Asthma in Children
diagnosis & classification

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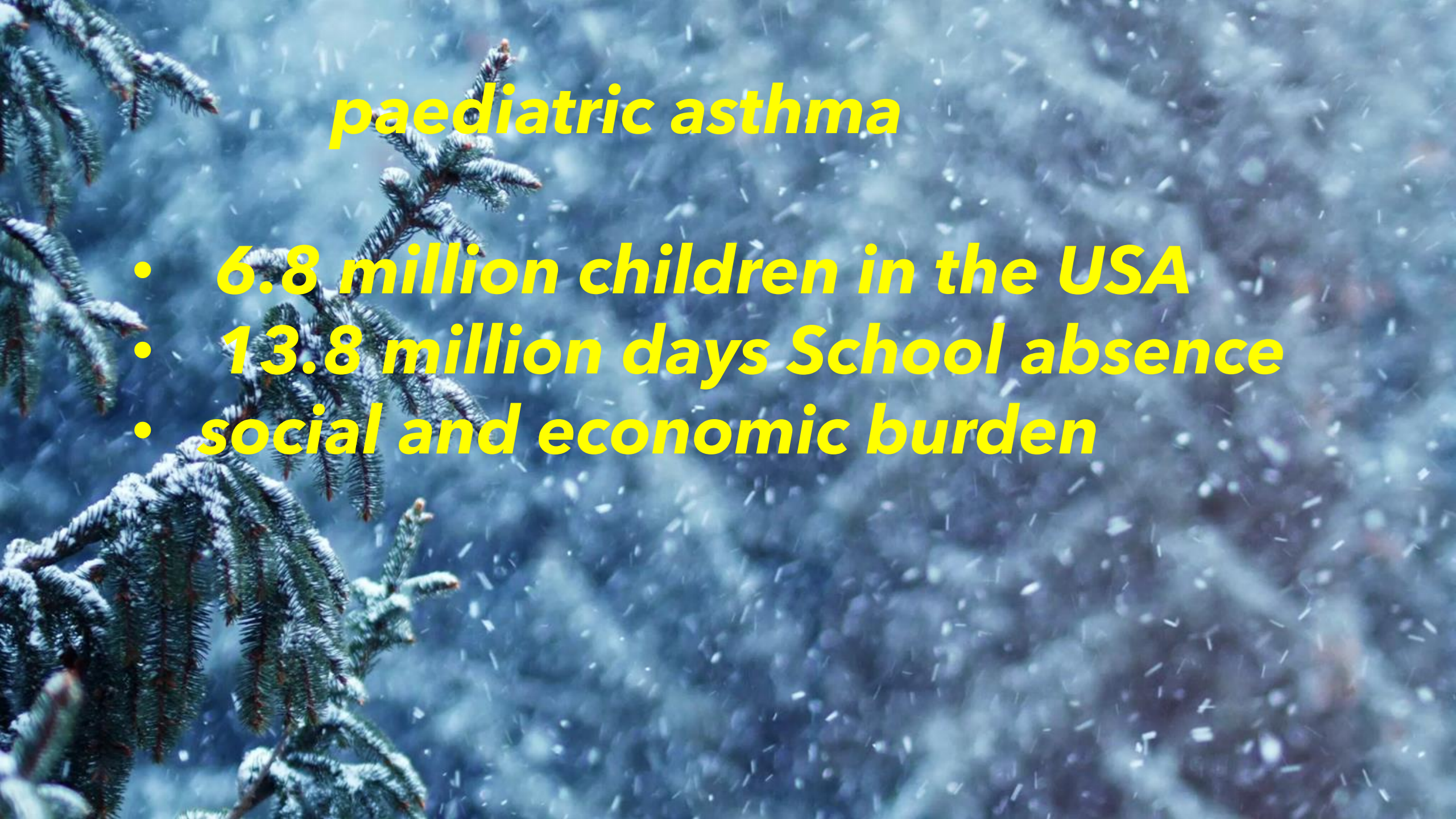

paediatric asthma
• 6.8 million children in the USA
• 13.8 million days School absence
• social and economic burden

