

# Asthma bronchiale/PGS (VPL)

Asthma bronchiale is **a lifelong chronic respiratory disease**

- the number of asthmatics is approximately 300 million (worldwide).

In the last 20 years, **we have observed an increase** especially in children and adolescents - it is becoming the most common chronic disease in children (also in the Czech Republic)

- the health-social-economic impact of asthma on the patient, his family and society increases

**Often underdiagnosed and undertreated**

- in the Czech Republic, an estimated 250,000–350,000 asthmatics are currently undiagnosed.

Asthma **cannot be completely cured, the goal is effective control of the disease and its symptoms**

- most often we deal with it on an outpatient basis,
- while untreated asthma causes irreversible functional changes and impairs the patient's performance.

## Definition

**GINA** (Global Initiative for Asthma) issued information (revision 11/2007) emphasizing the inflammatory nature:

**Asthma is a chronic inflammatory disease of the airways**, many cells and cellular agents are involved. It is a chronic inflammation that **causes an accompanying increase in bronchial reactivity**, which leads to repeated episodes of *wheezing, shortness of breath, chest pressure and coughing during breathing (especially at night and early in the morning)*. Usually accompanied **by extensive, variable bronchial obstruction**, which tends to be **reversible spontaneously or after treatment**.

## Epidemiology

**Prevalence:**

- total asthma in the Czech Republic – **approx. 8%**.
- in **children - more than 10%**.

**Mortality:**

- in the Czech Republic very low (last 10 years) **about 1/100 thousand resident**.

**Increased risk** of developing asthma **in families with allergies and atopics** (especially allergic rhinitis, atopic dermatitis).

## Etiology and pathogenesis

**Asthma development:**

- internal (on the host side) and external (from the external environment) risk factors apply.
- **Internal factors** - affecting the likelihood of developing asthma include:
  - **genetic predisposition** (to the onset and development of asthma),
  - **atopy**
  - **airway hyperreactivity**
  - **gender** can also participate (children: more common in boys, adults: in women).
- **External factors** - lead to higher susceptibility, exacerbation or are the cause of persistent symptoms:
  - **inhaled allergens**
  - **occupational sensitizing substances**

they first sensitize the airways (as early as the 17th week of intrauterine life) and then maintain asthmatic inflammation.

- in residential buildings, especially **dust mites, pet allergens**,
- from the external environment, especially **pollen and mold**.

**Tobacco smoke**, passive and active smoking (especially by pregnant mothers) and air pollution.

- after the sensitization phase and as so-called triggers, they cause exacerbations.
- possibly **non-specific stimuli**:
  - respiratory infection,
  - exertion,
  - hyperventilation ,

- weather changes,
- foodstuffs,
- emotional tension etc.

## Clinical picture of asthma

Onset is possible at any age.

- Typical repeated **shortness of breath conditions**:
  - with **wheezing** in the chest,
  - a feeling of **tightness or heaviness in the chest**,
  - **irritating cough** (predominant/as the only symptom),
- problems most often **at night/morning**.

Characteristic:

- great **variability** of condition,
- **rapid development** of symptoms,
- during **exacerbation**, **shortness of breath at rest**,
- on the lungs a lot of **wheezing, prolonged exhalation**,
- serious conditions ev. even the so-called "**quiet lung**" without spastic phenomena.
- **outside of exacerbations - also asymptomatic** with completely normal physical findings.

**Comorbidities** are often present:

- **allergic rhinitis**,
- possibly atopic **dermatitis**
- thus supplementing the clinical picture of asthma.

## Diagnostics

### Anamnesis

It is very important to confirm the pulmonary function test. Variable and reversible obstructive ventilation disorder is characteristic.

### Spirometrically

Gold standard (examination by the flow/volume loop method): we can detect an **obstructive ventilation disorder**, i.e.:

- **reduction of FEV<sub>1</sub>** (forcefully exhaled volume in 1 second) **below 80% of the appropriate value** and/or
- **reduction of the FEV<sub>1</sub> /FVC ratio** (FVC – vigorous vital capacity) **below 70%**.

The pulmonary function parameter for ambulatory monitoring by the patient is PEF (i.e. peak expiratory flow),

- value reduced - bronchial obstruction.

