



Reducing Childhood Asthma Exacerbations

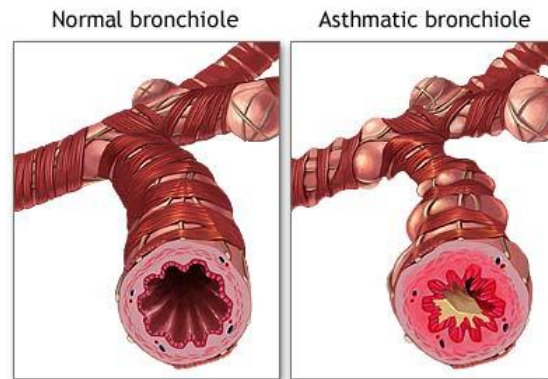
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Introduction:

- ▶ Asthma's pathophysiology - lies in airway inflammation and bronchial hyper-reactivity due to a variety of stimuli
- ▶ Described as causing “repeated episodes of wheezing, breathlessness, chest tightness, and nighttime or early morning coughing” (CDC, Asthma, 2018).
- ▶ No cure; however, symptoms can be maintained to avoid asthma exacerbations



Introduction (continued):

- ▶ Childhood asthma - the most common chronic disease affecting children in the United States
 - ▶ Affecting 8.4% of American children (CDC, National Center for Health Statistics: Asthma, 2018)
 - ▶ “the prevalence and morbidity of asthma among children in the United States have increased dramatically over the past 3 decades,” which leads to “205,000 pediatric hospitalizations and 697,000 emergency department visits each year” – (Krieger, 2010)
 - ▶ 14 million school days are missed each year because of asthma exacerbations

The Purpose

- ▶ Identify common asthma triggers
- ▶ Summarize resources and best practices to educate individuals in the reduction and/or elimination of potential asthma triggers to prevent childhood asthma exacerbations

Literature Review: Methods

- ▶ The Children's Health Alliance of Wisconsin (the Alliance), the Children's Hospital of Wisconsin (CHW), and the Centers for Disease Control and Prevention (CDC) general framework
 - ▶ Highlights basics on childhood asthma, symptoms, and triggers
- ▶ Further exploration needed for solutions to triggers to combat exacerbations

Methods

- ▶ Databases utilized:
 - ▶ PubMed Central
 - ▶ Web of Science
- ▶ Key words: asthma, childhood asthma, asthma triggers and solutions
- ▶ Excluded older than 2005 or those that did not pertain to topic

Methods

- ▶ Seven articles were reviewed
 - ▶ Described asthma triggers
 - ▶ Described effective prevention methods
 - ▶ Identified the role of public health officials

Results

Table 1. Asthma Triggers and Their Properties

Trigger	Result of Exposure	Allergic or Non-Allergic Response
Pollen	Airway inflammation due to exposure	Allergic
Pet dander		
Dust mites		
Pests		
Mold		
Exercise	Bronchospasm	Non-allergic
Stress		
Extreme weather		
Irritants in air, such as tobacco smoke		
Medication		

Discussion

- ▶ Triggers found in a variety of environments
 - ▶ Optimal to keep children's asthma under control by decreasing exposure to asthma triggers in their homes, child care centers, and schools
- ▶ Asthma triggers include:
 - ▶ Tobacco smoke
 - ▶ Dust mites
 - ▶ Pests
 - ▶ Pets
 - ▶ Mold
 - ▶ Strong odors (CDC, Common Asthma Triggers, 2010)

Discussion

- ▶ More than 92% of American homes contain concentrations of one or more allergen and 46% of homes contain three or more (Krieger, 2010).
- ▶ Feasible to reduce exposure to indoor allergens utilizing prevention techniques, which improves clinical outcomes and decreases asthma exacerbations (Krieger, 2010).
- ▶ “Preventive methods focus on environmental management to control asthma triggers” (Horner, 2008).

