



CODEN [USA]: IAJPBB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1070251>Available online at: <http://www.iajps.com>**Case Study****ASSESSMENT OF ENVIRONMENTAL TRIGGERS IN
CHILDHOOD WHEEZE: A PROSPECTIVE OBSERVATIONAL
STUDY**Neenu Paul^{1*}, Meekha Mary Varghese¹, Neenu Baby¹, Jithin Antony², Shaik Haja Sherief³,
Thangavel Sivakumar⁴¹ Pharm D Interns, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode,
Tamil Nadu, India.² Clinical Pharmacist, G Kuppasamy Naidu Memorial Hospital, Coimbatore, Tamilnadu, India.³ Asst. Professor, Department of Pharmacy Practice, Nandha College of Pharmacy, Erode,
Tamil Nadu, India.⁴ Principal, Nandha College of Pharmacy, Erode, Tamil Nadu, India.**Abstract:**

Background: Wheezing is a high pitched whistling sound that occurs when smaller airways are narrowed by presence of either bronchospasm, swelling of mucosal lining, excessive amounts of secretions, or inhaled foreign body. Childhood wheeze is triggered by inhaling certain substance such as animal dander, molds, cockroaches, pollen from plants, dust mites. An asthma attack can be induced or aggravated by direct irritants to lungs such as smoking, food allergy, air pollution.

Objective: The aim of our study is to assess the environmental triggers associated with childhood wheeze and to educate caretakers based on life style modifications.

Methods: A prospective observational study was done on environmental triggers associated with childhood wheeze in tertiary care hospital, Coimbatore during the period of 23rd January- 22nd July (6 months). The data was collected based on the validated checklist on triggers.

Results and discussion: A total of 116 patients were enrolled in age group up to 3 years, 4 years to 8 years and 9 years and above. Among them, 66 were male and 50 were females. About 112 children were suffering from wheeze in childhood. The main triggers associated with wheeze were cold, allergen, weather, air pollution and dust allergy.

Conclusion: we concluded that wheeze is triggered by substance such as weather, air pollution, dust, smoke, pet animals and allergens such as animal dander, mold, pollen from plants, dust mites

Keywords: Wheeze, Triggers, Allergens, Children, Pollution.

Corresponding author:

Neenu Paul,
Pharm D Interns,
Department of Pharmacy Practice,
Nandha College of Pharmacy, Erode,
Tamil Nadu, India.

QR code



Please cite this article in press as Neenu Paul et al., *Assessment of Environmental Triggers in Childhood Wheeze: A Prospective Observational Study*, Indo Am. J. P. Sci, 2017; 4(12).

INTRODUCTION:

Wheezing is a high pitched whistling sound that occurs when smaller airways are narrowed by presence of either bronchospasm, swelling of mucosal lining, excessive amounts of secretions, or inhaled foreign body. It is heard mostly on expiration as a result of critical airway obstruction [1]. Wheezing is common in infancy and childhood except in neonatal period when it is relatively rare. Based on International study of Asthma and Allergies in Childhood (ISAAC), UK has the highest record of prevalence of about 32.2%. in the age group of 0-5 years 50% children developed disease and in between 6-8years 32% children developed disease and about 15% children developed disease in age group of 9 years and above [2]. Infant wheezing is mixed with other causes of noisy breathing such as nasal obstruction in the first 2 years of life. Not every wheeze is indicative of asthma but is a prediction of asthma in persistent wheezers is possible. Wheezing is common in childhood as the children age increases wheezing decreases [3].

Infants are prone to wheeze because of anatomic factors related to chest wall and lungs in addition to immunologic and molecular influences in relation to older children [4]. Obstruction to flow is affected by airway caliber and complaints of infants lung . Marginal additional narrowing can cause flow limitation and subsequent wheezing [5]. In newborn chest wall, the inward pressure produced in expiration subjects the intra thoracic airway collapses. Flow limitation is affected in infants by differences in tracheal cartilage composition and airway smooth muscle tone causing increase in airway compliance in relation with older children. All these mechanism make the infant more susceptible to airway collapse, increased resistance and subsequent wheezing [6]. Immunologic and molecular influences contribute to infant's intensity to wheeze. Infants tend to have higher levels of lymphocytes and neutrophils, rather than mast cells and eosinophils in broncho-alveolar fluid, in comparison to older children and adults. A variety of inflammatory mediators have been released in the wheezing infant such as histamine and leukotrienes [7].