According to the degree and variability of obstruction, subjective difficulties and the frequency of the need to use relief medication, asthma was divided into degrees:

Asthma grade	daily symptoms	příznaky noční	exacerbations	lung function	daily variability	β 2 -agonists (with rapid onset of action)
1st grade= intermittent	< 1x per week	≤ 2x per month	short	FEV <sub>1</sub> ≥ 80 %, PEF ≥ 80 %	< 20 %	< daily
2nd grade= mild persistent	> 1x a week, < 1x a day	> 2x a month	effect on daily activities and sleep	FEV <sub>1</sub> ≥ 80 %, PEF ≥ 80 %	20–30 %	< daily
3rd grade= moderate persistent	daily	> 1x per week	disruption of normal daily activities and sleep	FEV <sub>1</sub> 60–80 %, PEF 60–80 %	> 30 %	daily
4th grade= severe persistent	daily	often	limitation of physical activities	FEV <sub>1</sub> ≤ 60 %, PEF ≤ 60 %	> 30 %	daily

- FEV<sub>1</sub> – forcefully exhaled volume in 1 second, FEV<sub>1</sub> value (in % of proper value (NH)).
- PEF - peak expiratory flow, PEF value (in % of personal best value (ONH)).

If all indicators are not met, or characteristics of the given grade, we classify the patient in a higher grade.

Obstruction:

- is **reversible** (except for the most severe stages with **fixed** obstruction),
- **will confirm the bronchodilation test** (BDT):

- standard BDT is performed by administering 400 µg of salbutamol to the patient (ideally with an inhalation attachment), the result is determined by spirometry after 30 minutes. We will compare the post-bronchodilation values with the pre-bronchodilation (default):
- it is significantly positive when the FEV 1  $\geq$  12% improves and at the same time by 200ml or the PEF value improves  $\geq$  15%. During the resting period, we can measure completely normal lung function values;
- therefore, we will perform a test for the presence of airway hyperreactivity using a **bronchoconstriction test** with a non-specific agent.

## Allergological examination

Investigating the share of allergy - revealing risk factors and triggers;

- **skin (prick) tests** with standardized allergens and/or
- serum level of **specific IgE**.

We will confirm positive findings from **the anamnesis** .

- **Total IgE** alone is not essential for the diagnosis of allergy.

In the case of **occupational asthma**, we must prove causality, for this purpose:

- **exposure test** at the workplace or
- **specific bronchoprovocation test** with a suspected substance.

Allergological examination will be carried out whenever asthma is suspected.

We do not postpone the start of asthma treatment while waiting for the results of an allergy test..

## Differential diagnosis

Dr. asthma bronchiale supports **the simultaneous** occurrence of allergic rhinitis or atopic dermatitis, possibly positive family history of allergies.

In diff.dg. we consider diseases:

- with manifestations **of shortness of breath, cough, wheezing, feelings of heaviness in the chest** and/or
- with **bronchial obstruction** - it is especially necessary to consider the possibility of **chronic obstructive pulmonary disease (COPD)**:
  - typical: **chronic, permanent, gradually progressing problems and irreversibility of bronchial obstruction** .
  - approx. **10% of patients** have **asthma + COPD** at the same time .
- dif.dg. reasoning is sometimes more difficult **in active smokers**.
- **aspiration of foreign bodies** (especially in children and the elderly),
- so-called **pseudoasthma** (most often from **vocal cord dysfunction (VCD** - vocal cord dysfunction).
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## Schema

Clinical picture + medical history + physical examination:

1. **pneumological examination** (+ possible collection of material for morphological examination)
2. **spirometry** :
  - obstruction => bronchodilation test:
    - positive => **ASTHMA**
    - negative => COPD / other disease with obstruction
  - normal => bronchodilation test
    - positive => **ASTHMA**
    - negative => it is not a disease with impaired ventilation
  - restriction susp. - dif.dg. eg IPF, cardiac insufficiency,...
3. **allergy examination**
  - negative => atopy not proven
  - positive => ATOPIA proven => **ATOPIC ASTHMA**

For asthma and atopic asthma, we start therapy: allergen vaccination, pharmacotherapy, regimen measures.

## Classification of asthma bronchiale

Older classification **according to the severity of the clinical condition before starting treatment** (table above) - disadvantages:

- it does not consider the fact of different reactions to treatment, different success rates of treatment.
- Asthma severity or response to treatment may change over the course of the disease.

