

# Management of Asthma in Special Situations



# Asthma in Pregnancy



- ▶ Most asthmatics have the onset of their symptoms in childhood, adolescence or early adulthood
- ▶ Therefore, most women who are suffering from this disease will eventually face the problem of management of asthma during pregnancy
- ▶ If left untreated, asthma can lead to serious complications for both mother and fetus

- ▶ When appropriately managed, both mother and baby should have an outcome like a normal pregnancy
- ▶ Both patients and physicians are concerned about the possible adverse effects of the drugs on the growth and development of the fetus
- ▶ Therefore, **women are reluctant to take**, and some **physicians are reluctant to prescribe** medications during pregnancy

- ▶ Most of the information about the teratogenic potential of drugs has come from animal experiments
- ▶ Human safety data on the effects of exposure to most medications during pregnancy is lacking
- ▶ Recommendations on uses of drugs are based on their safety record
- ▶ Only those drugs that have failed to demonstrate teratogenic or other adverse maternal or fetal effects should be prescribed

- ▶ Evaluate risks and benefits
- ▶ Obtain adequate informed consent
- ▶ Explain the consequences of failing to prescribe therapy
- ▶ The patient has a right to information

# Pulmonary Physiology during Pregnancy

- ▶ The basal metabolic rate increases thus requiring more oxygen delivery to the tissues
- ▶ Minute ventilation is increased to provide this additional oxygen, mainly by an increased tidal volume
- ▶ Hyperventilation itself may produce a sensation of dyspnoea, even in a normal woman

# Physiological Changes

- ▶ During the later stages of pregnancy, increase in abdominal contents pushes up the diaphragm reducing the functional residual capacity
- ▶ However, Forced Vital Capacity (FVC) and Forced expiratory Volume in 1 second ( $FEV_1$ ) and the expiratory flow rates are not altered



# Effects of Pregnancy on Asthma

- ▶ Asthma may begin or be diagnosed during pregnancy
- ▶ Or the severity of asthma may change in pregnancy
- ▶ The course of asthma during pregnancy is unpredictable
- ▶ Approximately one third women show improved asthma control, another one third remain unchanged, and the other third experience a worsening of asthma

# Effects of Pregnancy on Asthma

- ▶ With subsequent pregnancies, approximately **two thirds of women experience the same changes in their asthma as they did in their first pregnancy**
- ▶ Women with mild asthma are however unlikely to experience too many problems
- ▶ Those with moderate or severe disease will have the greatest problems

# Effects of Pregnancy on Asthma

Factors that may lead to a loss of control during pregnancy:

- ▶ Increased tendency for gastroesophageal reflux or stress
- ▶ Reduced medication by the patients, either on their own or even by treating physician
- ▶ Pregnancy itself may cause an increase feeling of breathlessness
- ▶ This needs to be objectively evaluated to differentiate it from a deterioration in asthma control and the patient needs to be reassured

# Effects of Asthma on Pregnancy

Maternal complications of uncontrolled asthma:

- Preeclampsia
- Gestational hypertension
- Hyperemesis gravidarum
- Vaginal hemorrhage
- Instrumental deliveries
- Toxemia
- Induced and complicated labors

# Effects of Asthma on Pregnancy

- ▶ Increased risk of spontaneous miscarriage
- ▶ Increased risk of fetal fatality
- ▶ Pregnant asthmatics are more likely to contract both respiratory and urinary infections, with incidence of occurrence being greater in acute asthmatics than mild asthmatics; the incidence is higher in mild asthmatics than nonasthmatics

# Effects of Asthma on Pregnancy

- ▶ Placenta previa
- ▶ Antepartum hemorrhage
- ▶ Postpartum hemorrhage
- ▶ Maternal hypocapnia, dehydration, and alkalosis. These may unfavorably affect fetal oxygenation by restricting uteroplacental blood flow

# Fetal Complications

Fetal complications of uncontrolled asthma include increased risk of :

- ▶ Perinatal death
- ▶ Intrauterine growth retardation
- ▶ Preterm birth
- ▶ Low birth weight
- ▶ Neonatal hypoxia

Improperly maintained asthma can result in acute asthma episodes, that can cause harm to the fetus by depleting the oxygen supply

# Neonatal complications

- ▶ Transient tachypnea
- ▶ Neonatal hyperbilirubinemia
- ▶ Neonatal hypoxia



# DIAGNOSIS OF ASTHMA DURING PREGNANCY

- ▶ A majority of women experience dyspnoea during pregnancy
- ▶ This may begin as early as the first or the second trimester, much before the intra-abdominal pressure rises due to growth of the fetus
- ▶ This is likely related to hormonal changes
- ▶ Asthma may begin for the first time during pregnancy