Asthma in children is challenging

1- natural course and risk Factor

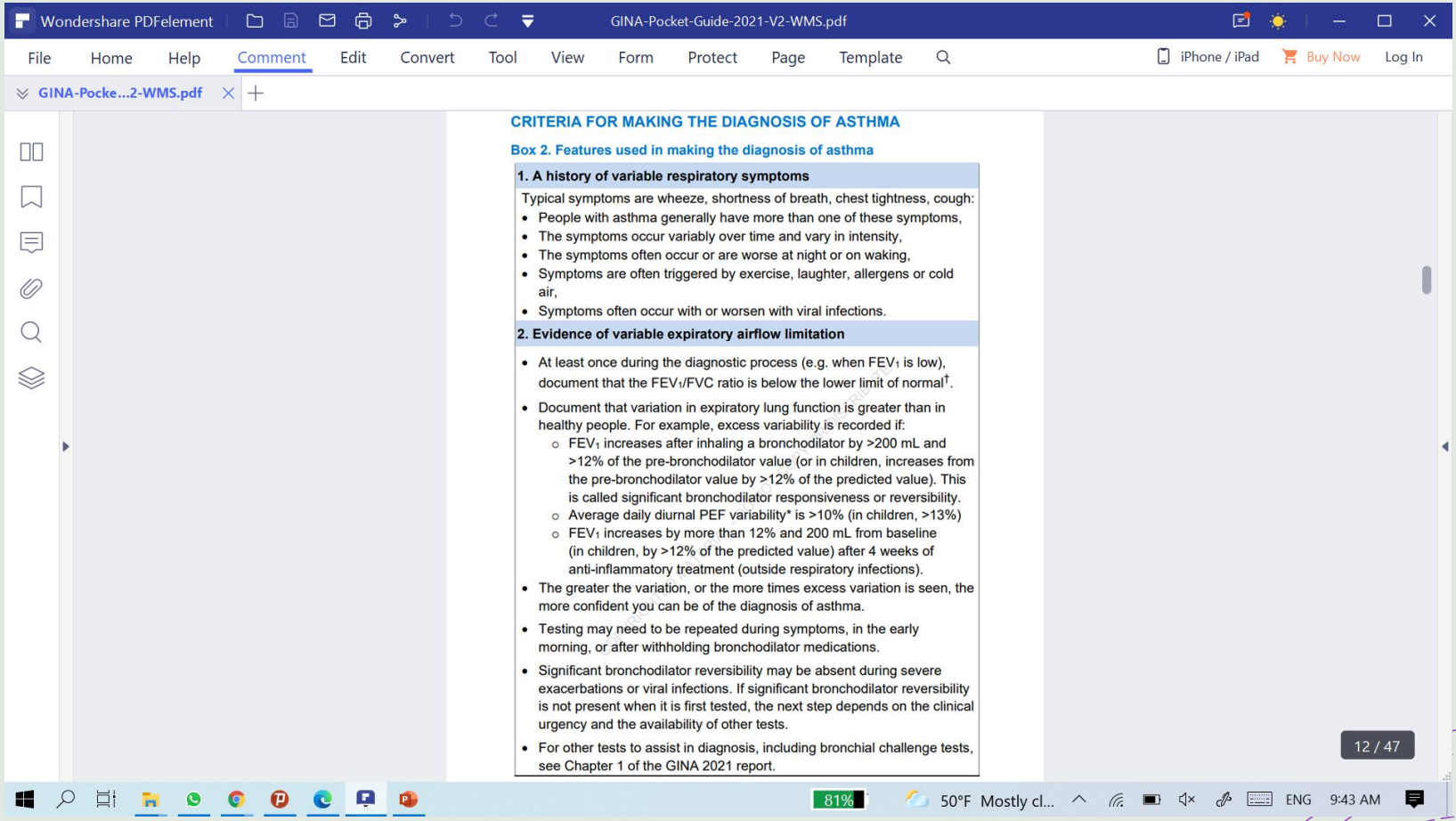
2- difficult evaluation

3- phenotypes of wheeze

4- longitudinal data

5- lung growth

6-which drug is useful for different types of wheeze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CRITERIA FOR MAKING THE DIAGNOSIS OF ASTHMA
Box 2. Features used in making the diagnosis of asthma
1. A history of variable respiratory symptoms
Typical symptoms are wheeze, shortness of breath, chest tightness, cough:
People with asthma generally have more than one of these symptoms,
The symptoms occur variably over time and vary in intensity,
The symptoms often occur or are worse at night or on waking,
Symptoms are often triggered by exercise, laughter, allergens or cold air,
Symptoms often occur with or worsen with viral infections.
