


Wheeze, Sneeze, and Itch If You Please

Asthma in Children




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Definition

Asthma is a respiratory condition marked by spasms in the bronchi of the lungs, causing difficulty in breathing. It usually results from an allergic reaction or other forms of hypersensitivity.

Oxford Dictionary



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Asthma in Children

How will I use this information to help my member?

- I will be able to better identify if a patient has Asthma
- I will be better able to recognize environmental triggers.
- I will know when to refer to a specialist
- I will know when to warn member of worsening condition.



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Definition

- Asthma is a chronic respiratory disorder characterized by
 - variable airway inflammation
 - airway obstruction
 - airway hyperresponsiveness
- It affects all the “tubes of the lung”

BMJ Best Practices 08 Jun 2021; Downloaded from the web 7/2021



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Definition

- Asthma also affects the alveoli
- Alveoli are the air sacks in the lung where gas exchange occurs
- Note that this definition appropriately does not include allergy

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What Asthma Does to the Lungs

NORMAL AIRWAY

MUSCLE

AIRWAY WALL

ASTHMATIC AIRWAY

TIGHTENED MUSCLES CONSTRICT AIRWAY

MUCUS

INFLAMED/THICKENED AIRWAY WALL

WHAT CAUSES ASTHMA?
ASTHMA.NET

Author: [medicoedu](#); TAGGED: Asthma, Pulmonary Disease, Respiration, Respiratory

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Symptoms

Childhood Asthma Signs And Symptoms:

- Frequent coughing
- Worsens with a viral infection
- After a respiratory infection
- Delayed recovery
- Bronchitis
- Bouts of coughing or wheezing

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Symptoms

- Occurs while asleep
 - Fatigue, which can be due to poor sleep
- Is triggered by exercise or cold air
 - Trouble breathing that hampers play or exercise
- A whistling or wheezing sound when breathing out
- Shortness of breath
- Chest congestion or tightness

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Classification

There are 4 general categories:

1. Mild intermittent
2. Mild persistent
3. Moderate persistent
4. Severe persistent

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Classification

There are 4 general categories:

1. Mild intermittent

- Mild symptoms
- Up to two days a week and
- Up to two nights a month

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Classification
There are 4 general categories:

Mild persistent

•Symptoms more than twice a week
•But no more than once in a single day

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Classification
There are 4 general categories:

Moderate persistent

•Symptoms once a day
•But no more than once in a single day

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Classification
There are 4 general categories:

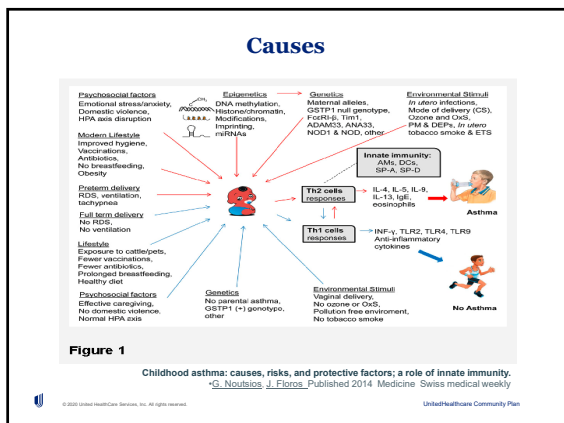
Severe persistent

•Symptoms throughout the day on most days and
•Frequently at night

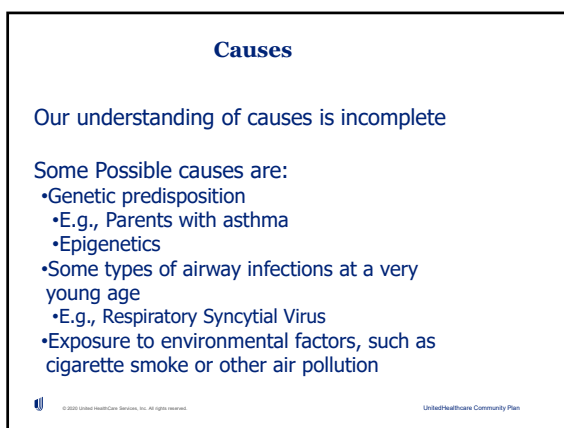
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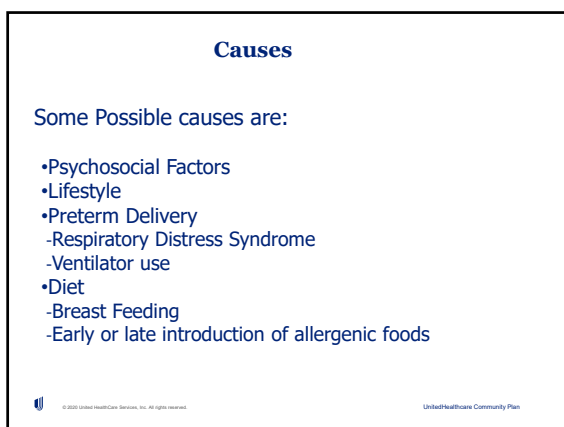
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Exposure to environmental factors