Respiratory diseases are mostly caused by a combination of genetic (inherited) factors and environmental triggers. Allergic response plays a strong role in childhood asthma. 70-85% of children with asthma have allergens. In people with allergies, the immune system reacts to exposure to allergens. All asthma patients should be evaluated for or educated about environmental triggers that may worsen asthma symptoms or may trigger

exacerbation. Patients with persistent and intermittent asthma should be evaluated for sensitivity to allergens that may include:

- Indoor inhalant allergens (example: dust mites, pet dander)
- Indoor pollutants(example: formaldehyde)

The identified environmental factors can be managed by reduced exposure, household modifications, and allergen immunotherapy. Foods with sulfites also contribute to worsen asthma symptoms, so such food items should be avoided [8].

Allergic asthma is triggered by inhaling certain substance such as:

- ❖ **Animal dander:** Animal shed small scales or flakes that have the appearance of dandruff. Dander is composed of minute pieces of hair, feather, and skin. Dander can trigger hyper sensitivity and asthma reactions [9].
- ❖ **Molds:** Molds are fungi that grow in moist environments. They survive by absorbing nutrients from plants and animal matter, and they produce a small spore that becomes airborne, and trigger asthma attacks. If the spores land on moist surface they will grow in to new molds [10].
- ❖ **Cockroaches:** These insects can be found usually lesser number in some urban and rural homes. For individuals with asthma the droppings and saliva of cockroaches triggers asthma attacks by reducing lung function.
- ❖ **Pollen** from plants.
- ❖ **Dust mites:** These are tiny arachnids related to ticks and spiders found in homes, that are invisible to eye. They feed on skin flakes and dust, usually on mattresses, pillows, carpets and upholstered furniture. Dust mites pieces and droppings are allergens that travel through air and trigger the allergic cascade and worsen asthma. This can be managed by careful housekeeping.

An asthma attack can be induced or aggravated by direct irritants to the lungs. Important irritants include [11].

Smoking: Environmental tobacco smoke is a mixture of smoke from the burning cigarettes with smoke exhaled from the lungs and the smell of tobacco smoke can trigger the immune response that initiate the inflammatory process that leading to runny nose, watery eyes, sinus congestion, lower peak flows, wheezing and shortness of breath. Parental smoking increases the airway responsiveness of infants in the first 2-10 weeks of life. This extends even to the fetus of pregnant women who smoke. These mothers tend

to have babies born at low birth weight, which affect lung function and increase their babies risk for asthma [12].

Food allergies: About 8-10% of children with asthma also have food allergies. Research suggests that peanut and milk allergies can increase asthma severity. Indoor chemicals, chemicals used for cleaning house hold products and furniture materials are asthma triggers [13].

Air pollution: Fossil fuels and chemicals may contribute to air pollution that may worsen asthma symptoms [14].

Children's are more vulnerable to asthma triggering environmental exposure than that of adults, because their body systems are still developing. Certain behaviors of children tend to expose them to chemicals and organisms that can triggers the asthma attacks for example: Children often play close to the ground, this behaviour can put them in contact with contaminated soil. Indoor behaviour can put them in contact with contaminated carpet and surface dust. The environmental protection agency(EPA) reports that children's asthma risk are greater when compared to adults because they have higher inhalation rates per unit of body weight and they take over more asthma triggering factors and beverages (dairy products and peanuts) [15].

MATERIALS AND METHODS:

A prospective observational study was done on Paediatric outpatient department of GKNM Hospital, Coimbatore during the period of 6 months. Children between age category of 6 months to 18 years and diagnosed with wheeze, asthma and lower respiratory tract infection were enrolled for the study. All in patients as well as out-patients were included in the study. Sample size of the study was 116 children. Data collection tools were patient case file, patient data collection form and validated checklist for environmental triggers. Analysis of data was performed using statistical package of social science (SPSS).

RESULTS:

Study participants were recruited based on inclusion and exclusion criteria. A total of 116 patients were enrolled in age group up to 3 years, 4 years to 8 years and 9 years and above. Among them, 66 were male and 50 were females. Prevalence of children with Wheeze was 96%, LRI + Wheeze is 2% and Asthma is less than 1% as indicated (Table no.1). Based on triggers associated with childhood wheeze, 68% children suffer from cold infection.76% children were exposed to allergen. 25% had food allergy.16% with drug allergy. 81.89% were exposed to weather air pollution. 65.5% have dust allergy. 65% children have contact with pet animals (Table No.2). This table shows the relation of various risk factors associated with childhood wheeze.

