Management of Asthma in Pregnancy

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Asthma is estimated to occur in about 4% of pregnancies, typically occurring as a preexisting comorbidity, although some cases of asthma may initially present during a pregnancy. The overall management goals of asthma in pregnancy are effective management of symptoms to avoid fetal hypoxia, while at the same time minimizing any drug related risks to the fetus. Both pregnancy and asthma have impact over each other leading to certain changes and affecting the perspective of each other.

Effect of Pregnancy on Asthma

Maternal hyperventilation occurs from increasing concentration of progesterone without a corresponding change in respiratory rate. Various changes in respiratory parameters which occur during pregnancy have been shown in table 1. Pregnancy has variable effects on asthma. About 28% of pregnant asthmatics improve, 33% remain unchanged and 35% deteriorate usually between 24 and 36 weeks of gestation. Asthma symptoms improve during the last four weeks (37 to 40 weeks).

During labour and delivery, only 10% of asthmatics report symptoms and only half of those require treatment. During post partum period, the severity of asthma reverts to its pre-pregnancy level in 75% asthmatics. In subsequent pregnancies, the severity of asthma tends to be the same as in previous pregnancy. Severe asthmatics are most likely to experience a worsening of symptoms during pregnancy, while mild asthmatics are likely to improve. However, absence of expected decrease in IgE concentration during pregnancy is one of the predictor that asthma may worsen during pregnancy.

Factors that may improve Asthma during Pregnancy

Following features may improve asthma during pregnancy:

1. Factors that may improve Asthma during Pregnancy:

2. Factors that may improve Asthma during Pregnancy:

3. Factors that may improve Asthma during Pregnancy:

4. Factors that may improve Asthma during Pregnancy:

5. Factors that may improve Asthma during Pregnancy:
**Table 1. Physiological Changes Applicable to Asthma during Pregnancy**

<table>
<thead>
<tr>
<th>Physiological Parameter</th>
<th>Normal value</th>
<th>Changes during pregnancy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tidal Volume</td>
<td>0.5 L</td>
<td>0.55 L at 8-11 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.60 L by 36-39 weeks</td>
</tr>
<tr>
<td>Minute Ventilation</td>
<td>6 L/minute</td>
<td>7.7 L at 8-11 weeks</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9.2 L by 36-39 weeks</td>
</tr>
<tr>
<td>O₂ Consumption</td>
<td>Increases about 20%</td>
<td></td>
</tr>
<tr>
<td>CO₂ Production</td>
<td>Increases by 34% at last trimester</td>
<td></td>
</tr>
<tr>
<td>Total Lung Capacity</td>
<td>4.2 L</td>
<td>Decreases by 4-6%</td>
</tr>
<tr>
<td>Residual Lung Volume</td>
<td>1.1 L</td>
<td>Declines</td>
</tr>
<tr>
<td>Functional Residual Capacity</td>
<td>1.2 L</td>
<td>Declines</td>
</tr>
<tr>
<td>ABG Value</td>
<td>pH 7.38-7.42</td>
<td>pH 7.42-7.47</td>
</tr>
<tr>
<td></td>
<td>PaO₂ - 95±5 mm Hg.</td>
<td>PaO₂ - 90 mm Hg.</td>
</tr>
<tr>
<td></td>
<td>- PaO₂ - 38-2 mmHg.</td>
<td>PaO₂ - 25-32 mm Hg.</td>
</tr>
</tbody>
</table>

- Progesterone mediated bronchodilation.
- Estrogen or progesterone mediated potentiation of beta-adrenergic bronchodilation.
- Decreased plasma histamine-mediated bronchoconstriction.
- Pulmonary effect of increased serum free cortisol.
- Glucocorticosteroid-mediated increased beta-adrenergic responsiveness.
- Prostaglandin E mediated bronchodilation.
- Atrial natriuretic factor-induced bronchodilation.
- Increased half life or decreased protein binding of endogenous or exogenous bronchodilator.
- Decreased functional residual capacity of lung.
- Increased plasma basic protein reacting the lung
- Increased viral or bacterial respiratory infection - triggered asthma
- Increased gastroesophageal reflux - induced asthma
- Increased Stress
- Reduced PaCO₂

Most of the effects are related to changing hormonal level in pregnant woman. The interaction of these mechanisms is undoubtedly complex. For example, the levels of free cortisol may improve asthma symptoms while this effect may be counterbalanced by the pregnancy related increase in serum progesterone, aldosterone and deoxycorticosterone. Asthmatics with improved symptoms during pregnancy, the balance between these hormones may be tipped toward free cortisol, while the opposite occurs in those whose symptoms worsen. Improvement in symptoms during the last four weeks of pregnancy and the lack of symptoms during labour coincides with the highest level of free cortisol.
Effect of Asthma on Pregnancy Outcome