The impact on children of formaldehyde exposure

Significant positive association between exposure and childhood asthma

Long-term exposure associated with Certain cancers (e.g., Sino nasal)

Published: 1 March 2010 <https://doi.org/10.1289/ehp.0901143>;
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Exposure to environmental factors

Indoor Environmental Exposures

Dust Mites

Require moisture to survive; humid environments

In more humid climates,
Found in homes and in schools

30% to 62% of children with persistent asthma are sensitized to dust mite

Indoor Environmental Control Practices and Asthma Management
Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Exposure to environmental factors

Indoor Environmental Exposures

Cat and Dog Allergens

25% to 65% of children with persistent asthma sensitized to cat or dog allergens

Usually at home

May be in other places where the child spends significant time

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Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Exposure to environmental factors

Indoor Environmental Exposures

Rodents

75% to 80% of US homes have detectable mouse allergen

Inner-city homes are as much as 1000-fold higher than those found in suburban homes.

Of note, farm/rural environments were not studied separately

Indoor Environmental Control Practices and Asthma Management
Pediatrics November 2016; 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Exposure to environmental factors

Indoor Environmental Exposures

Cockroach

Sensitivity to cockroach is linked to asthma morbidity and mortality.

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Pediatrics November 2016; 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Exposure to environmental factors

Indoor Environmental Exposures

Dampness and mold

In children with persistent asthma
The prevalence of mold sensitization
is approximately 50%

56% of homes had mold thresholds above those associated with asthma symptoms

Indoor Environmental Control Practices and Asthma Management
Pediatrics November 2016; 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Causes

Indoor Environmental Exposures

Other Environmental Factors

Particulate matter (PM)
 airborne particles in the range of 2.5- to 10 microns or less
 penetrate to alveoli cause inflammation non-allergic;
 Examples: smoking cooking, sweeping, wood-burning stoves,
 fireplaces, biomass burning, electronic nicotine delivery
 systems (e-cigarettes), cigar smoke, incense, bus idling
 outside of school, and other smoked substances e.g.
 marijuana.

Smoking 30% of all US children and 40% to 60% of US
 children in low-income households are exposed to SHS in
 their homes

Indoor Environmental Control Practices and Asthma Management
 Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>
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Causes

Indoor Environmental Exposures

Other Environmental Factors

Particulate matter (PM) and Secondhand Smoke

30% of all US children are exposed at home

40% to 60% of children in low-income households
 are exposed in their homes

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 Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>
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Causes

Indoor Environmental Exposures

Other Environmental Factors

Particulate matter (PM) and Secondhand Smoke

Particulate matter (PM) is airborne particles

Range in size from 2.5 microns (or less) to 10
 microns

Penetrate to alveoli
 Cause inflammation, non-allergic

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 Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>
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Causes
Other Environmental Factors:

Particulate Matter

| | |
|---|---|
| Cooking | Smoking |
| Sweeping (broom or unfiltered vacuum) | Electronic nicotine delivery systems (e-cigarettes) |
| Wood-burning stoves | Cigar smoke |
| fireplaces (think camping trips and cabins) | Incense |
| Biomass burning | Other smoked substance |
| Bus idling outside of school | e.g. Marijuana |

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Causes

Indoor Environmental Exposures

Other Environmental Factors

Nitrous Oxide (NO₂)

NO₂ is a gas that is a byproduct of combustion
Occurs both indoors and outdoors

Affects both allergic and nonallergic children with asthma.

Indoor Environmental Control Practices and Asthma Management
Pediatrics November 2016; 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>

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Causes

Allergy: Increased immune system sensitivity

Causes the lungs and airways to swell and produce mucus upon exposure to triggers.

