

## Bölüm 4

# GEBELİKTE MEYDANA GELEN FİZYOLOJİK DEĞİŞİKLİKLER VE OBSTETRİK ANESTEZİ YÖNETİMİ

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### GİRİŞ

Gebelik sürecinde gelişmekte olan fetüsün beslenmesi ve gelişimini sürdürebilmesi için anne vücudunda önemli anatomik ve fizyolojik değişiklikler meydana gelir. Bu değişiklikler birçok organ sistemini etkiler. Çoğunlukla genç ve sağlıklı bireylerin oluşturduğu gebelik olgularının hamilelik süresinde göstermiş olduğu fizyolojik değişikliklerin iyi bilinmesi ve patolojik değişikliklerin ortaya konması için ayrıntılı anestezi değerlendirmesi yapılmalıdır. Gebelik, başta solunum sistemi olmak üzere, kardiyovasküler sistem, sindirim sistemi, üriner sistem ve hematolojik sistem olmak üzere birçok sistemi (endokrin, metabolik, immün sistem...) etkiler.

Bu bölümde gebelik süresince oluşan fizyolojik değişiklikleri ve obstetrik hastalara anestezi yaklaşımı ele alacağız.

### SOLUNUM SİSTEMİ DEĞİŞİKLİKLERİ

Gebelikte birlikte oksijen ihtiyacında önemli bir artış meydana gelir. Çünkü, metabolizma hızında yaklaşık %15 ve oksijen tüketiminde %20 oranında bir artış olur. Dakika ventilasyonda %40-50'lik bir artış vardır. Gebedeki hiperventilasyona bağlı olarak arteriyel pO<sub>2</sub>'de artış ve arteriyel PCO<sub>2</sub>'de düşüş olur. Serum bikarbonat düzeyi ise, 18-22 mmol/l civarında, yani hafif kompanse solunumsal alkaloz durumu vardır. (1-3) İnspiratuar yedek hacim, gebeliğin erken döneminde tidal volümün artmasına bağlı olarak azalırken, 3.trimesterde Fonksiyonel Rezidüel Kapasite (FRK)' nin azalmasına bağlı olarak artar. Diafragmatik yükselme ve göğüs anteroposterior çapında artışa bağlı olarak FRK azalır. Nefes darlığı, hamileliğin herhangi bir döneminde başlayabilen, konuşurken veya efor