Discussion

Tobacco Smoke – Secondhand Smoke

- ▶ Secondhand tobacco smoke – the most common asthma trigger for children
- ▶ Defined as “smoke that has been exhaled, or breathed out, by the person smoking” (CDC, Secondhand Smoke Facts, 2017).
- ▶ Over 50% of children diagnosed with asthma are exposed to tobacco smoke (Kanchongkittiphon et al, 2014).
- ▶ Over 60% of children diagnosed with asthma have a mother or caretaker who smokes (Kanchongkittiphon et al., 2014).
- ▶ Best method against tobacco smoke exposure - tobacco cessation
 - ▶ Pharmaceutical treatment or nicotine replacement found successful
- ▶ If smoking cessation is not possible or successful, smoking should not occur in the home, in the car, or near open windows and doors leading to the interior of the building, especially not on child care center and school premises
 - ▶ Tobacco smoke possesses solid particles, semi volatile, and volatile organic compounds that are known to be or suspected to be major irritants to the eye and respiratory tract (Kanchongkittiphon et al., 2014).
 - ▶ Indicates the harsh impact of secondhand smoke, especially on a young child with asthma

Discussion

Tobacco Smoke – Thirdhand Smoke

- ▶ Defined as “residual nicotine and other chemicals left on indoor surfaces by tobacco smoke” (Mayo Clinic, 2017).
- ▶ Children exposed to thirdhand smoke by touching a contaminated surface or breathing in the toxins from the surface (Mayo Clinic, 2017).
 - ▶ Thirdhand smoke's chemicals and toxins linger on surfaces and settle in dust that can persist for weeks (Kanchongkittiphon et al., 2014).
 - ▶ Need for thirdhand smoke policies in child care centers, schools, and facility vehicles – public health assistance, if needed
 - ▶ Encourage referrals and ways to quit smoking for parents as well as staff to protect the health of children (AAFA, 2012).
 - ▶ In “Parental Perceptions and Practices toward Childhood Asthma,” 80.3% of participants used precautions, such as avoiding smoking indoors (Abu-Shaheen et al., 2016).
 - ▶ Use of combination of precautions resulted in improved quality of life of the children as well as decreased asthma exacerbations

Discussion

Strong Odors

- ▶ Strong odors - asthma trigger due to large quantities of concentrated molecules when breathed in can cause bronchospasms of their airway resulting in asthma symptoms
- ▶ Include plants, sinks, windows, scented items, such as air fresheners, potpourri, diffusers, scented candles, incense, cleaning products, and perfume and cologne of staff, volunteers, and students (WAC, School Walkthrough Guidebook, 2015).
- ▶ Exposure to a harmful odor resulted in higher levels of bronchoconstriction, hyperventilation, and panic, concluding the harmful and strong odors negatively impacted the participants and caused airway inflammation in participants resulting in asthma symptoms (Jaen and Dalton, 2014).
- ▶ Best solution is to restrict these scented items
 - ▶ Public health officials can assist in the creation of a policy to ensure there is regulation and standards for the use
 - ▶ Alternative - open windows or use an exhaust fan (AAFA, 2012).
 - ▶ Choose products that are fragrance-free, release limited chemicals odors, least toxic, and most environmentally friendly (WAC, School Walkthrough Guidebook, 2015).
- ▶ A study done on inner city homes, "Home environmental intervention in inner-city asthma: a randomized controlled clinical trial," conducted a study in which 75% of the experimental households were provided high efficiency particulate air cleaner (HEPA air filters), which results showed a 39% decrease in particulate matter in the air concluding day time asthma symptoms decreased in the experimental group (P=0.04) (Eggleston et al, 2005).
- ▶ Additionally, in the study, "Parental Perceptions and Practices toward Childhood Asthma," 81.5% of participants used precautions, such as avoiding strong odors (Abu-Shaheen et al, 2016). This was another precaution, when used with other precautions, that resulted in improved quality of life for children as well as decreased asthma exacerbations.