Triggers may be substances or environmental changes

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Causes

Triggers are what cause an Asthma attack to occur

Triggers are sometimes difficult to identify

Vary from child to child

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Causes

Asthma triggers vector, image ID: 117955925
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Causes

Triggers can include:

Viral infections such as the common cold

Exposure to air pollutants, such as tobacco smoke

Exposure to dust mites, pet dander, pollen or mold

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Causes

Triggers can include:

- Physical activity
- Weather changes or cold air
- Chemical exposures (cleaning agents)

Sometimes, asthma symptoms occur with no apparent triggers.

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Assessment

Assessment
Complete review of patient history Emphasis on the discussed factors

- Evidence of allergy
 - Atopic disease
 - Eczema
 - Food allergies
- Perinatal History
 - Prenatal and Nursery problems

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Assessment

- Family History
 - Asthma,
 - Eczema,
 - Bronchitis,
 - COPD
- Complete physical examination
- Psycho-social assessment
- School performance
- Behaviors

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Assessment

Tests

Routine Laboratory Studies and inflammatory markers

Chest X-ray

Spirometry

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Assessment

Tests

Additional studies if indicated such as:

Sweat Test for Cystic Fibrosis

TB skin test

Other Pulmonary Function Tests

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Assessment

Differential Diagnoses:

An incomplete list of initial considerations

When you hear hoof beats, think of horses, not zebras.

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Assessment

Differential Diagnoses: Things to consider other than allergic Asthma that cause wheezing and breathing problems

Bronchiolitis:
Viral diseases of infants and young children
May be episodic

Inhaled foreign body or aspiration

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Assessment

Differential Diagnoses:

Congenital or acquired heart disease

Weak bronchial or tracheal support structures

Tracheomalacia

Bronchomalacia

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Assessment

Differential Diagnoses:

Cystic Fibrosis

Long list of others
Zebras

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Assessment

Differential Diagnoses:

As the assessment and treatment progress, the differential diagnoses will change and cone down.

This is a “living list” that is modified by repeated clinical patient assessments over time.


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Treating Asthma

Treatment
Stepped Procedures

Dependent on the severity at presentation:

- Mild intermittent
- Mild persistent
- Moderate persistent
- Severe persistent


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Treating Asthma

Treatment

Each level is a starting point

The response to treatment determines continuation, reduction, or increase of medications.


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Treating Asthma

Treatment

Management of exercise-induced symptoms or trigger induced symptoms such as weather using medications.

Three different protocols:

Birth to 5 years

6-11 years

Adolescents are managed like adults

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Treating Asthma

FIGURE 4-26. CLASSIFYING ASTHMA SEVERITY AND INITIATING TREATMENT IN CHILDREN 5-11 YEARS OF AGE
Assessing severity and initiating therapy in children who are not currently taking long-term control medications

| Components of Severity | Classification of Asthma Severity (5-11 years of age) | | | |
|---|---|-------------------------------|------------------------------|---|
| | Intermittent | Mild Persistent | Moderate Persistent | Severe Persistent |
| Frequency of symptoms | ≤ 2 days/month | > 2 days/month, but not daily | > 2 days/week, but not daily | > 2 days/week, with frequent night awakenings |
| Interference with normal activities | None | Mild | Moderate | Severe |
| Expiratory peak flow (PEF) or forced expiratory volume in 1 second (FEV₁) | ≥ 90% predicted | 80-90% predicted | 60-80% predicted | < 60% predicted |
| Expiratory peak flow (PEF) or forced expiratory volume in 1 second (FEV₁) variability | None | Mild | Moderate | Severe |
| Expiratory peak flow (PEF) or forced expiratory volume in 1 second (FEV₁) variability | None | Mild | Moderate | Severe |
| Expiratory peak flow (PEF) or forced expiratory volume in 1 second (FEV₁) variability | None | Mild | Moderate | Severe |

Recommended Step for Initiating Therapy
(Class Figure 4-26 For Stepwise Therapy)

Step 1 (Intermittent): As-needed SABA

Step 2 (Mild Persistent): Low-dose ICS or as-needed SABA with low-dose ICS

Step 3 (Moderate Persistent): Low/medium-dose ICS/LABA

Step 4 (Severe Persistent): Medium/high-dose ICS/LABA

Step 5 (Severe Persistent): High-dose ICS + LTRA or High-dose ICS + LABA

Notes:

- PEF, expiratory peak flow; FEV₁, forced expiratory volume in 1 second; PFT, forced vital capacity; SABA, short-acting beta₂-agonist; LABA, long-acting beta₂-agonist; LTRA, leukotriene receptor antagonist; ICS, inhaled corticosteroid.
- For children, the clinical decision-making required to treat individual children varies.
- Level of severity is determined by both frequency and risk. Asthma management depends on patient's response to the previous 2-4 weeks and necessary change resulting in the most severe category in which the patient is currently.
- All patients, there are inadequate data to recommend combinations of medications with different levels of asthma severity. For example, the combination of low-dose ICS with medium-dose LABA is not recommended. For moderate persistent asthma, the combination of low-dose ICS with low-dose LABA is not recommended. For severe persistent asthma, the combination of low-dose ICS with low-dose LABA is not recommended.