The new classification is based **on the level of control**

- strict requirements: every week with an exacerbation is a week without asthma control and a reason to review maintenance treatment,
- 3 grades: under control, under partial control or under insufficient control.

Control level	daily symptoms	limitation of activities	night symptoms (awakening)	the need for relief drugs	lung function	exacerbations
Asthma under control (all features met)	none ( $\leq 2x$ per week)	none	none	none ( $\leq 2x$ per week)	normal	none
Asthma under partial control (any of the signs met)	> 2 times a week	any	any	> 2 times a week	< 80% NH or ONH*	$\geq 1$ per year
Asthma under insufficient control (any of the features met)	$\geq 3$ signs of partial control per week					1 in any given week

NH = proper value, ONH = personal best value

## Therapy

The therapy of asthma bronchiale and asthma attack is analyzed by 2 other attestation questions:

- Bronchial asthma therapy
- Therapy of an attack of asthma bronchiale

## Equipment of the VPL surgery

In the **first line** (general practitioner, ambulatory specialist, RZP doctor), for the initial treatment of asthma exacerbations, in addition to the history and physical examination, the following should be available:

- **exhalation meter**,
- **pulse oximeter**,
- **an inhalation attachment** ("spacer") for children and adults or a nebulizer
- **inhaled  $\beta_2$ -agonists** with a rapid onset of action,
- **oral corticosteroid** (Prednisone 20mg or Medrol 16mg)
- possibly **source of oxygen**.

An acute exacerbation of asthma should lead to an analysis of the causes that caused it.

## Long-term monitoring of asthma

The general practitioner monitors his asthmatic for:

- **frequency and severity of symptoms and exacerbations**,
- **PEF** values,
- **limitation** of normal activities, missed days from school/work, limitation of leisure activities,
- correct **inhalation techniques**,
- **adverse effects of antiasthmatics**, **comorbidities** and **comedication**,
- compliance **with non-pharmacological prevention, regimen measures** (including non-smoking compliance).

## Asthmatic in special situations

### Scheduled Operations

Preparing the patient for the planned surgical procedure:

- with respect to age, ECG and X-ray S+P are required as part of the pre-operative examination, but spirometry is not required in patients with proven or possible obstructive ventilation disorder,
- it is recommended **to double the anti-asthmatic treatment in advance**, as **intubation can provoke bronchospasm**,
- for asthma that **is not under control**, do not hesitate **to increase the doses of anti-inflammatory treatment**, ev. start **systemic corticoids** (20-40 mg of prednisone in adults) **10-14 days before the planned operation**. Corticosteroids are discontinued on the day of surgery and **100-200 mg of hydrocortisone** (or equivalent) is applied.

### Pregnancy

- prevalence **in pregnancy is increasing** (now approx. 8.5%),
  - is **the most common chronic disease in pregnancy**,
  - during pregnancy, **asthma improves in 1/3, does not change in 1/3, and worsens in 1/3** (mostly in

the 24th–36th week of pregnancy, towards the end and during childbirth, it rarely worsens),

- **3/4 of women return to their previous state within 3 months of giving birth .**
- **Inadequately controlled** asthma is a far greater risk for both mother and fetus than any pharmacotherapy (including systemic corticoids)
  - it is necessary **to carefully monitor and check more often** - cooperation and mutual awareness of the asthmatologist, gynecologist and general practitioner. **No antiasthmatics are contraindicated** during pregnancy or lactation .
- **Exacerbation** of asthma during pregnancy is managed **with intensive treatment while monitoring oxygen saturation** (SatO<sub>2</sub> min 95%, otherwise **do not hesitate with oxygen therapy** - to prevent hypoxic damage to the fetus).

## Other chronic diseases in asthmatics - the effect of comedication

### Atopic eczema

- **The first of the diseases of the allergic march ,**
- it arises **in 90% in the period from birth to the age of 6 .**
- It is often accompanied by asthma (30% of children and 50% of adults with atopic eczema have asthma at the same time) - it is referred to as the so-called **dermorespiratory syndrome** .
- to **affect skin and respiratory symptoms**, we administer drugs **systemically** :
  - **oral corticosteroids , antileukotrienes and antihistamines .**
  - most treatments for both diseases are for local application

### Allergic rhinosinusitis

- in coincidence with asthma, it is referred to as the so-called **unified allergic airway syndrome** .
- the pharmacotherapy of both is similar:
  - **intranasal corticosteroids, ICS, antihistamines, SALT .**
- Inadequate control of allergic inflammation can cause problems in other parts of the respiratory tract.

