MATERNAL CRITICAL CARE

Key notes on: Physiological changes in pregnancy

- All body systems are affected by pregnancy
- Physiological changes begin once conception occurs
- There is variation in what 'normal' changes occur in pregnant women – a lot of the studies done on physiology in pregnancy are old and had small numbers of participants – we are still learning....
- Women with multiple gestations experience further adaptations compared with singleton pregnancy (particularly to cardiovascular system)
- Labour and the early postpartum period are also associated with physiological adaptation e.g. further increases in cardiac output
- Cardiac and respiratory systems are dramatically affected
  - Cardiac output increases 30-50% - small ↑ in HR, larger ↑ in stroke volume
  - Increase in circulating volume by 40-50%
  - Minute volume increases 40-50% with resultant reduction in $PaCO_2$ 28-32mmHg
  - ~ 75% of pregnant women experience 'breathlessness' during pregnancy
- Carbohydrate metabolism alters with increasing insulin resistance as the pregnancy progresses
- Increase in some clotting factors – doubling of fibrinogen by term
- Physiology changes may affect medication levels and efficacy for example:
  - ↓ serum albumin = ? altered protein binding capacity
  - Increased glomerular filtration rate (potential for increased excretion)
  - Changes to maternal drug metabolising enzymes (difficult to predict metabolism pattern of regular drugs)
- Many laboratory tests have different 'normal' values in pregnancy – which may vary according to gestation e.g. serum urea and creatinine levels.

Key resources/recommended reading

Pollock W, Kingwell E. Chapter 28 'Pregnant and postpartum considerations' *in* Aitken L, Marshall A, Chaboyer W [eds]. ACCCN's Critical Care Nursing 3rd ed. Sydney, Elsevier. 2015.

Carlin A, Alfirevic Z. Physiological changes of pregnancy and monitoring. *Best Practice & Research Clinical Obstetrics & Gynaecology.* 2008;22(5):801-23.

Klajnbard A, Szecsi PB, Colov NP, Andersen MR, Jorgensen M, Bjorngaard B, et al. Laboratory reference intervals during pregnancy, delivery and the early postpartum period. *Clinical Chemistry and Laboratory Medicine.* 2010;48:237-48.

Abbassi-Ghanavati M, Greer LG, Cunningham FG. Pregnancy and Laboratory Studies: A Reference Table for Clinicians. *Obstetrics & Gynecology*. 2009;114:1326-31 10.097/AOG.0b013e3181c2bde8.

Szecsi PB, Jorgensen M, Klajnbard A, Andersen MR, Colov NP, Stender S. Haemostatic reference intervals in pregnancy. *Thrombosis and Haemostasis.* 2010;103:718-27.

Nevo O, Soustiel JF, Thaler I. Maternal cerebral blood flow during normal pregnancy: a cross-sectional study. *American Journal of Obstetrics and Gynecology.* 2010;203(5):475.e1-.e6.

Cheung KL, Lafayette RA. Renal Physiology of Pregnancy. *Advances in Chronic Kidney Disease.* 2013;20(3):209-14.

Sanghavi M, Rutherford JD. Cardiovascular Physiology of Pregnancy. *Circulation.* 2014;130(12):1003-8.

American Diabetes Association. Management of Diabetes in Pregnancy. *Diabetes Care.* 2015;38(Supplement 1):S77-S79.

Bedson R, Riccoboni A. Physiology of pregnancy: clinical anaesthetic implications. *Continuing Education in Anaesthesia, Critical Care & Pain.* 2013.

Feghali M, Venkataramanan R, Caritis S. Pharmacokinetics of drugs in pregnancy. *Seminars in Perinatology*. 2015;39(7):512-9.

Tan EK, Tan EL. Alterations in physiology and anatomy during pregnancy. *Best Practice & Research Clinical Obstetrics & Gynaecology*. 2013;27(6):791-802.

Costantine MM. Physiologic and pharmacokinetic changes in pregnancy. *Frontiers in pharmacology*. 2014;5.

LoMauro A, Aliverti A. Respiratory physiology of pregnancy. *Physiology masterclass*. 2015;11(4):297-301.

Mor G. The unique immunologic and microbial aspects of pregnancy. *Placenta.* 2017;57:226.

Meah VL, Cockcroft JR, Backx K, Shave R, Stöhr EJ. Cardiac output and related haemodynamics during pregnancy: a series of meta-analyses. *Heart*. 2016;102(7):518-26.

Medici M, Korevaar TIM, Visser WE, Visser TJ, Peeters RP. Thyroid Function in Pregnancy: What Is Normal? *Clinical Chemistry*. 2015;61(5):704-13.

Guntupalli KK, Hall N, Karnad DR, Bandi V, Belfort M. Critical Illness in Pregnancy: Part I: An Approach to a Pregnant Patient in the ICU and Common Obstetric Disorders. *Chest.* 2015;148(4):1093-104.

Bolded = highly recommended