Asthma Initiative of Michigan: Classification and Treatment of Children Age 5 to 11
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Treating Asthma

| | STEP 1 | STEP 2 | STEP 3 | STEP 4 | STEP 5 |
|--|----------------|--------------|--|----------------------|-------------------------------|
| Reliever therapy | As-needed SABA | | As-needed SABA or low dose ICS/ LABA | | |
| Controller therapy | | Low dose ICS | Low/medium ICS/LABA | Medium/high ICS/LABA | Add-on treatment (omalizumab) |
| Other common controller options | Low dose ICS | LTRA | Medium/high dose ICS Low ICS + LTRA | High dose ICS + LTRA | Low dose OCS |

Stepwise pharmacotherapy management in asthmatic children.

SABA, short-acting beta₂-agonist;
ICS, inhaled corticosteroids;
LABA, long-acting beta₂-agonist;
LTRA, leukotriene receptor antagonists;
OCS, oral corticosteroids

Treating Pediatric Asthma According Guidelines

Front Pediatr. 2018; 6: 234. Published online 2018 Aug 23. doi: 10.3389/fped.2018.00234



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Treating Asthma

Treatment

Medications available:

Short acting beta agonist (SABA):
 Albuterol (inhaled)

Inhaled corticosteroids (ICS):
 Low dose or high dose
 Budesonide, Fluticasone

Leukotriene receptor antagonists (LTRA)
 Montelukast

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Treating Asthma

Treatment

Medications available:

Long-acting Beta Antagonist (LABA)
 Salmeterol
 formoterol

Oral corticosteroid (OCS)
 Prednisone

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Treating Asthma

Treatment

Emerging Treatments:

Intravenous Immune Globulin (IVIG)
 Cytokine agonists (interleukin
 agonists)
 Synthequine
 Anakinra

Management of GERD
 Bronchial Thermoplasty

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Treating Asthma

Treatment

Diet:

A well-balanced healthy diet including adequate hydration is important to prevent asthma flare ups and long-term lung disease.

Breastfeeding reduces the incidence

Vitamin D insufficiency has been implemented as a major contributor to pulmonary health.



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Paediatric Respiratory Reviews
Volume 13, Issue 4, December 2012, Pages 236-243

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Treating Asthma

Treatment

Control environmental triggers

- Individually tailored control measures
- Reduce asthma symptoms and exacerbations
 - Similar in efficacy to controller medications
 - Appear to be cost-effective
 - Sustained for up to 1 year after the intervention

Indoor Environmental Control Practices and Asthma Management
Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Treating Asthma

Treatment

Control environmental triggers

Do an environmental history to evaluate the key indoor environmental exposures

Serum allergen-specific IgE antibody tests may be performed

Allergy skin testing

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Pediatrics November 2016, 138 (5) e20162589; DOI: <https://doi.org/10.1542/peds.2016-2589>



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Treating Asthma

Treatment

Education

- Have an Asthma Action Plan and stick to it.
- Take medicines as prescribed.
- Identify and avoid triggers.
- Use tools when necessary
 - asthma diary
 - peak flow meter
- Identify and know what to do for a severe flare-up.

Kid Health from Nemours 2019; Downloaded from the web 7/29/21



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Conclusion

- Asthma in Children has many causes.
 - Allergy is the most common
 - Environmental exposures can be a cause or trigger exacerbations
 - In some children there is no identified cause
- Asthma has a negative impact on a child's well being
 - Physical and emotional impacts
 - Treatment usually curtails the negative effects
 - Untreated Asthma can result in morbidity and mortality



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Conclusion

- The other causes of airway inflammation and Asthma symptoms is extensive.
- When evaluating a child for Asthma the list of possible diagnoses will be coned down with time.
- A step protocol gives a starting point; the response of the child directs the modifications.




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Conclusion

- This presentation is an overview.
- The main take away is to appreciate the complexity of the problem and to recognize that this is a treatable disease.



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