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## **KAYNAKÇA**

1. Izakson, Alexander, Yitzhak Cohen, and Ruth Landau. "Physiologic Changes in the Airway and the Respiratory System Affecting Management in Pregnancy." *Principles and Practice of Maternal Critical Care*. Springer, Cham, 2020. 271-283.
2. Rosen, Mark A., and Richard B. Weiskopf. "Management of anesthesia for the pregnant surgical patient." *The Journal of the American Society of Anesthesiologists* 91.4 (1999): 1159-1159.
3. LoMauro, A., Aliverti, A., Alberigo, D., Persico, N., Frykholm, P., Briganti, F., ... & Righi, I. "The effect of pregnancy on respiratory function." *Eur Respir J*. 2018 52: OA2149; DOI: 10.1183/13993003.congress-2018.
4. Elkus R, Popovich J Jr. Respiratory physiology in pregnancy. *Clin Chest Med*. 1992;13(4):555-565.
5. Hegewald MJ, Crapo RO. Respiratory physiology in pregnancy. *Clin Chest Med*. 2011;32(1):1-13. doi:10.1016/j.ccm.2010.11.001
6. Bobrowski RA. Pulmonary physiology in pregnancy. *Clin Obstet Gynecol*. 2010;53(2):285-300. doi:10.1097/GRE.0b013e3181e04776
7. Lumbers ER, Pringle KG. Roles of the circulating renin-angiotensin-aldosterone system in human pregnancy. *Am J Physiol Regul Integr Comp Physiol*. 2014;306(2):R91-R101. doi:10.1152/ajpregu.00034.2013
8. Elsheikh A, Creatas G, Mastorakos G, Milingos S, Loutradis D, Michalas S. The renin-aldosterone system during normal and hypertensive pregnancy. *Arch Gynecol Obstet*. 2001;264(4):182-185. doi:10.1007/s004040000104
9. Troiano NH. Physiologic and Hemodynamic Changes During Pregnancy. *AACN Adv Crit Care*. 2018;29(3):273-283. doi:10.4037/aacnacc2018911
10. Althaus J, Wax J. Analgesia and anesthesia in labor. *Obstet Gynecol Clin North Am*. 2005;32(2):231-244. doi:10.1016/j.ogc.2005.01.002
11. Lai C, Coulter SA, Woodruff A. Hypertension and Pregnancy. *Tex Heart Inst J*. 2017;44(5):350-351. Published 2017 Oct 1. doi:10.14503/THIJ-17-6359
12. Ngene NC, Moodley J. Physiology of blood pressure relevant to managing hypertension in pregnancy. *J Matern Fetal Neonatal Med*. 2019;32(8):1368-1377. doi:10.1080/14767058.2017.1404569
13. Ouzounian JG, Elkayam U. Physiologic changes during normal pregnancy and delivery. *Cardiol Clin*. 2012;30(3):317-329. doi:10.1016/j.ccl.2012.05.004
14. Body C, Christie JA. Gastrointestinal Diseases in Pregnancy: Nausea, Vomiting, Hyperemesis Gravidarum, Gastroesophageal Reflux Disease, Constipation, and Diarrhea. *Gastroenterol Clin North Am*. 2016;45(2):267-283. doi:10.1016/j.gtc.2016.02.005
15. Chatila AT, Nguyen MTT, Krill T, Roark R, Bilal M, Reep G. Natural history, pathophysiology and evaluation of gastroesophageal reflux disease. *Dis Mon*. 2020;66(1):100848. doi:10.1016/j.disamonth.2019.02.001
16. Matos JF, Americo MF, Sinzato YK, et al. Role of sex hormones in gastrointestinal motility in pregnant and non-pregnant rats. *World J Gastroenterol*. 2016;22(25):5761-5768. doi:10.3748/wjg.v22.i25.5761
17. Belzile M, Pouliot A, Cumyn A, Côté AM. Renal physiology and fluid and electrolyte disorders in pregnancy. *Best Pract Res Clin Obstet Gynaecol*. 2019;57:1-14. doi:10.1016/j.bpobgyn.2018.11.008
18. Soma-Pillay P, Nelson-Piercy C, Tolppanen H, Mebazaa A. Physiological changes in pregnancy. *Cardiovasc J Afr*. 2016;27(2):89-94. doi:10.5830/CVJA-2016-021
19. Cheung KL, Lafayette RA. Renal physiology of pregnancy. *Adv Chronic Kidney Dis*. 2013;20(3):209-214. doi:10.1053/j.ackd.2013.01.012
20. Odutayo A, Hladunewich M. Obstetric nephrology: renal hemodynamic and metabolic physiology in normal pregnancy. *Clin J Am Soc Nephrol*. 2012;7(12):2073-2080. doi:10.2215/CJN.00470112