Table 1: Gender, Indication and Age Group of Study Population

Gender	Number of patients	Percentage
Male	66	56.9
Female	50	43.1
Indication	Number of patients	Percentage
Wheeze	112	96.6
LRI + Wheeze	3	2.6
Asthma	1	0.9
Age Group	Number of patients	Percentage
Up to 3 years	40	34.5
4 years to 8 years	41	35.3
9 years and above	35	30.2

Table 2: Environmental Triggers

Triggers	Number of patients (N=116)	Percentage
Infection		
Cold	79	68.1
Allergens		
Dust	71	61.2
Smoke	33	28.4
Animal	26	22.4
Mold	5	4.3
Food Allergy		
Fish	11	9.5
Cold Food	1	0.9
Chocolate	1	0.9
Egg	13	11.2
Sea Food	3	2.6
Drug Allergy		
Tablet	4	5.3
Asthalin	2	5.0
Antibiotics	1	2.5
Weather, Air Pollution		
Cold	86	74.1
Smoke	9	7.8
Exercise	5	6.6
Perfume	2	2.6
Vapor from cleaning	1	1.3
Chalk	1	1.3
Polish	1	1.3
Dust Allergy		
Present	76	65.5
Contact with pet animals		
Present	76	65.5

DISCUSSION:

Wheeze is the most frequently occurring respiratory disease in childhood and represent major public health burden. Wheezing in infancy could be a sign of diverse clinical condition. Our study contains more males than females. Due to gender differences, bronchial airway is shorter in males than females so they usually get wheeze or breathing difficulty. The anatomic factors related to chest wall and lungs resulting in bronchospasm, swelling of mucosal lining, inhaled foreign body and due to excessive amount of secretion. The majority of infants are associated with wheezing have transient conditions associated with diminished airway function at birth and do not have increased risk of asthma or allergies

in life later. In a substantial majority of infants wheezing episodes are probably related to predisposition to asthma. This indicates that children are more prone to wheeze in childhood. Based on triggers associated with childhood wheeze, our study concludes that there is relation between triggers and wheeze in childhood. Lung of a child are still growing and early exposure to environmental pollutants can easily alter the lung development and function. Children are more active and they have increased breathing rate that lead to deposition of large amount of environmental pollutants in respiratory tract. In 2015 **Qingling Zhang *et al.***, conducted a similar study and he concluded that there

is a link between environmental triggers and allergic disease [16].

On exposure to cold, mucus is produced which thickens and harder to remove inhaled particles as a result children are prone to infection. The nose becomes stuffy and congested and tries to warm the cold air which enters to the nostrils to protect the lung tissue. Some cold air reaches lung and trigger release of histamine which causes narrowing of airway in wheezing. Similar studies conducted by **Henna Hyrkas *et al.***, concluded that allergic rhinitis and asthma increases respiratory symptoms in cold weather and increased effect on shortness of breath, wheezing and phlegm production [17]. About 76% children were exposed to allergen such as dust mites, animal dander, molds. Allergen such as animal dander triggers hypersensitivity and asthma reactions. Mold grows in moist environment and produce tiny spores that can become airborne, triggers the wheeze attacks. The droppings and saliva of cockroach's triggers asthma attack by reducing lung function. Dust mite pieces and dropping are allergen are travel through air and triggers the allergic cascade and worsen wheeze. Therefore allergen exposure plays an important role in asthma morbidity. **William F Kelly *et al.***, conducted a study, in his study he concluded that exposure to allergen in first years of life have increased asthma morbidity [18].

It is observed that dust allergy is an environmental triggers associated with wheeze were **Patrick N *et al.***, in America conducted a similar study concluded that coarse fraction, NO₂, allergen exposure are important constituent of air pollution and important determinants of wheeze in urban environment [19]. Due to air pollution, the oxygen concentration and purity of the air is decreased in atmosphere. When we inhale polluted air the oxygen required will be less in it and along with dust particles it causes irritation of the mucous membrane of the respiratory system which in turn causes wheezing. Contact with animals, triggers the hypersensitivity reactions by inhaling substance such as spores, flakes, minute pieces of skin, hair and feather of animals. A relation between pet animals and wheezing cannot be found because of small sample size. Majority of children were from city and they developed wheeze. Smoking triggers immune response that initiates inflammatory process leading to runny nose, watery eyes, sinus congestion. Parental smoking increases the airway response of infants. Our study concluded that 33 % children exposed to smoking developed wheeze. **Claudio Schvartsman *et al.***, concluded that children exposed to tobacco smoke have an increased risk of developing wheezing. This risk increases in

association with number of cigarettes smoked inside the house and presents of allergic components in the family [20].

CONCLUSION:

From our study we concluded that wheeze is triggered by substance such as weather, air pollution, dust, smoke, pet animals and allergens such as animal dander, mold, pollen from plants, dust mite etc. This highlights the importance of caretaker's education based on life style modifications such as

- Inform patients to minimize smoke asthma triggering effect by refining from smoking in the home and care.
- Recommend the use of High filtration vacuum cleaners for patients with asthma and hyper sensitivity problem.
- Use a basic mop to clean hard flows; do not use cleaning fluids that are known to trigger asthma and hypersensitivity reactions. For patients with asthma steam cleaners may be better suited than basic mop for hard flows.
- Caretakers might consider making non toxic liquid cleaners from mixture of white vinegar and baking soda.
- Pet animals should be kept out of bed rooms and not let the animal sleep in the bed. Pet should be kept off furniture and be bathed frequently with allergen reducing shampoo.