2. Evidence of variable expiratory airflow limitation
At least once during the diagnostic process (e.g. when FEV1 is low), document that the FEV1/FVC ratio is below the lower limit of normal†.
Document that variation in expiratory lung function is greater than in healthy people. For example, excess variability is recorded if:
FEV1 increases after inhaling a bronchodilator by >200 mL and >12% of the pre-bronchodilator value (or in children, increases from the pre-bronchodilator value by >12% of the predicted value). This is called significant bronchodilator responsiveness or reversibility.
Average daily diurnal PEF variability* is >10% (in children, >13%)
FEV1 increases by more than 12% and 200 mL from baseline (in children, by >12% of the predicted value) after 4 weeks of anti-inflammatory treatment (outside respiratory infections).
The greater the variation, or the more times excess variation is seen, the more confident you can be of the diagnosis of asthma.
Testing may need to be repeated during symptoms, in the early morning, or after withholding bronchodilator medications.
Significant bronchodilator reversibility may be absent during severe exacerbations or viral infections. If significant bronchodilator reversibility is not present when it is first tested, the next step depends on the clinical urgency and the availability of other tests.
For other tests to assist in diagnosis, including bronchial challenge tests, see Chapter 1 of the GINA 2021 report.
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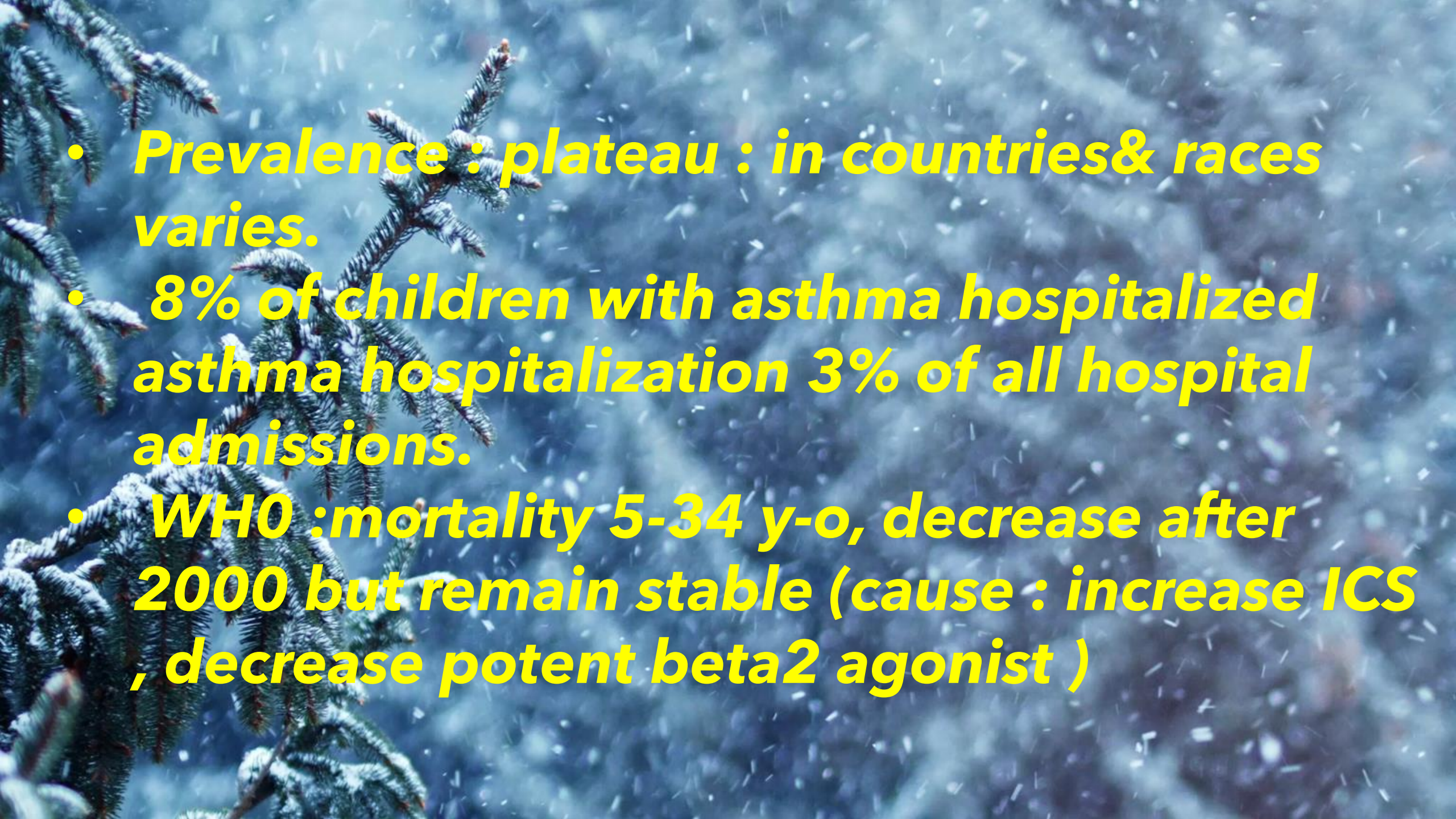
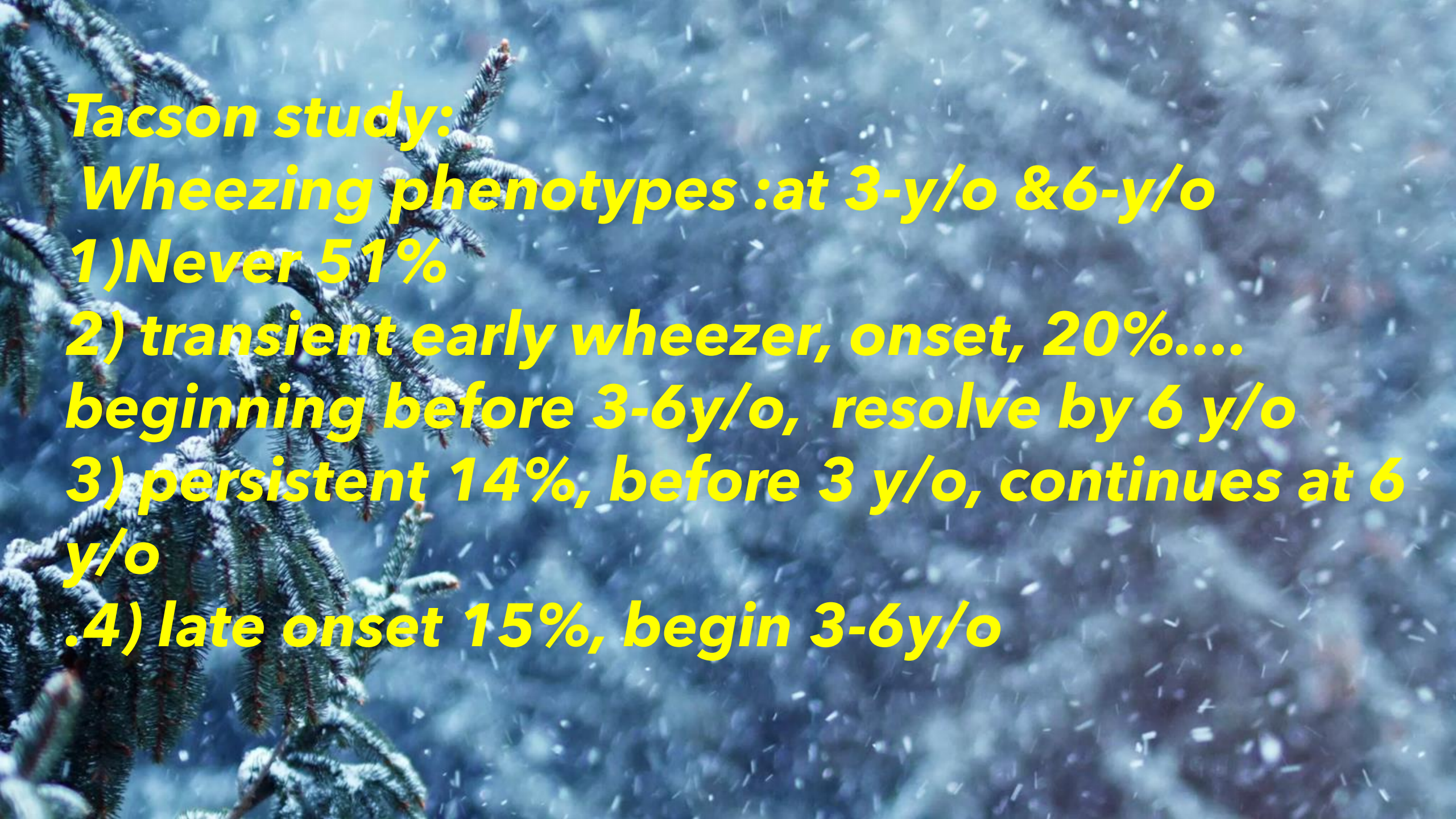
81%
50°F Mostly cl...
ENG
9:43 AM