# DIAGNOSIS OF ASTHMA DURING PREGNANCY

Clinical features that suggest asthma

- Variability
- Intermittancy
- Triggers
- Diurnal variation

# DIAGNOSIS OF ASTHMA DURING PREGNANCY

- ▶ It is important to differentiate asthma from other causes of dyspnea, such as hormonally induced respiratory changes
- ▶ Dyspnoea related to pregnancy does not cause significant alterations in forced vital capacity (FVC) or forced expiratory volume in one second ( $FEV_1$ )
- ▶ The ratio of  $FEV_1$ / FVC remains unchanged

# Diagnosis

- ▶ Asthma will result in reduced  $FEV_1/FVC$  ratio and  $FEV_1\%$  predicted and reduced flow rates
- ▶ These features along with history suggest asthma

# Differential Diagnosis

- ▶ Anemia
- ▶ Respiratory infections, such as bronchitis or pneumonia
- ▶ Cardiac disorders
- ▶ Physiologic dyspnea of pregnancy
- ▶ Pulmonary embolism

# Monitoring

- ▶ Best measure of lung function for evaluating asthma is the FEV<sub>1</sub>
- ▶ Compare with spirometric values during the nonpregnant state
- ▶ Repeat spirometry on each visit during pregnancy to assess both severity and control of asthma
- ▶ In moderate or severe cases, home peak flow meters may be provided

# Monitoring

- ▶ Early recognition of an impending worsening of lung function is even more vital in pregnancy
- ▶ The fetus may be threatened early during hypoxaemia
- ▶ Spirometry provides information about the degree of control

# PRINCIPLES FOR MANAGING ASTHMA DURING PREGNANCY

The principal goal of management of the pregnant asthmatic is to give birth to a healthy baby

Other goals are similar to those for nonpregnant patients with asthma:

- ▶ to achieve normal, or near normal, pulmonary function
- ▶ with minimal or no adverse effects from therapy
- ▶ to control symptoms without nocturnal awakening
- ▶ to maintain normal activities without lost time from school or work
- ▶ to actively participate in exercise
- ▶ to avoid acute exacerbations and the need for emergency department visits or hospitalizations



# PRINCIPLES FOR MANAGING ASTHMA DURING PREGNANCY

The components of asthma management remain the same as in the nonpregnant state

- ▶ Assessment and monitoring
- ▶ Avoidance of triggers and environmental control
- ▶ Pharmacotherapy
- ▶ Patient education

# PRINCIPLES FOR MANAGING ASTHMA DURING PREGNANCY

- ▶ Concern about the adverse effects of drugs leads to undertreatment
- ▶ **Avoid undertreatment:** aggressive medical treatment be administered, not only for acute symptoms, but for prevention of attacks
- ▶ A crisis or emergency plan should be prepared for each patient in anticipation of an attack

# Fetal Monitoring

- ▶ Early sonography for evaluating fetal growth
- ▶ Sequential sonographic evaluations are indicated if growth retardation is suspected or if the patient's asthma is moderate to severe
- ▶ Daily kick counts and daily maternal evaluation of fetal activity

# Fetal Monitoring

- ▶ In addition, fetal assessment is needed during asthma exacerbations and also during labor
- ▶ Continuous monitoring is recommended when asthma is uncontrolled or severe, or when fetal assessment on admission is not reassuring

# EMERGENCY TREATMENT FOR ACUTE ASTHMA

- ▶ Aggressive treatment is essential for an acute asthma attack to assure adequate oxygen supply to the fetus
- ▶ This is the time when the fetus is at the greatest risk
- ▶ Oxygen must be administered to maintain maternal and fetal  $P O_2$

# EMERGENCY TREATMENT FOR ACUTE ASTHMA

- ▶ Monitoring of arterial oxygen saturation by pulse oximetry and ,if required, arterial blood gas analysis, is mandatory
- ▶ Fetal heart rate must be monitored during an asthma exacerbation, observing for decelerations or absent variability

# EMERGENCY TREATMENT FOR ACUTE ASTHMA

- ▶ The management principles are the same as in the nonpregnant state
- ▶ Frequent nebulizations with bronchodilators, salbutamol and ipratropium bromide, and oral/parenteral steroids must be used as the risks during an acute exacerbations far outweigh any presumed risks due to the drugs
- ▶ The patient may require to be hospitalized if the initial response in the emergency room is unsatisfactory

# EMERGENCY TREATMENT FOR ACUTE ASTHMA

- ▶ Due to physiological hyperventilation, the  $\text{PaCO}_2$  is normally less than 35
- ▶ Therefore, during an exacerbation, a  $\text{Pa CO}_2$  of more than 35 mm Hg indicates  $\text{CO}_2$  retention during pregnancy and may signal impending respiratory failure
- ▶ In the event of respiratory failure, the mother must be intubated and mechanically ventilated urgently