REFERENCES:

- 1.Horak E. Wheezing in infants and toddlers: new insights. *Wien Klin Wochenschr.* 2004; 116(1-2):15-20.
- 2.Kurukulaaratchy RJ, Fenn M, Twiselton R, Matthews S, Arshad SH. The prevalence of asthma and wheezing illnesses amongst 10 year old school children. *Respiratory Medicine* . 2002; 96(3):163-169.
- 3.Piippo-SavolainenE, Korppi M. Wheezy babies-wheezy adults? Review on long- term outcome until adulthood after early childhood wheezing. *Acta Paediatrica* .2008; 97(1):5-11.
- 4.Klennert MD, Liu AH, Pearson MR, Ellison MC, Budhiraja M, Robinson J. Short term impact of a randomized multifaceted intervention for wheezing infants in low income families. *Archives Pediatric Adolescent Medicine.* 2005; 159(1):75-82.
- 5.Frey U, Makkaonen K, Wellman T, Beardsmore C, Silverman M. Alterations in airway properties in infants with a history of wheezing disorders. *American Journal of Respiratory Critical Care Medicine.* 2000; 161(6):1825-1829.

6. Mortan RL, Sheiks S, Corbett ML, Eid NS. Evaluation of the wheezy infants. *Annals of allergy asthma immunology*. 2001; 86(3):251-256.
7. Joseph L, Goldberg S, Picard E. A randomized trial of home oxygen therapy from the ED for acute bronchiolitis. *Pediatrics*. 2006; 1189(3):1319-1320.
8. National Heart Lung and Blood Institute National Asthma Education and Prevention Program Expert Panel report 3: guidelines for the diagnosis and management of asthma [Internet]: Washington DC 2007 [August 20; 2013]. Available from: <http://www.nhlbi.nih.gov/guidelines/asthmaasthgdln.pdf>.
9. Mc Glaun S. Should asthmatics and allergy sufferers have pets [Internet]. Washington DC; 2008 [July 20; 2011]. Available from http://www.housekeepingchannel.com/a_289 should Asthmatics and Allergy_ Sufferers_ Have Pets.
10. US Environmental Protection Agency. A brief guide to mold, moisture, and your home [internet]. Washington DC; 2008 [July 20; 2011]. Available from <http://www.epa.gov/iedmold1/moldguide.htm>.
11. US Environmental Protection Agency. Asthma triggers: gain control. Secondhand smoke [internet]. Washington DC; 2008. [May 16; 2011]. Available from <http://www.epa.gov/asthma/shs.html>.
12. US Environmental Protection Agency. Child-Specific Exposure Factors Handbook [internet]. Washington, DC; 2008. [May 16; 2011]. Available from: http://cfpub.epa.gov/ncea/cfm/recor_display.cfm?deid.
13. C F Macdougall, A J Cant, A F Colver. How dangerous is food allergy in childhood, The incidence of severe and fatal allergic reactions across the UK and Ireland. *Arch this child*. 2002; 86(10): 236-239.
14. Ostro, Bart, Lipsett, Michael, Mann, Jennifer. et al., Air pollution and Exacerbation of Asthma In African- American Children in Los Angeles. *International Society for Environmental Epidemiology*. 2001; 12(2) : 200-208.
15. Sram R J, Binkova B, Dejmek J, Bobak M. Ambient air pollution and pregnancy outcome: a review of the literature. *Environ Health perspet*. 2005; 113(4) :375-382.
16. Qingling Zhang, Zhiming Qiu, Kian Fan Chung, and Shau-Ku Huang. Link between environmental air pollution and allergic asthma. *East meets West Journal of Thoracic Disease*. 2015; 7(1): 14-22.
17. Hyrkas H, Jaakkola MS, Ikäheimo TM, Hugg TT, Jaakkola J. Asthma and allergic rhinitis increase respiratory symptoms in cold weather among young adults. *Respiratory Medicine*. 2014 ;108(1):63-70.
18. William F Kelly. Allergic and Environmental Asthma Overview of Asthma. *Journal of Allergy Clinical Immunology*. 2016; 104(2) : 305-310.
19. Patrick N Breyse, Gregory B Diette, Elizabeth C Matsui, Arlene M Butz, Nadia N Hansel and Meredith C McCormack. Indoor Air Pollution and Asthma in Children. *Proceedings of American Thoracic Society*. 2010; 7(2): 102-106.
20. Claudio Schvartsman, Sylvia Costa Lima Farhat, Samuel Schvartsman, and Paulo Hilario Nascimento Saldiva. Parental smoking patterns and their association with wheezing in children. *Clinics Journals (Sao Paulo)*. 2013;68(7): 934-939.