- *Prevalence : plateau : in countries& races varies.*
- *8% of children with asthma hospitalized asthma hospitalization 3% of all hospital admissions.*
- *WH0 :mortality 5-34 y-o, decrease after 2000 but remain stable (cause : increase ICS , decrease potent beta2 agonist)*

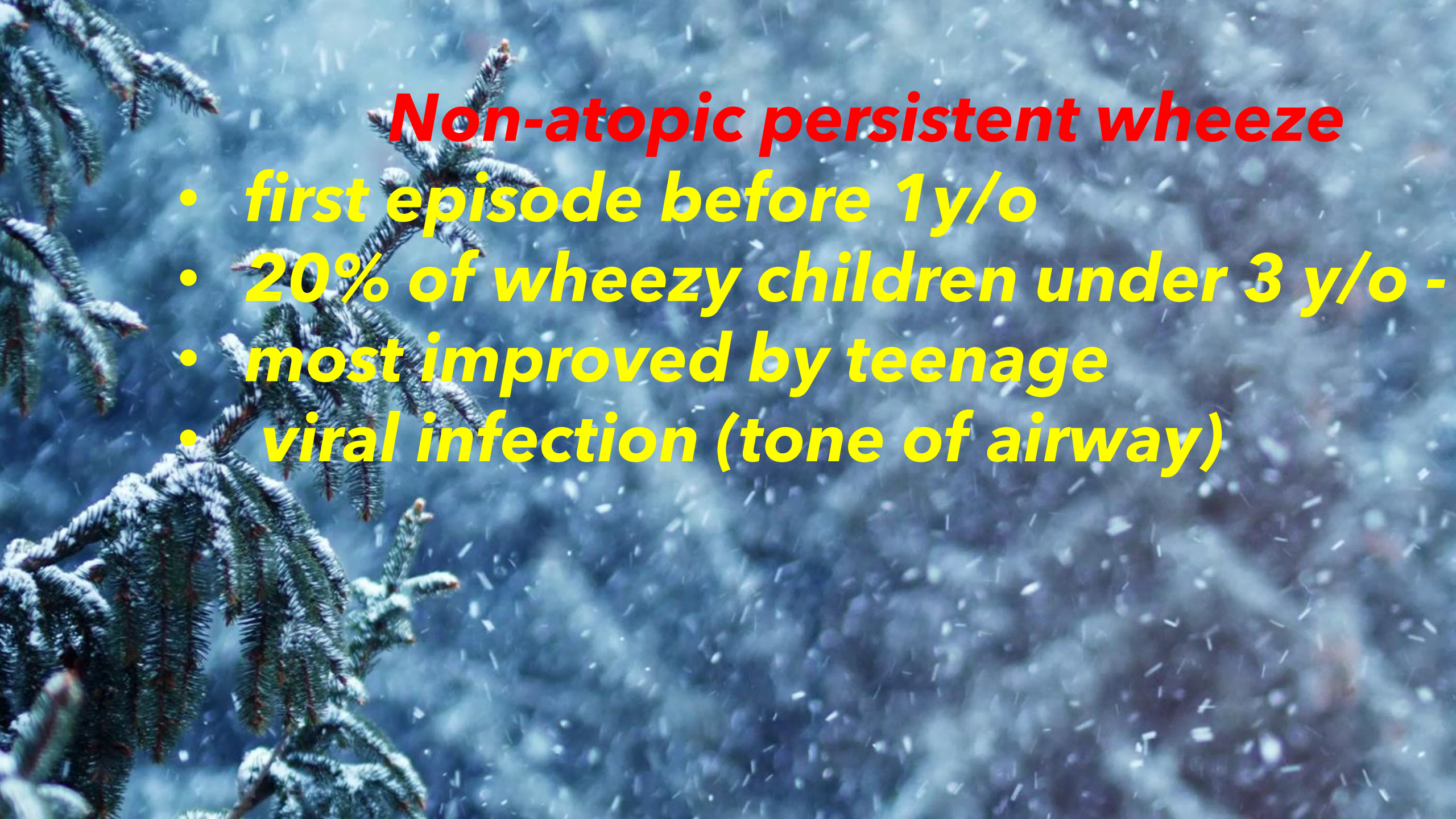

Tacson study:
Wheezing phenotypes :at 3-y/o &6-y/o
1)Never 51%
2) transient early wheezer, onset, 20%....
beginning before 3-6y/o, resolve by 6 y/o
3) persistent 14%, before 3 y/o, continues at 6 y/o
.4) late onset 15%, begin 3-6y/o