21. Jeyabalan A, Lain KY. Anatomic and functional changes of the upper urinary tract during pregnancy. *Urol Clin North Am.* 2007;34(1):1-6. doi:10.1016/j.ucl.2006.10.008
22. Shreeve NE, Barry JA, Deutsch LR, Gomez K, Kadir RA. Changes in thromboelastography parameters in pregnancy, labor, and the immediate postpartum period. *Int J Gynaecol Obstet.* 2016;134(3):290-293. doi:10.1016/j.ijgo.2016.03.010
23. Paliogiannis P, Zinellu A, Mangoni AA, et al. Red blood cell distribution width in pregnancy: a systematic review. *Biochem Med (Zagreb).* 2018;28(3):030502. doi:10.11613/BM.2018.030502
24. Guo Y, Zhang N, Zhang D, et al. Iron homeostasis in pregnancy and spontaneous abortion. *Am J Hematol.* 2019;94(2):184-188. doi:10.1002/ajh.25341
25. Katz D, Beilin Y. Disorders of coagulation in pregnancy. *Br J Anaesth.* 2015;115 Suppl 2:ii75-ii88. doi:10.1093/bja/aev374
26. Sharp HT. The acute abdomen during pregnancy. *Clin Obstet Gynecol.* 2002;45(2):405-413. doi:10.1097/00003081-200206000-00011
27. Chandra S, Tripathi AK, Mishra S, Amzarul M, Vaish AK. Physiological changes in hematological parameters during pregnancy. *Indian J Hematol Blood Transfus.* 2012;28(3):144-146. doi:10.1007/s12288-012-0175-6
28. Noyola-Martínez N, Halhali A, Barrera D. Steroid hormones and pregnancy. *Gynecol Endocrinol.* 2019;35(5):376-384. doi:10.1080/09513590.2018.1564742
29. Springer D, Jiskra J, Limanova Z, Zima T, Potlukova E. Thyroid in pregnancy: From physiology to screening. *Crit Rev Clin Lab Sci.* 2017;54(2):102-116. doi:10.1080/10408363.2016.1269309
30. Vannuccini S, Bocchi C, Severi FM, Challis JR, Petraglia F. Endocrinology of human parturition. *Ann Endocrinol (Paris).* 2016;77(2):105-113. doi:10.1016/j.ando.2016.04.025
31. Carlin A, Alfircvic Z. Physiological changes of pregnancy and monitoring. *Best Pract Res Clin Obstet Gynaecol.* 2008;22(5):801-823. doi:10.1016/j.bpobgyn.2008.06.005
32. Meo SA, Hassain A. Metabolic Physiology in Pregnancy. *J Pak Med Assoc.* 2016;66(9 Suppl 1):S8-S10.
33. Blumer I, Hadar E, Hadden DR, et al. Diabetes and pregnancy: an endocrine society clinical practice guideline. *J Clin Endocrinol Metab.* 2013;98(11):4227-4249. doi:10.1210/jc.2013-2465
34. Kalra S, Jawad F. Insulin therapy in pregnancy. *J Pak Med Assoc.* 2016;66(9 Suppl 1):S48-S51.
35. Ryckman KK, Spracklen CN, Smith CJ, Robinson JG, Saftlas AF. Maternal lipid levels during pregnancy and gestational diabetes: a systematic review and meta-analysis. *BJOG.* 2015;122(5):643-651. doi:10.1111/1471-0528.13261
36. Thiele K, Diao L, Arck PC. Immunometabolism, pregnancy, and nutrition. *Semin Immunopathol.* 2018;40(2):157-174. doi:10.1007/s00281-017-0660-y
37. Devroe S, Van de Velde M, Rex S. General anesthesia for caesarean section. *Curr Opin Anaesthesiol.* 2015;28(3):240-246. doi:10.1097/ACO.000000000000185
38. Cobb BT, Lane-Fall MB, Month RC, Onuoha OC, Srinivas SK, Neuman MD. Anesthesiologist Specialization and Use of General Anesthesia for Cesarean Delivery. *Anesthesiology.* 2019;130(2):237-246. doi:10.1097/ALN.0000000000002534
39. Maronge L, Bogod D. Complications in obstetric anaesthesia. *Anaesthesia.* 2018;73 Suppl 1:61-66. doi:10.1111/anae.14141
40. Macarthur A. Management of controversies in obstetric anaesthesia. *Can J Anaesth.* 1999;46(5 Pt 2):R111-R121. doi:10.1007/BF03013187
41. Philpott CM, Conboy P, Al-Azzawi F, Murty G. Nasal physiological changes during pregnancy [published correction appears in *Clin Otolaryngol.* 2005 Feb;30(1):88]. *Clin Otolaryngol Allied Sci.* 2004;29(4):343-351. doi:10.1111/j.1365-2273.2004.00815.x
42. Schier R, Guerra D, Aguilar J, et al. Epidural space identification: a meta-analysis of complications after air versus liquid as the medium for loss of resistance. *Anesth Analg.* 2009;109(6):2012-2021. doi:10.1213/ANE.0b013e3181bc113a
43. Daley MD, Rolbin SH, Hew EM, Morningstar BA, Stewart JA. Epidural anesthesia for obstetrics after spinal surgery. *Reg Anesth.* 1990;15(6):280-284.

