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Respiratory Disease in Pregnancy

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Abstract:

Pregnancy is associated with many anatomical and physiologic changes that affect the presentation and management of various illnesses. This article deals with several respiratory issues that one may encounter in the gravid patient, including asthma, pneumonia, tuberculosis and acute respiratory distress in pregnancy. Approach to dyspnoea in pregnancy and smoking cessation is also discussed.

pregnancy [2]. A compensatory metabolic acidosis results from this state of respiratory alkalosis, with bicarbonate levels in the range of 18 to 21 mmol/L. Lower bicarbonate levels shift the haemoglobin oxygen dissociation curve to the right, so that the affinity of maternal haemoglobin to oxygen is reduced, thereby facilitating transfer of oxygen to the foetus. On the other hand, this reduction in bicarbonate results in a lower buffering capacity, which makes the pregnant woman particularly susceptible to acidosis [3]. Knowledge of physiologic changes of pregnancy is critical in managing various respiratory issues, including ventilator settings, deciding when to intubate the pregnant woman and assessing improvement.

Keywords: Respiratory disease; pregnancy; dyspnoea

Introduction

The following manuscript is a commentary on a recent publication on "Respiratory disease in pregnancy" by our group [1]. Various pulmonary illnesses may be encountered in pregnancy and may have an effect on pregnancy outcomes. An understanding of how pregnancy affects the disease presentation and vice versa, will help the clinician provide better care for the gravid patient. The recently published article about respiratory disease in pregnancy [1] aims to highlight this aspect of some important pulmonary conditions. Pulmonary embolism, an important consideration in pregnancy, due to hypercoagulability from mechanical and hormonal factors, is not included in this article, due to its greater relevance with haematology. It must, however, remain an important differential for shortness of breath in pregnancy.

Physiologic changes in the respiratory system with pregnancy

Pregnancy is associated with an increase in minute ventilation which occurs as a result of increase in tidal volume, at the expense of functional residual capacity (FRC). [FRC = Residual volume (RV) + expiratory reserve volume (ERV)]. Respiratory rate is unchanged. This increase in minute ventilation results in a higher PaO₂ in the maternal circulation (104-108 mmHg or 13.8-14.3 kPa) and a lower PaCO₂ from 35-40 mmHg (4.6-5.3 kPa) in the non-pregnant state to 27-32 mmHg (3.6-4.2 kPa) in

Approach to dyspnoea in pregnancy

Shortness of breath is a common complaint in pregnancy. While mechanical factors such as increased abdominal girth and weight gain are pertinent in late gestation, hormonal factors, such as progesterone induced stimulation of the respiratory centre in the brain, are felt to be responsible for the sense of "air hunger" described often by pregnant women in early gestation. Differentiating between physiologic and pathologic dyspnoea of pregnancy can be diagnostically challenging. Table 1, adapted from the original article [1], outlines important causes of dyspnoea, their clinical characteristic and interventions necessary to diagnose and manage the condition.

Asthma in pregnancy

The course of asthma in pregnancy is unpredictable, with improvement noted in a third of all patients, worsening in another third and no change in the rest. Acid reflux, commonly seen in pregnancy and post nasal drip associated with pregnancy rhinitis may contribute to worsening asthma symptoms in pregnancy. On the other hand, increase in serum cortisol and progesterone-induced smooth muscle relaxation has been postulated as mechanisms for possible improvement of asthma in pregnancy [4]. The management of asthma in pregnancy differs little from the non-pregnant state. Inhaled beta agonists and inhaled steroids form the crux of therapy and a step-wise increase in therapy based on disease severity is recommended, as outlined in Table 2.

Pneumonia and tuberculosis

While the etiologic agents and management of pneumonia do not differ for the gravid patient, there are certain factors in pregnancy that contribute to increased risk of complications. These include altered T lymphocyte immunity, maternal physiologic changes such as increased oxygen consumption, hypo albuminemia and decreased oncotic pressure, elevation of the diaphragm, and a propensity for aspiration related to relaxation of sphincter tone [5]. Common etiologic agents include bacteria (streptococcus pneumonia, hemophilus influenza, atypical organisms such as mycoplasma pneumonia, chlamydomphila pneumonia) and viruses (influenza, varicella). Treatment is with a combination of cephalosporin and a macrolide such as azithromycin for atypical bacterial pathogens. Both of these classes of antibiotics can be used safely in pregnancy. Fluoroquinolones, which are often used for community acquired pneumonia in the outpatient setting, are generally not used in pregnancy secondary to concerns about arthropathy in immature animals and concern for potential fetal toxicity. Oseltamivir is the drug of choice for treatment of influenza in pregnancy because of its systemic absorption and the greater clinical experience with gestational use of this drug, whereas varicella pneumonia is treated with intravenous acyclovir.