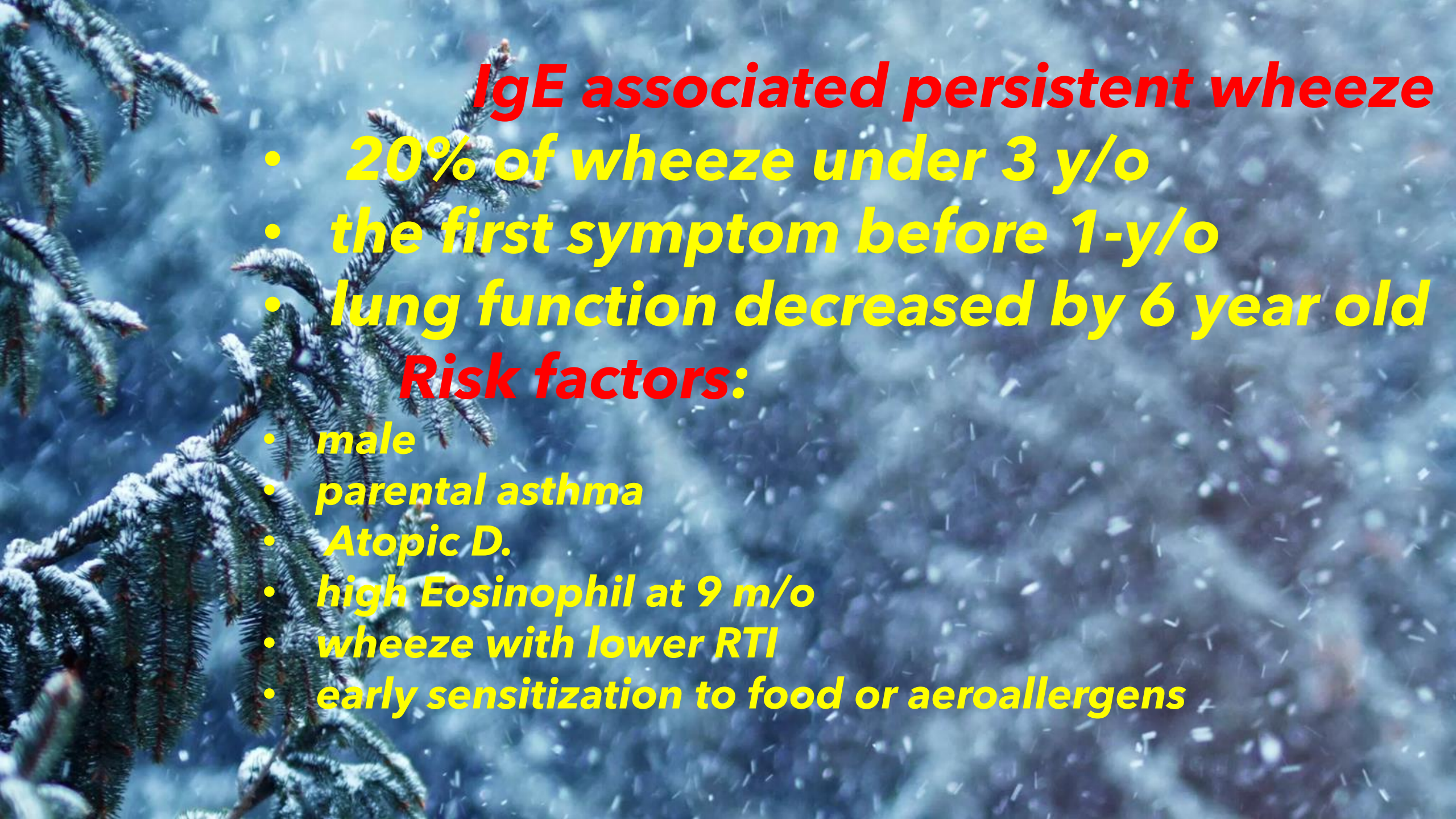
Transient early wheezer

- before 3 y/o, 60% improved by 6-y/o.
- no relation to atopy.
- mother smoking, high relation

Risk factors :

- older sibling (school age)
- day care
- Endotoxin,
- Allergens in the house
- male gender
- bottle fed
- However,25% of transient continue to wheeze in adolescence


Non-atopic persistent wheeze
• first episode before 1y/o
• 20% of wheezy children under 3 y/o -
• most improved by teenage
• viral infection (tone of airway)



IgE associated persistent wheeze

- 20% of wheeze under 3 y/o
- the first symptom before 1-y/o
- lung function decreased by 6 year old

Risk factors:

- male
- parental asthma
- Atopic D.
- high Eosinophil at 9 m/o
- wheeze with lower RTI
- early sensitization to food or aeroallergens

Risk factors for asthma development in children

- allergic sensitization is key point of persistent asthma
: alternaria sensitization related to asthma in the future

- Gender: boys 1.5 fold
- Total IgE
- immune response(IFN)- IL5- IL13

in adolescence: girls more than boy(obesity-hormone-Lung functions -environment)

Risk factors asthma

- previous sever exacerbation
- hospitalization visit for asthma in the past year
- currently using or recently stop using oral CS
- no currently using ICS
- use of two SABA canister per month
- Difficult perception of asthma severity
- social history
- Low economy state
- Illicit drug
- Psychological
- co-morbidity
- cardiac disease
- food allergy disease

modified asthma predictive index

1-history of 4 or more episodes with at least one physician diagnosed

2 - in addition the child must meet at least one of the following major conditions or at least 2 of the following minor condition

: modified asthma predictive index

major criteria

- parental history of asthma
- physician diagnosed
- atopic dermatitis
- allergic sensitization to at least 1 aeroallergen

minor criteria

- --allergic sensitization to milk- egg or peanut
- - Wheeze unrelated to colds
- - blood eosinophil>4%

Viral & bacterial RTI

- RSV_ Rhinovirus- Influenza- Para I- metapneumovirus: recent wheeze
- 50% of children with RSV bronchiolitis : asthma at 6 y-o
- Rhinovirus : the most frequent of asthma exacerbation i young & older children & related to development of asthma in later childhood
- Virus : immune response toward asthma or Atopy predispose to viral infection?
- (recent data : allergic sensitization predisposes to viral infection)