44. Simmons SW, Dennis AT, Cyna AM, Richardson MG, Bright MR. Combined spinal-epidural versus spinal anaesthesia for caesarean section [published online ahead of print, 2019 Oct 11]. *Cochrane Database Syst Rev.* 2019;10(10):CD008100. doi:10.1002/14651858.CD008100.pub2
45. Holck G, Camann W. Controversies in obstetric anesthesia. *J Anesth.* 2013;27(3):412-422. doi:10.1007/s00540-012-1518-z
46. Hess PE. What's new in clinical obstetric anesthesia in 2015?. *Int J Obstet Anesth.* 2017;32:54-63. doi:10.1016/j.ijoa.2017.03.008
47. Palmer CM. Continuous spinal anesthesia and analgesia in obstetrics. *Anesth Analg.* 2010;111(6):1476-1479. doi:10.1213/ANE.0b013e3181f7e3f4
48. Sarı MA, Küçükçüçlü S, Özbilgin Ş, et al. Retrospective Evaluation of Anaesthetic Techniques for Caesarean. *Turk J Anaesthesiol Reanim.* 2015;43(6):373-380. doi:10.5152/TJAR.2015.91069
49. Hood DD, Curry R. Spinal versus epidural anesthesia for cesarean section in severely preeclamptic patients: a retrospective survey. *Anesthesiology.* 1999;90(5):1276-1282. doi:10.1097/00000542-199905000-00009
50. Kendall MC, Robbins ZM, Cohen A, et al. Selected highlights in clinical anesthesia research. *J Clin Anesth.* 2017;43:90-97. doi:10.1016/j.jclinane.2017.10.002
51. Rafi MA, Arfeen Z, Misra U. Conversion of regional to general anaesthesia at caesarean section: increasing the use of regional anaesthesia through continuous prospective audit. *Int J Obstet Anesth.* 2010;19(2):179-182. doi:10.1016/j.ijoa.2009.08.008
52. Bowring J, Fraser N, Vause S, Heazell AE. Is regional anaesthesia better than general anaesthesia for caesarean section?. *J Obstet Gynaecol.* 2006;26(5):433-434. doi:10.1080/01443610600720345
53. Birnbach DJ, Bateman BT. Obstetric Anesthesia: Leading the Way in Patient Safety. *Obstet Gynecol Clin North Am.* 2019;46(2):329-337. doi:10.1016/j.ogc.2019.01.015
54. Riley ET, Cohen SE, Macario A, Desai JB, Ratner EF. Spinal versus epidural anesthesia for cesarean section: a comparison of time efficiency, costs, charges, and complications. *Anesth Analg.* 1995;80(4):709-712. doi:10.1097/00000539-199504000-00010
55. Tasnif Y, Morado J, Hebert MF. Pregnancy-related pharmacokinetic changes. *Clin Pharmacol Ther.* 2016;100(1):53-62. doi:10.1002/cpt.382
56. Heesen M, Klimek M. Nonobstetric anesthesia during pregnancy. *Curr Opin Anaesthesiol.* 2016;29(3):297-303. doi:10.1097/ACO.0000000000000311
57. Taylor CR, Dominguez JE, Habib AS. Obesity And Obstetric Anesthesia: Current Insights. *Local Reg Anesth.* 2019;12:111-124. Published 2019 Nov 18. doi:10.2147/LRA.S186530