Discussion

Pests

- ▶ Pests and their excrement can cause asthma attacks (CDC, 2010).
- ▶ Recommended to remove all food and water sources for pests, vacuum and/or sweep every two to three days to remove crumbs and other food particles that attract the pests (CDC, 2010).
- ▶ Pest allergens found in corners, behind furniture, under sinks, along window sills, and especially in dark, wet areas
 - ▶ Can be present in schools if there are issues with kitchen cleanliness, food storage, and water damage.
 - ▶ A study completed by Sheehan et al. (2017) demonstrated that inner-city school children in the Northeastern US missed school more often due to asthma-related issues when there were greater levels of mouse allergen exposure in their homes and schools.
 - ▶ High levels of cockroach allergens in homes, especially children's bedrooms, which is a large concern for causing asthma exacerbations (Kanchongkittiphon et al, 2014).
 - ▶ Study conducted in inner city homes, "Home environmental intervention in inner-city asthma: a randomized controlled clinical trial," provided 84% of the experimental households with cockroach extermination, which resulted in a 51% decrease in cockroach allergen levels (Eggleston et al, 2005).
 - ▶ Associated with a decrease in daytime asthma symptoms (Eggleston et al., 2005).
- ▶ Necessary to develop an Integrated Pest Management system in child care centers and schools, using guidelines provided by the Environmental Protection Agency (EPA)
- ▶ Address underlying issues, such points of entry and moisture issues, to ensure pests do not return.

Discussion

Pets

- ▶ Pets - dander, excrement, urine, and saliva – asthma triggers
- ▶ Mainly consist of pets with fur, such as dogs, cats, hamsters, guinea pigs, and rabbits (Kanchongkittiphon et al., 2014).
- ▶ No scientific evidence to support the existence of hypoallergenic pets (Kanchongkittiphon et al., 2014).
 - ▶ All mammals, at this time, are thought to be sources of allergens
- ▶ Interventions to reduce the impact of pets as an asthma trigger
 - ▶ Pets should not co-sleep with children with allergies, especially if they have been diagnosed with asthma (CDC, 2010).
 - ▶ Bathing of the animal every week (CDC, 2010).
 - ▶ Wall-to-wall carpeting and upholstered furniture should be vacuumed weekly
 - ▶ If there is no carpeting, damp mop weekly (CDC, 2010).
- ▶ In schools and child care centers, classroom pets include mice, gerbils, hamsters, birds, and rabbits as well as therapy animals
- ▶ Best recommendation - remove animals from the child care center and implement a “no pet policy” (WAC, School Walkthrough, Guidebook, 2015).
 - ▶ If animals are desired, recommendations include allowing fish, butterflies, and reptiles into the classroom (WAC, School Guidebook, 2015).
 - ▶ Keep animals in their cages and away from fabric objects in the classroom, especially away from sleeping areas and items (Kanchongkittiphon et al., 2014).

Discussion

Mold

- ▶ Moisture causes mold; whose spore are an asthma trigger.
- ▶ Mold - multicellular fungus that rapidly grows on wet surfaces (WAC, page 20).
- ▶ High level of mold spores have been found in homes as well as schools (Kanchongkittiphon et al, 2014)
- ▶ Positive correlation between visible mold in homes and airway-related symptoms and allergic diseases in the children who participated in the cross-sectional study (Weber et al, 2017).
- ▶ Breathing in mold spores can cause asthma exacerbations.
- ▶ Mold growth can be controlled through an air conditioner or dehumidifier (CDC, 2010).
 - ▶ Humidity levels should be no higher than 50% in the home (Kanchongkittiphon, 2014) to reduce mold growth.
- ▶ Found on walls, on ceilings, under flooring, in appliances, in bathrooms, on plants, on window sills, and in and around sinks (WAC, page 10).
- ▶ Prevent mold growth:
 - ▶ Bathrooms and surfaces exposed to moisture cleaned with a diluted bleach solution and dried regularly
 - ▶ source of moisture and water leaks should be identified and then fixed
 - ▶ Use exhaust fans, or other ventilation in areas where moisture is generated, such as bathrooms and kitchens (Kanchongkittiphon, 2014).
 - ▶ Limit when windows are open, such as days with high outdoor mold counts (AAFA, 2012).
 - ▶ Cleaning and replacing furnace and air conditioning filters regularly (AAFA, 2012)
 - ▶ Position refrigerators and free-standing freezers away from carpeting and on mats or trays to catch any leaking water (WAC, School Walkthrough Guidebook, 2015).

