in a series of logistic regression analyses. The primary independent variables were indicator variables

for whether or not the respondent reported having asthma and whether or not they reported having been bullied, either in school or electronically. Because there was a strong association between having been bullied in school and having been bullied electronically, separate logistic regression models were constructed for each type of bullying. Interaction terms between asthma and being bullied were included in each of the logistic regression models, as were a number of relevant covariates (ie, age, sex, race, and feeling sad or hopeless almost every day for two weeks or longer in the past 12 months). A sensitivity analysis was conducted by excluding the feeling sad or hopeless almost every day for 2 weeks or longer in the past 12 months covariate from each of the logistics regression models. Because the YRBS was conducted using a complex sampling design, all analyses accounted for the primary sampling units, sampling strata, and sampling weights. The findings from the logistic regression models were summarized using odds ratios and their 95% confidence intervals. All analyses were conducted using Proc Surveyfreq and Proc Surveylogistic within SAS version 9.4 (Cary, NC).

RESULTS

The study consisted of 13,154 high school students. Approximately 56% self-identified as being white, 14% black, 21% Latino, and 9% other. Half of the participants identified as being female. The reported age distribution was: 13 years old or younger (0.3%), 14 years old (10.0%), 15 years old (24.1%), 16 years old (25.2%), 17 years old (24.7%), and 18 years old or older (15.7%). In the past 12 months, 30% of the students acknowledged having felt sad or hopeless almost every day for two weeks or longer. Asthma was reported in 21% of the participants. Approximately 20% of the students reported being bullied at school, while 15% reported having been bullied electronically in the past 12 months.

There were several important and perhaps striking findings pertaining to the frequency of suicidal ideation and behavior. First, the frequency of self-reported suicidal ideation/behavior was high, with the overall proportions of students who reported contemplating suicide, making a plan, making an attempt, or incurring an injury related to a suicide attempt being 17.0%, 13.6%, 7.9%, and 2.6%, respectively. Secondly, having asthma was consistently associated with a significantly ($p < .05$) increased odds of suicidal ideation and suicidal behavior. The odds of suicidal ideation/behavior was also consistently and significantly ($p < .05$) higher among students who reported having been bullied in the past year. Thus, the lowest rates of suicidal ideation/behavior were found among students without asthma who did not report having been bullied, and the highest rates were noted among students who reported both having asthma and having been bullied. In fact, among students with asthma who were bullied at school and electronically, the percentages who contemplated suicide, made a plan, made an attempt, or incurred an injury related to suicide attempt were 48.5%, 41.9%, 27.6%, and 10.2% respectively.

Tables 1 lists the details of the multivariable logistic regression models that addressed bullying at school. The results of 4 separate models are presented, one for each type of suicidal ideation/behavior. Model-adjusted percentages of each type of ideation/behavior are listed for each of the 4 population strata of interest ([with vs. without asthma] x [bullied vs. not bullied at school]). Odds ratios (ORs) and their associated 95% confidence intervals

(95% CIs) reflect the extent to which the odds of the ideation/behavior were increased when comparing bullied students to students who did not report having been bullied. For example, among the adolescents without asthma ($N = 10,340$), being bullied at school was associated with a 2.7-fold increase in the odds of having contemplated suicide (35.1% having contemplated suicide vs. 11.3%; $OR = 2.7$), while among adolescents with asthma ($N = 2,814$), being bullied at school was associated with a 1.8-fold increase in the odds of having contemplated suicide (38.5% having contemplated suicide vs. 16.2%; $OR = 1.8$). Whereas we hypothesized that there would exist a synergistic effect between having asthma and being bullied with respect to suicidal ideation/behaviors, we did not find this to be the case. In fact, only one significant ($p < .01$) interaction between asthma and being bullied was noted (within the model for suicide contemplation), and this interaction was in the opposite direction of what we had originally hypothesized. This is evident by the fact that the OR of having contemplated suicide between being bullied at school and not being bullied at school was higher among students without asthma (35.1% vs. 11.3%, $OR = 2.7$) than among students with asthma (38.5% vs. 16.2%, $OR = 1.8$). Table 1 also demonstrates the vast differences in the frequencies of suicidal ideation/behaviors when comparing students with asthma who reported having been bullied at school to students without asthma who did not report bullying (contemplation: 38.5% vs. 11.3%; plan: 35.6% vs. 9.1%; attempt: 21.5% vs. 4.9%; injury: 7.5% vs. 1.3%). In the sensitivity analysis, the odds of each suicidal ideation/behavior were significant in all the multivariable logistic regression models that addressed bullying at school.