In most women asthma has no effect on the outcome of pregnancy. However uncontrolled asthma may lead to increase in pre-term birth, low birth weight, neonatal seizure, transient tachypnoea of newborn, neonatal hypoglycemia. Uncontrolled asthma can also lead to higher rates of pregnancy induced hypertension or preeclampsia and Caesarean section, hyperglycemia, vaginal haemorrhage, premature rupture of membrane.

Monitoring of Asthmatic women during pregnancy

Classification of asthma has been described in GINA Guidelines. Pregnant women should be monitored in following ways:

- Office spirometry at each visit preferably at every 4-6 weeks.
- Peak expiratory flow rate be measured with peak flow metres daily especially for those who are on medication for asthma
- Peak flow rate should be taken on admission to labour delivery unit and then every 12 hours.
- If asthma symptoms develop, peak flow rates should be measured after treatments to see adequacy of response.
- I.V. fluids may be necessary to ensure the mother's proper hydration.
- Adequate analgesia will limit the risk of bronchospasm.

Indicator of Good Control of Asthma

- Active without experiencing any asthma symptoms.
- Sleeping through the night, and not waking due to asthma symptoms.
- Attaining her personal best peak flow reading.

Monitoring Fetus

Ultrasound: To detect early indication of fetal distress.

Asthma Management During Pregnancy

Avoidance of asthma triggers: Various risk factors which may precipitate asthma should be avoided as under.

1. Avoidance of pollens, molds, pet dander, house dust mites and cockroaches.
2. Avoidance of substances like paints, chemical fumes, strong odours and environmental pollution.
3. Remove allergy causing pets or animals at home or work place.
4. Avoid Acetyl Salicylic Acid (ASA) products and P-blockers.
5. Cessation of smoking - A pregnant women who smokes runs a higher risk of a severe asthma episode. This could also seriously reduce the oxygen supply to the fetus, especially if the blood of the fetus already contains a large amount of carbon monoxide from cigarette smoke.
6. Avoidance of routine skin testing to identify allergens due to potential risk of systemic reaction.
7. Immunotherapy may be safely continued, if already receiving injections, but initiation of immunotherapy is not recommended.

Principles of Drug Therapy: Inhaled therapy is better than oral therapy because oral therapy may produce systemic side effects during long term therapy.
4. If oral steroids are required for asthma control, prednisolone and methyl prednisolone are the preferred preparations since they cross the placenta poorly. Try to minimise the dosage and duration of oral corticosteroid and alternate day dosing be preferred over daily dosing.

According to Global Initiative for Asthma\textsuperscript{10}, classification of asthma severity should be undertaken and stepwise asthma management.

Management During Labour\textsuperscript{14}: Acute attacks of asthma are very rare in labour due to endogenous steroid production. In women receiving oral steroid, there is a theoretical risk of maternal hypothalamic-pituitary-adrenal axis suppression. Women with asthma may safely use all forms of pain relief in labour but should be asked about any known sensitivity to aspirin or NSAIDS before using these drugs for pain relief\textsuperscript{12,14}. Following precautions/steps should be undertaken during labour.

1. Advise women that acute asthma is rare in labour.
2. Advise women to continue their usual asthma medications in labour.
3. In the absence of acute severe asthma, reserve * Caesarean section for the usual obstetric indications.
4. If anaesthesia is required, regional (epidural) blockade is preferred to general anaesthesia in women with asthma.
5. PGE\textsubscript{2} is safe for induction of labour as it has got some bronchodilator effect.
6. Use prostaglandin F2\textsubscript{0}c with extreme caution in women with asthma because of the risk of inducing bronchoconstriction.
7. MgSO\textsubscript{4} is drug of Choice for treating preterm labour.
8. Women receiving oral steroid (prednisolone) at a dose exceeding 7.5 mg per day for more than two weeks prior to delivery should receive parenteral hydrocortisone 100 mg 6-8 hourly during labour.
9. Oxytocin is safe for labour induction.
10. Elective Caesarian section is more coi with severe asthma and should be dont close cooperation of respiratory phys obstetrician and anesthetist.

REFERENCES

7. Doucette JT, Bracken MB. Possible role of asthma in risk of preterm labour and delivery. Epidemiology 1993 143-150.