Discussion

Dust Mites

- ▶ Dust mite allergens found within the fecal matter (Kanchongkittiphon et al., 2014).
- ▶ Found anywhere dust accumulates: in upholstered furniture, stuffed animals, pillows, wall-to-wall carpeting, and window treatments.
- ▶ "Asthmatic children living indoors with average humidity level >50% were three times more likely to have elevated mite levels" (Kanchongkittiphon et al., 2014), which was correlated to increased asthma symptoms.
- ▶ Recommended that carpets are replaced with non-fabric materials, such as foam mats, in child care centers and schools.
 - ▶ If carpeting is not avoidable, it should be vacuumed weekly and professionally cleaned
- ▶ Wash stuffed animals, bedding, pillows, and window treatments in hot water greater than 130 degrees (Kanchongkittiphon et al., 2014).
 - ▶ Alternative: place the items in the freezer overnight at least once a week (WAC, 2017).
- ▶ Wash bedding and sanitize the cots weekly
- ▶ Blinds and curtains are highly recommended to be replaced with pull down shades.
- ▶ Store toys in plastic bins with lids to reduce the possibility of dust collecting on the toys.
 - ▶ Shelving and storage containers - dusted regularly with a damp cloth weekly to minimize dust accumulation.
- ▶ Replace upholstered furniture with wooden, plastic, or vinyl furniture (WAC, School Walkthrough Guidebook, 2015).
- ▶ Scientific research supports the use of physical interventions, such as regular dusting and vacuuming, which have shown an improvement in lung function and decrease hospitalization (Kanchongkittiphon et al., 2014).

The Role of Public Health Officials

- ▶ The WAC created a WAC home walkthrough program
 - ▶ The goal of the walkthrough “to improve the quality of life and management of asthma by reducing environmental asthma triggers found within the home” (WAC, Wisconsin Asthma Plan, 2015).
 - ▶ Unfortunately, no longer being funded; however, the concepts and ideas behind the program would allow public health officials to identify where asthma triggers are present in the home, and then provide recommendations for low and no-cost solutions to families.
 - ▶ Officials become involved in the process of reducing the presence of asthma triggers and asthma exacerbations.
 - ▶ Home education and support greatly increases the opportunity to decrease asthma triggers and improve the health of those living in the home by reducing exposure to asthma triggers, decrease symptoms of asthma, decrease the use of the emergency department for asthma-related needs, and increase the quality of life for children (Krieger, 2010).
 - ▶ Home visits focus on multiple triggers through multiple interventions, which studies have shown leads to more successful reduction of the presence of asthma triggers (Krieger, 2010).
 - ▶ Public health officials can provide resources including vacuums, mattress and pillow encasements, cleaning supplies, and even referrals for tobacco cessation (Krieger, 2010).
- ▶ The WAC also created a child care walkthrough program to assist the community.
 - ▶ The goal - “to reduce exposure to environmental asthma triggers found in child care centers” (WAC, School Walkthrough Guidebook, 2015).
 - ▶ The Asthma Allergy Foundation of America - checklist that child care centers can utilize to evaluate their facilities and determine what policies should be created and/or adjusted to reduce the presence of asthma triggers (AAFA, 2018).
 - ▶ If funding is available, public health officials could tour facilities and assist the child care center’s staff in determining if there are any changes that can be made to reduce the presence of asthma triggers.
 - ▶ Reducing the presence of asthma triggers with the use of physical interventions, such as vacuums and mattress and pillow encasements, has shown an improvement in lung function and decreased hospitalizations (Kanchongkittiphon et al., 2014).
 - ▶ Challenges include shortage of health professionals, communication between patients and providers, changes in disease patterns, high need and demand of health services, and poor accessibility to healthcare services (Abu-Shaheen et al., 2016).

Conclusion

- ▶ Childhood asthma - affects thousands of children in the United States
- ▶ Common asthma triggers include:
 - ▶ Tobacco smoke
 - ▶ Dust mites
 - ▶ Pests
 - ▶ Pets
 - ▶ Mold
 - ▶ Strong odors
- ▶ Based on the findings of the literature review - if physical prevention techniques are utilized to combat common asthma triggers, positive outcomes, such as decreased asthma exacerbations, missed school days, hospitalization, and mortality and morbidity rates of children could be achieved.
- ▶ Physical prevention methods were also identified:
 - ▶ Removing carpeting
 - ▶ Smoking cessation
 - ▶ Utilizing effective cleaning methods
 - ▶ Repairing water incursions
- ▶ Public health officials - play an essential role in educating and encouraging parents, teachers, and caregivers on asthma triggers and how to prevent childhood asthma exacerbations. By reducing childhood asthma exacerbations, the quality of children's lives is greatly improved.

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