Table 2 lists details of the multivariable logistic regression models that addressed cyberbullying (ie being bullied electronically). The patterns of the results of these models were generally similar to those presented in Table 1 that addressed being bullied at school. Although no significant interactions were noted between having asthma and being cyberbullied, the odds of each suicidal ideation/behavior outcome were higher among students with asthma compared to those without asthma, and higher among students who were cyberbullied compared to students who did not report having been cyberbullied. Of particular interest is the fact that among the students with asthma ($N = 2814$), the odds of having an injury related to a suicide attempt was 3.5 times higher among adolescents who were bullied electronically versus those who were not bullied (9.7% vs. 1.8%, $OR = 3.5$). The odds of each suicidal ideation/behavior were significant in the sensitivity analysis for the separate multivariable logistic regression models that addressed cyberbullying.

DISCUSSION

This may be the first study that has examined the joint impact of asthma and bullying on suicidal behaviors. Results across the various outcome models were relatively consistent; having asthma and being bullied were found to be independent risk factors for suicidal ideation and associated behaviors. Whereas we hypothesized that the impact of being bullied would be even worse for adolescents with asthma compared to those without asthma (ie having interactive effects), this was not found to be true. Nevertheless, this study demonstrates that the highest odds of suicidal ideation and associated behaviors were identified among adolescents with both of these risk factors.

Earlier reports have presented reasons why having asthma might increase the likelihood of suicidal ideation and/or behaviors. For example, Goodwin and Marusic note that asthma is “associated with impairment in school and social functioning, symptoms of depression, anxiety symptoms, and anxiety disorders” and that “suicidal ideation is among the strongest predictors of suicidal behavior.”¹⁸ Similarly, results of the 2001 to 2010 National Health and Nutrition Examination Survey indicate that US adolescents who were diagnosed with asthma incurred more days of feeling mentally unwell relative to adolescents who were never diagnosed with asthma.²⁶ Youth with asthma often report feeling stigmatized,²⁹ and some researchers have noted that even primary school-aged children with asthma may feel their activities and their social lives are often limited by their condition; being bullied may be one of the consequences of having asthma.³⁰

Our results noting the increased odds of suicidal behaviors among children who were bullied are similar to findings in earlier studies. For example, in a study of the CDC’s 2011 YRBS, both in-school bullying and cyberbullying were found to be associated with increased odds of suicide attempts, with the associations indicating the presence of a “dose-response” relationship.⁵ Suicidal behaviors were worse among teens who were bullied compared with those who were not bullied, with the worst outcomes occurring among teens who were bullied both in school and electronically.

Limitations

Although the results from this study are generalizable to the entire population of US high school students due to the nationwide sampling scheme of the 2013 YRBS, there are several limitations in the study. First, all of the data included in the analyses relied on self-report. As such, we were not able to control for any clinically diagnosed mental illnesses such as depression within the models; however, to mitigate this potential bias, we did control for feeling sad or hopeless almost every day for two weeks or longer in the past year. Secondly, the 2013 YRBS did not provide a definition for being bullied at school; nor did it consider in-person bullying outside of school property. Studies have showed that students may view being bullied differently than researchers,^{31,32} and the lack of a formal definition accompanying the YRBS question on being bullied at school may have led to an underreporting of bullying on school property. Also, in person bullying can occur in places outside of school: in neighborhoods and community social organizations.^{33–35} Thirdly, the 2013 YRBS did not include information on prescribed asthma medication, current asthma status, or asthma severity. Research investigating the impact of medications with leukotriene modifiers such as inhalers and steroids has been of interest since the Food and Drug Administration mandated medication labels to contain information on possible suicidality in 2009.^{36–39} Other researchers have observed that parents of children with harsh asthma conditions were more troubled about their children being victims of bullying.²⁰ Thus, the ability to include more information on the medication prescribed to control asthma symptoms, asthma symptoms at the time of the survey, and severity of asthma could provide a better understanding of the relationship among having asthma, being bullied, and exhibiting suicidal ideation and/or behaviors. Overall, we believe that the associations of interest would likely have been stronger if formal definitions had been provided, given that

non-differential misclassification tends to bias such associations towards the null hypothesis.
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IMPLICATIONS FOR SCHOOL HEALTH