TB is one of the leading causes of mortality in reproductive age women. With adequate treatment, pregnant women with TB have similar outcomes to non-pregnant women. However, the diagnosis may be delayed in pregnancy; often due to the nonspecific symptoms and misguided hesitancy to perform a chest radiograph in the pregnant patient. Screening for high risk patients at onset of prenatal care is recommended. Risk factors that should prompt screening for tuberculosis include HIV infection, close contact with a person known or suspected to have active tuberculosis, medical comorbidities or immunosuppression, medically underserved status, low income, alcohol or drug addiction residency in a long-term care facility (e.g. correctional institutions, mental health institutions), homelessness, health professionals working in a high-risk health care facility, and birth in or emigration from a country with high tuberculosis prevalence [6].

Tuberculin skin testing is safe and should be used in pregnancy when indicated. For those women diagnosed with latent TB in pregnancy, current guidelines recommend treating

those with the highest risk of reactivation such as those with HIV infection, recent conversion (within the last two years), or a contact to a known case [7]. The preferred initial treatment regimen for TB in pregnancy is Isoniazid (INH), rifampin (RIF), and ethambutol (EMB) daily for 2 months, followed by INH and RIF daily, or twice weekly for 7 months (for a total of 9 months of treatment). Latent TB is treated with INH daily or twice weekly for 9 months, with pyridoxine (vitamin B6) supplementation. Pyrazinamide, streptomycin and fluoroquinolones are not recommended for use in pregnancy [8].

Acute respiratory distress in pregnancy (ARDS)

Most cases of ARDS result from sepsis, major trauma, massive transfusion or aspiration. In pregnancy, other unique causes may apply, such as preeclampsia, acute fatty liver of pregnancy, obstetric haemorrhage or tocolytic-induced pulmonary edema [9]. The overall approach to the treatment of ARDS in pregnancy closely follows that for the general population and includes supportive care while identifying and treating the underlying cause. Pregnancy associated physiologic changes and need for attention to foetal well-being cause important changes in management of ARDS in pregnant versus non-pregnant patients. For example, maternal oxygenation threshold is higher in pregnancy (with an aim to keep saturation >95%) while permissive hypercapnia in pregnancy is controversial and often avoided due to risk of foetal acidosis.

Smoking cessation in pregnancy

Cigarette smoking is one of the most important modifiable causes of poor obstetrical outcomes. Despite being highly motivated, not all pregnant women are able to achieve complete cessation of smoking during pregnancy. Cognitive behavioural therapy which encompasses the use of counselling, incentives and positive reinforcement, along with nicotine replacement therapy are effective strategies in pregnant patients. Nicotine replacement therapy may be considered preferable to continued smoking due to the exposure to other toxins in cigarette smoke. Alternative smoking cessation agents, varenicline and bupropion, that have been used with success in the non-pregnant population, are typically avoided in pregnancy due to lack of safety and efficacy data.

Table 1: Important causes of dyspnoea in pregnancy

	Cause of dyspnoea	Clinical characteristics	Helpful Investigations	Interventions
1.	Dyspnoea of pregnancy	Need to take a deep breath intermittently, or inability to get a deep enough breath	None	Reassurance
2.	Asthma/airways disease	Dyspnoea with chest tightness or wheezing	Spirometry, pre and post bronchodilator	Inhaled beta agonists +/- inhaled steroids
3.	Cardiac disease	Myocardial/valvular dysfunction: Progressive Orthopnea or Orthopnea with paroxysmal nocturnal dyspnea. Often present at end of second trimester or in early postpartum period when fluid shifts occur	Echocardiogram	Diuretics, beta blockers as indicated. ACE inhibitors contraindicated in pregnancy

4.	Arrhythmia	Sudden onset and cessation, associated sensation of palpitations or chest discomfort	Electrocardiogram, holter or event monitor	Beta blockers, calcium channel blockers
5.	Venous thromboembolism	Sudden onset, any trimester. May have associated DVT features	Computerized tomography pulmonary angiogram, V/Q scan, lower extremity dopplers	Anticoagulation with injectable heparins in pregnancy, warfarin in the postpartum period.

Table 2: Asthma management in pregnancy: stepwise approach for preferred treatments adapted from [10].

Step 1 (When symptoms are mild and intermittent)	No daily medication needed. Short-acting inhaled beta2-agonists (albuterol: @Ventolin, @Proair) as needed for symptoms
Step 2 (When symptoms are mild but persistent)	Low dose inhaled corticosteroids
Step 3 (When symptoms are moderate, persistent and occur daily)	Low dose inhaled corticosteroids plus long-acting beta2-agonist OR medium dose inhaled corticosteroids
Step 4 (for severe persistent, continual symptoms, or with frequent nocturnal symptoms)	High dose inhaled corticosteroids plus long-acting inhaled beta2-agonist and if needed, systemic steroids

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