Bacterial RTI

- Neonate: colonization of HI, Pneumococci, Morexella C: Recurrent wheez by 6 y/o
- One study: BAL in wheezy children: 81% neutrophilic inflammation, 59% ; 3 organism : antibiotic: 92% improve
- Viral infections alter the airway microbiome & overgrowth
- Hygiene hypothesis is a paradox (probiotics – GI microbes)(Th1-Th2)


• Gaenetics & Epigenetic
• Psychosocial factors:
• -Depression
• - stress
• - anxiety

Diagnosis

Diagnosis

- Hx
- Timing of wheeze(acute or chronic)
- Viral and feeding relation
- Family & atopic past Hx
- Co-morbid condition
- Response to previous treatment
- Socioeconomic

Physical Examination

- PE of chest is often nl
- Up & lower RT – skin- chest
- Wheeze improvement with salbutamol
- Unilat wheeze(FB- pneumothorax)
- Sinusitis: purulent PND/
- FTT(ID-CF-CHD)
- Clubbing (CF)/
- Neurological deficit(Aspiration)

Sign & symptom

- The most common : intermittent cough
- Shortness of breath
- Chest tightness- chest pain-
- increase at night ,
- during exercise, laughing, allergen
- Asthma medication experience: improve with bronchodilators: suggest asthma

Sign & symptom

- Exposure to virus or mycoplasma-chlamydia : increase hyperresponsiveness to cold, dry air
- AR-AC-FA-AD- parental asthma – wheeze apart cold : support dx

- Attack : wheeze , B/S,
- crackles(inflammation- secretion)

Radiography

- First line evaluation of a child with recurrent wheeze : should : Cray(infilt.-mass-great vessels- FB)
- Mild asthma : nl
- Hyperlucency- flat diaphragm-

Ap diameter-

horizontal position of rib- peribranchial thickening – atelectasis- (Rt middle lobe syndrome,

CXRay Is not routine in attacks unless : infection-pneumothorax- atelectasis

Radiography

- Ba swallowing
  vascular ring –
  microaspiration

- CT of chest :

mass-
LN-
bronchiectasis-
remodeling

Pulmonary Function Test

- PEF; asses control of asthma(PE is more important
- Effort dependent
- Spirometry
- For any child >4y/o for diagnosis of asthma or management
- FEV1 ,FEV1/FVC pre & post bronchodilator (10-12% FEV1, FEV1/FVC>25% increase)

diagnosis

- ***Body platysmography – infant PFT- Impulse Osilometry***
- ***Bronchial provocation (methacholine- cold air- Exercise- Adenosine mono phosphate)***

Radiography

FeNO airway inflammation, may be useful , non invasive diagnostic tool

may diagnose

1- asthma in children

2- response to ICS in children

3- possibility of asthma

4- Risk of asthma relaps with URI

American Thoracic Society:FeNO:

Eosinophilic inflammation- CS response – airway inflammation: CS using?- Adherence to CS using

In children FNO>35 part /billion ppb: eosinophilic airway inflammation & likely response to ICS

Under 20 ppb : unlikely eosinophilic inflammation: no response to increase dose of ICS

Factors influence on FeNo

+***Atopy***

+***Age***

+***Nasal inflammation***

+***RT infection***

+***Ingestion o nitrate ed foods***

+***Alcohol***

+***Caffeine- medication(ICS)- smoke- exercise***

LAB

+*Eosinophilia*

+*Allergic sensitization(supportive not diagnostic)*

+*Immune work up (infections)*

+*Sweat chloride test*

+*Bx(ciliary dyskinesia)*

+*BAL(infection*

+*PPD (TB)*

+Allergic specific IgE

+***60% of children are at risk for development of asthma, sensitized to aeroallergen or foods by age 2-3 y/o***

+***In vitro: ELISA***

+***In vivo : skin prick test***

Asthma severity, intermittent

- ***Day <= 2 days/ wk,***
- ***Night <= 2/mo***
- ***FEV1>80%***
- ***FEV1/FVC.>85%***

Asthma severity, Mild

+***Day > 2 days/ wk,***

+***Night*** 0-4 y/o : 1-2 /mo

+ 5y/o :3-4/mo

+***Activity : nl***

+***FEV1/FVC.>80%***

Asthma severity, moderate

+***Day > daily symptom***

+***Night*** 0-4 y/o : 3-4 /mo

+ 5y/o :1/wk

+***Activity : some limitation***

+***FEV1 60-80%***

+***FEV1/FVC 5-11y/o 75-80%***

+ ***>12y/o***

Asthma severity, sever

+***Day > throughout the day***

+***Night*** 0-4 y/o : 1 /wk

+ 5y/o :often

+***Activity : extreme limitation***

+***FEV1 <60%***

+***FEV1/FVC 5-11y/o 75%***

+ ***>12y/o***

RISK

+Exacerbation

+***Intermittent*** : 0-4y/o: 0-1/year, >5y/o : 1/y

+***MILD and more*** :