# Chronic Asthma

- ▶ Medication is usually necessary to control asthma in the mother
- ▶ Therapy must allow adequate oxygenation and growth of the fetus
- ▶ Classification of severity and step-appropriate treatment is the same as in the nonpregnant state

# Chronic Asthma

- ▶ When choosing drugs, the prescriber must look at the effects on both the mother and the fetus
- ▶ Maternal considerations may include adverse effects such as drowsiness, tremors, or nausea
- ▶ Fetal effects that should be contemplated include teratogenicity, growth retardation, and toxicity

# *Antihistamines*

- ▶ Approximately 20% of pregnancies are complicated by allergic rhinitis and other allergic disorders
- ▶ Another 10% have nonallergic causes of rhinitis
- ▶ Uncontrolled rhinitis may lead to sinusitis or exacerbate asthma. Therefore, antihistamines often are used during pregnancy
- ▶ Use intranasal cromolyn or more potent intranasal therapy, such as beclomethasone or budesonide, for uncontrolled symptoms of allergic rhinitis before trying antihistamines

# *Antihistamines*

- ▶ Use **chlorpheniramine** or **tripelennamine**, with loratadine or cetirizine being reserved for those patients in whom sedation must be avoided or minimized
- ▶ **Try to avoid oral antihistamines during the first trimester**
- ▶ Only very limited data are available on newer antihistamines, and therefore risk-benefit analysis generally reserves these agents for special circumstances

# *Decongestants*

Topical drug oxymetazoline is the preferred decongestant

- ▶ a cause of rhinitis medicamentosa
- ▶ continuous use should not exceed 2 to 3 days

The oral decongestant pseudoephedrine along with phenylpropanolamine may cause gastroschisis

All oral decongestants be avoided during the first trimester

**Pseudoephedrine** remains the oral decongestant drug of choice after the first trimester

# *Beta-2 Agonists*

- ▶ Epinephrine is teratogenic in some animal species
- ▶ Epinephrine has largely been replaced by nebulized drugs
- ▶ Terbutaline is preferable in the rare instance where a subcutaneous product is needed for acute asthma
- ▶ Epinephrine is still the drug of choice for treating acute anaphylaxis

# *Beta-2 Agonists*

- ▶ High doses of beta agonists may cause side effects, including tachycardia, hyperglycemia, hypokalemia, nervousness, and tremor in the mother and exposed newborn
- ▶ But their benefits far outweigh these relatively minor reactions
- ▶ In the acute setting, where high-dose therapy is indicated, serum electrolyte monitoring is indicated

# *Beta-2 Agonists*

- ▶ Cardiac monitoring and supplemental oxygen reduce the chance of an untoward event
- ▶ The inhaled route of administration is preferred, but there may be instances when oral forms of the medications are useful



# *Ipratropium*

- ▶ The anticholinergic agent ipratropium is useful in patients who cannot tolerate beta<sub>2</sub>-agonists
- ▶ Although human pregnancy data are lacking, animal studies are reassuring
- ▶ Nebulized ipratropium may provide additional bronchodilation when added to inhaled beta-agonist therapy for status asthmaticus

# *Theophylline*

- ▶ long track record of use in pregnancy
- ▶ Theophylline generally is used for its mild-to-moderate bronchodilatory effects but immunomodulatory, anti-inflammatory, and bronchoprotective properties
- ▶ Theophylline, in its sustained release form, is an option when therapy in addition to inhaled corticosteroids is required for night-time awakening or frequent need for beta<sub>2</sub> -agonists during the day

# *Theophylline*

- ▶ Toxic effects of theophylline range from mild-to-severe gastrointestinal symptoms to cardiac arrhythmias and seizures
- ▶ Blood levels should be monitored to achieve and maintain serum theophylline levels of between 5 and 12 ug/mL during pregnancy
- ▶ There is no advantage to including intravenous aminophylline for the treatment of status asthmaticus
- ▶ There may be an indication for aminophylline during hospitalization in a pregnant patient with impending or acute respiratory failure

# *Corticosteroids*

- ▶ Inhaled corticosteroids are accepted as the most effective medication for the long-term control of patients with persistent asthma
- ▶ The most human pregnancy data are available for **beclomethasone** and **budesonide**
- ▶ There is **no significant difference in the incidence of congenital malformations** in the IS-treated group

# *Corticosteroids*

- ▶ Oral corticosteroids are essential in managing acute and severe asthma during pregnancy
- ▶ Several trials have demonstrated the safety of short-term, high-dose systemic corticosteroids and lack of increased perinatal mortality
- ▶ In one study there was a significant increase in oral clefts with first trimester systemic corticosteroid exposure
- ▶ In a literature review of 457 infants exposed to systemic corticosteroids, there was a 3.5% incidence of congenital malformations