Regardless of how bullying occurs, adolescents who are bullied and/or have asthma have higher odds of suicidal ideation and associated behaviors. School administrators, teachers, counselors, and nurses should be attentive in monitoring signs of being bullied, especially among students with asthma. School administrators should continue to identify and utilize interventions and policies to stop and prevent all types of bullying; by doing so they may help promote positive social interactions among students and thus reduce suicide risk in all adolescents. School administrators should collaborate with school nurses and counselors, especially those with crisis management experience, to develop school policies, interventions and programs to prevent bullying.^{41,42}

Acknowledgments

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Table 1

Percentages and Odds Ratios of Suicidal Ideation/Behavior among Students with and without Asthma Who Did and Did Not Report Being Bullied at School

Suicidal Ideation/Behavior	Asthma Not Present (N = 10,340)		Asthma Present (N = 2814)	
	Not Bullied at School (N = 8520)	Bullied at School (N = 1820)	Not Bullied at School (N = 2185)	Bullied at School (N = 629)
Contemplation				
% reporting "Yes"	11.3%	35.1%	16.2%	38.5%
OR (95% CI)	Ref	2.7 (2.3 – 3.2)	Ref	1.8 (1.5 – 2.3)
Plan				
% reporting "Yes"	9.1%	26.7%	12.8%	35.6%
OR (95% CI)	Ref	2.3 (1.9 – 2.7)	Ref	2.3 (1.7 – 3.1)
Attempt				
% reporting "Yes"	4.9%	17.0%	6.9%	21.5%
OR (95% CI)	Ref	2.5 (2.0 – 3.0)	Ref	2.3 (1.7 – 3.1)
Injury				
% reporting "Yes"	1.3%	6.8%	2.1%	7.5%
OR (95% CI)	Ref	3.3 (2.5 – 4.4)	Ref	2.2 (1.5 – 3.3)

Odds ratios (ORs) and 95% confidence intervals (CIs) in this table were adjusted for age, sex, race, and feeling sad for 2 weeks or longer in the past 12 months. The ORs reflect the relative increase in the odds of suicidal ideation/behavior among students who reported being bullied when compared to students who did not report being bullied.

Ref: Reference group

Table 2

Percentages and Odds Ratios of Suicidal Ideation/Behavior among Students with and without Asthma Who Did and Did Not Report Being Bullied Electronically

Suicidal Ideation/Behavior	Asthma Not Present (N = 10,340)		Asthma Present (N = 2814)	
	Not Bullied Electronically (N = 9002)	Bullied Electronically (N = 1338)	Not Bullied Electronically (N = 2313)	Bullied Electronically (N = 501)
Contemplation				
% reporting "Yes"	12.2%	38.5%	16.3%	42.7%
OR (95% CI)	Ref	2.4 (2.0 – 2.9)	Ref	2.2 (1.7 – 3.0)
Plan				
% reporting "Yes"	9.6%	29.7%	13.7%	36.7%
OR (95% CI)	Ref	2.2 (1.8 – 2.8)	Ref	2.2 (1.6 – 3.2)
Attempt				
% reporting "Yes"	5.0%	21.2%	6.6%	25.7%
OR (95% CI)	Ref	3.0 (2.4 – 3.7)	Ref	3.3 (2.2 – 4.8)
Injury				
% reporting "Yes"	1.3%	9.2%	1.8%	9.7%
OR (95% CI)	Ref	4.5 (3.1 – 6.6)	Ref	3.5 (2.0 – 6.0)

Odds ratios (ORs) and 95% confidence intervals (CIs) in this table were adjusted for age, sex, race, and feeling sad for 2 weeks or longer in the past 12 months. The ORs reflect the relative increase in the odds of suicidal ideation/behavior among students who reported being bullied when compared to students who did not report being bullied.

Ref: Reference group