+ 0-4y/o: 2/6mo or

>=4wheeze /y, more than 1 day with high risk for asthma

+, >5y/o : >= 2/year

Well Controlled

- Symptom <= 2/week. 1 in a day
- Night 0-4y/o <=1/mo
- 5-11Y/o <=1/mo
- >=12y/o <= 2/mo, , <= 2 days /wk
- Nl activity
- FEV1>80%
- Risk 0-4 y/o 0-1/year
- >5 y/o 0-1/y

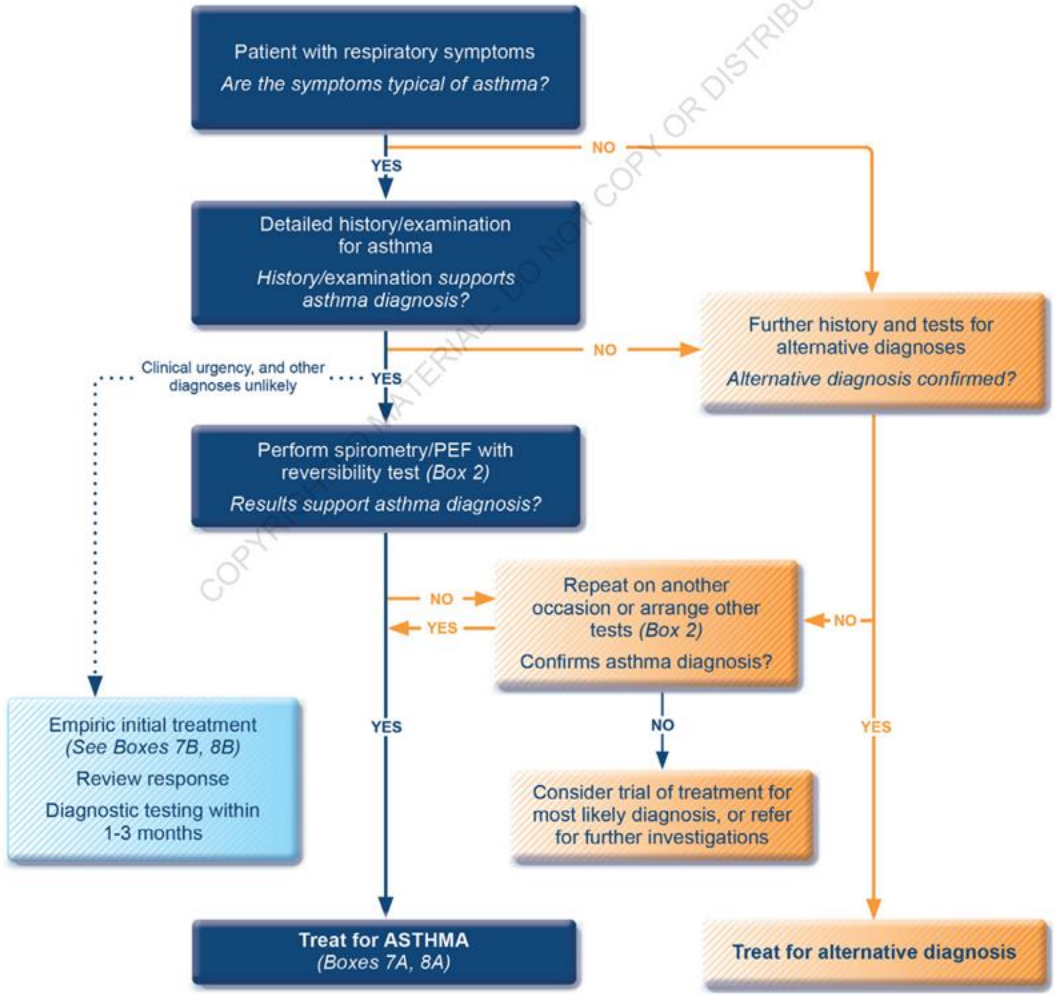
Not Well Controlled

+ Symptom > 2/week. Or multiple
+ Night 0-4y/o >1/mo
+ 5-11Y/o >= 2/mo
+ >=12y/o 1-3/wk, , > 2 days /wk
+ Activity: some limitation
+ FEV1, 60-80%
+ Risk 0-4 y/o 2-3/year
+ >5 y/o >2/y

Poor Controlled

+ Symptom , throughout the day
+ Night , several times
+ Activity: extreme limitation
+ FEV1, <60%
+ Risk 0-4 y/o >3/year
+ >5 y/o

Box 1. Diagnostic flow-chart for asthma in clinical practice



The **diagnosis of asthma** should be confirmed, and the evidence documented in the patient's medical record, preferably before starting