### Corticoiddependent diseases

- i.e. serious diseases treated with systemic corticoids (oral) - they also favorably affect asthmatic inflammation

airways. Asthma worsens/occurs when total corticosteroids are discontinued:

- at the same time as **corticoids** we also administer **small doses of ICS** ,
- **when discontinuing systemic corticoids , we can increase** them if necessary .

### Diabetes mellitus (DM)

- **Aggravation/induction of DM** by continuous administration of systemic corticoids (in the treatment of cortico-dependent asthma), \*short-term course of systemic corticoids for **short-term worsening of diabetes** ,
- large doses, especially after  $\beta$  2 -agonists, can **aggravate the tendency to hypokalemia** in diabetics .

### Cardiovascular diseases (IHD, hypertensive disease)

CHD, hypertensive disease may be **aggravated** by asthma pharmacotherapy:

- **systemic corticoids,  $\beta$  2 -agonists.**

Asthma can be **aggravated by** :

- **beta blockers, acetylsalicylic acid** (preventive antiplatelet agent).

Differential diagnostic difficulties - relatively frequent cough when taking ACEI.

### Thyrotoxicosis

Effects of  **$\beta$  2 -agonists** :

they can increase **tachycardia** , mask the developing thyrotoxicosis with side effects (tremor, tachycardia).

**In thyrotoxicosis :**

- check the history of asthma before administration of beta-blockers,
- thyrotoxicosis **can cause an exacerbation/substantial worsening of asthma** .

### Rheumatic diseases, diseases of the neuromuscular apparatus

Administered nonsteroidal antirheumatic drugs can complicate asthma in **ASA and NSAID intolerance**.

### Gastroesophageal reflux, peptic ulcer disease

GER and VCHGD are **aggravated** by (long/short) **administration of systemic corticoids and theophyllines** .

**GER itself aggravates asthma** (irritation of the autonomic nervous system of the esophagus) and **can lead to OIA** .

### Diseases with impaired liver or kidney function

**Deterioration of the breakdown and elimination** of systemically administered antiasthmatics - **especially theophyllines**.

### Neurological diseases

Neurological diseases with extrapyramidal tremor:

- may be aggravated by administration of po/inhalation  $\beta$  2 -agonists,
- significant extrapyramidal tremor may be the cause of poor inhalation technique - worsening asthma.

### Psychiatric diseases

- **Exacerbation/induction by systemic corticoids** in cortico-dependent asthma.
- **$\beta$  2 -agonists** can induce **depression**.
- With serious psychiatric illnesses, there is **low compliance and adherence to treatment** - it can

be also the cause of OIA,

- **uncontrolled asthma also leads to deterioration of mental health.**

### Forecast

The prognosis is **good** for:

- timely diagnosed and timely treated asthma,
- provided good compliance (pharmacological and non-pharmacological),

**except in cases of difficult-to-treat asthma** (OIA).

### Prevention

It is still only **secondary and tertiary prevention** has a component:

- **pharmacological** (preventive treatment including allergen vaccination) and
- **non-pharmacological** (technical and regime measures, adjustments to the housing, school and work environment - with the task of **limiting exposure to** asthma inducers and triggers).

The most common comorbidity of asthma - **allergic rhinitis** often precedes the development of bronchial asthma. In case of **persistent colds**, it should be **min. Spirometry performed once a year** to detect bronchial obstruction in time (sometimes even in a clinically mute patient).

## Links

### Related Articles

On the VPL portal:

- Bronchial asthma therapy
- Therapy of an attack of asthma bronchiale

On Wikilectures:

- Asthma
- Asthma bronchiale/case report
- Status asthmaticus
- Bronchial asthma therapy

### External links

[www.svl.cz/....astma-2008.pdf](http://www.svl.cz/....astma-2008.pdf) ([https://www.svl.cz/Files/nastenka/page\\_4771/Version1/astma-2008.pdf](https://www.svl.cz/Files/nastenka/page_4771/Version1/astma-2008.pdf))

### Literature

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