# *Corticosteroids*

- ▶ Long-term use of systemic corticosteroids also carries the risk of significant hyperglycemia and its associated risks
- ▶ There are reports of fetal distress from severely elevated glucose levels in previously undiagnosed or well-controlled gestational or type-I diabetics within 24 to 48 hours of the administration of high-dose oral or parenteral corticosteroids

# *Corticosteroids*

- ▶ Gestational or pre-existing diabetes mellitus may be exacerbated by the use of systemic corticosteroids, and glucose monitoring is required in that situation
- ▶ Considering the high risk of status asthmaticus, however, it is still generally accepted that the benefits of appropriate use of systemic corticosteroids for severe asthma far outweigh any presumed risks of direct adverse effects to mother or baby

# *IMMUNOTHERAPY*

- ▶ To reduce the risk of anaphylaxis, it is recommended that immunotherapy be initiated electively in anticipation of a planned pregnancy so that maintenance levels can be reached before conception
- ▶ Initiation of and increasing doses of immunotherapy and skin testing is generally avoided during pregnancy



# Older Adults: Special Considerations

- High prevalence of coexisting obstructive lung disease
  - Determine the extent of reversible airflow obstruction
  - Use 2- to 3-week trial of systemic corticosteroids
- Essential to review patient technique in using medications and devices

# Older Adults: Special Considerations (continued)

- Asthma medications may have increased adverse effects
  - **Bronchodilators**
    - Airway response to bronchodilators may change with age
    - Patients with pre-existing ischemic heart disease may experience tremor and tachycardia
    - Concomitant use of anticholinergics and beta<sub>2</sub>-agonists may be beneficial

# Older Adults: Special Considerations (continued)

## – Theophylline

- Theophylline clearance is reduced, causing increased blood levels
- Age is independent factor for developing life-threatening events from iatrogenic chronic theophylline overdose
- Potential for drug interactions (e.g., with epinephrine, antibiotics, H<sub>2</sub>-histamine antagonists)

# Older Adults:

## Special Considerations (continued)

- **Systemic corticosteroids** can provoke confusion, agitation, changes in glucose metabolism
- **Inhaled corticosteroids**
  - May be associated with dose-dependent reduction in bone mineral content
  - Treat concurrently with:
    - Calcium supplements and
    - Vitamin D and, when appropriate,
    - Estrogen replacement

# Older Adults: Special Considerations (continued)

- Medications for other diseases may exacerbate asthma
  - NSAIDs
  - Nonselective beta-blockers
  - Beta-blockers found in some eye drops

# Managing Exercise-Induced Bronchospasm (EIB)

- Anticipate EIB in all patients
- Teachers and coaches need to be notified
- Diagnosis
  - History of cough, shortness of breath, chest pain or tightness, wheezing, or endurance problems during exercise
  - Conduct exercise challenge **OR** have patient undertake task that provoked the symptoms
  - 15% decrease in PEF or FEV<sub>1</sub> is compatible with EIB

# Managing Exercise-Induced Bronchospasm (EIB) (continued)

- Management Strategies
  - Short-acting inhaled beta<sub>2</sub>-agonists used shortly before exercise last 2 to 3 hours
  - Salmeterol may prevent EIB for 10 to 12 hours
  - Cromolyn is also acceptable
  - A lengthy warm-up period before exercise may preclude medications for patients who can tolerate
  - Long-term-control therapy, if appropriate

# Managing Seasonal Asthma Symptoms

- Medical history is usually sufficient to determine sensitivity to seasonal allergens.
- Just before allergy season:
  - Start daily anti-inflammatory therapy
- During allergy season:
  - Continue anti-inflammatory therapy
  - Use stepwise approach to control symptoms



# Gastro-esophageal reflux

- ▶ Occurs frequently in adults and children
- ▶ Suspected to be a trigger for difficult asthma
- ▶ Abnormal reflux is defined as significant acid exposure ( $\text{pH} < 4.0$ ) to the distal esophagus for more than 1.2 hrs over a 24 hr period

# Gastro-esophageal reflux

- ▶ PPI inhibitors
- ▶ Prokinetic agents
- ▶ Antacids
- ▶ Postural, dietary advice
- ▶ Surgery

# Gastro-esophageal reflux

## Mechanisms

- ▶ Acid aspiration
- ▶ Direct acid stimulation of esophagus
- ▶ Stimulation of the vagus
- 💧 When present, should be treated
- 💧 Asthma control may be improved

# Summary

- ▶ Successful management of pregnant women with asthma can be a challenge for both physicians and patients
- ▶ The situation demands that informed consent for all management decisions be obtained and documented
- ▶ The preponderance of evidence indicates that, if the asthma is appropriately managed, the outcome will result in the birth of a healthy baby