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# Respiratory disease in pregnancy

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Many physiological and anatomical changes of pregnancy affect the respiratory system. These changes often affect the presentation and management of the various respiratory illnesses in pregnancy. This article focuses on several important respiratory issues in pregnancy. The management of asthma, one of the most common chronic illnesses in pregnancy, remains largely unchanged compared to the nonpregnant state. Infectious respiratory illness, including pneumonia and tuberculosis, are similarly managed in pregnancy with antibiotics, although special attention may be needed for antibiotic choices with more pregnancy safety data. When mechanical ventilation is necessary, consideration should be given to the maternal hemodynamics of pregnancy and fetal oxygenation. Maintaining maternal oxygen saturation above 95% is recommended to sustain optimal fetal oxygenation. Cigarette smoking has known risks in pregnancy, and current practice guidelines recommend offering cognitive and pharmacologic interventions to pregnant women to assist in smoking cessation.

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## Physiologic changes in the respiratory system with pregnancy

Pregnancy is associated with profound anatomical, physiological, and biochemical changes, which affect the different organ systems variably. Changes begin soon after fertilization and continue throughout gestation. Many of these adaptations occur in response to hormonal or mechanical stimuli, and they can either be misinterpreted as disease or mask a compromised status. For example, progesterone-mediated vasodilation can lead to increased mucosal vascularity and edema, presenting as rhinitis and causing an increased prevalence of epistaxis in pregnancy. On the other hand, because pregnancy is typically associated with lower levels of carbon dioxide ($PaCO_2$) than the normal nonpregnant state, a finding of "normal" $PaCO_2$ level in arterial blood gases may indicate impending respiratory failure, and this should prompt the clinician to consider intubation.

Mechanical changes to the respiratory system during pregnancy result from several adaptations the body undergoes to accommodate the growing uterus in the abdomen. Understandably, the diaphragm is elevated by about 4–5 cm past its original position [1]. The clinical implication of this change is that a higher approach might be necessary while performing a thoracentesis on a pregnant woman. There is also an increase in the chest wall circumference and the anteroposterior diameter, resulting from hormone-induced relaxation of ligaments connecting the ribs to the sternum leading to an outward flare of the lower ribs. There is anecdotal experience to suggest that this leads to a mechanical stress on the lower ribs predisposing pregnant women to stress fractures from even minor trauma such as coughing [2,3].

Pregnancy has a major effect on lung volumes. It is associated with a 30–50% increase in tidal volume (TV), which occurs at the expense of the functional residual capacity (FRC) (FRC = residual volume (RV) + expiratory reserve volume (ERV)) [4]. While the respiratory rate is not increased, minute ventilation (product of respiratory rate and TV) is increased, leading to a higher $PaO_2$ in the maternal circulation (104–108 mmHg or 13.8–14.3 kPa) and a reduction in $PaCO_2$ from 35-–40 mmHg (4.6–5.3 kPa) in the nonpregnant state to 27–32 mmHg (3.6–4.2 kPa) in pregnancy [1]. Despite the changes in TV and FRC, spirometry remains unchanged in pregnancy. Therefore, abnormal spirometry results should be attributed to underlying respiratory illness and not to pregnancy itself [5].

The lower $PaCO_2$ in the maternal circulation results in a state of chronic respiratory alkalosis (pH 7.4–7.45), which is compensated for by an increase in renal excretion of bicarbonate, leading to a reduced serum bicarbonate level of 18–21 mmol/L [4]. This has both advantages and disadvantages for the expectant mother. On the one hand, lower bicarbonate levels shift the hemoglobin oxygen dissociation curve to the right, so that the affinity of maternal hemoglobin to oxygen is reduced, thereby facilitating the transfer of oxygen to the fetus. On the other hand, this reduction in bicarbonate results in a lower buffering capacity, which makes the pregnant woman particularly susceptible to acidosis [4].

## Approach to dyspnea in pregnancy

Shortness of breath is a common complaint in pregnancy, with over two-thirds of pregnant women experiencing some form of it during the gestation period. An increasing abdominal girth or weight gain alone are not enough to explain the symptoms as many women experience it in early gestation before such changes have occurred.

Dyspnea of pregnancy refers to a commonly encountered condition in pregnancy in which women describe a sense of "air hunger" or a "need to take a deep breath intermittently." All too often, the patient will report that the shortness of breath was first noticed while conversing, because she cannot complete her sentence without pausing for a breath. Progesterone-induced stimulation of the respiratory center in the brain, necessary for the increase in TV with pregnancy, is thought to be the possible mechanism of this. By the third trimester, the majority of women will report some decrease in exercise tolerance most likely resulting from mechanical changes associated with weight gain and decreased venous return.

When a pregnant woman complains of dyspnea, distinguishing between underlying disease and normal pregnancy-related dyspnea can be a difficult diagnostic problem. While the differential diagnosis of dyspnea in general includes a myriad of conditions, the list of conditions of particular importance in pregnancy is relatively small. Table 1 describes these causes, clinical features characteristic for the condition, and a brief summary of possible investigations and interventions.

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