

2. BÖLÜM

GEBELİKTE MATERNAL FİZYOLOJİK DEĞİŞİKLİKLER

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GİRİŞ

Gebelik, uterus içinde büyüyen fetoplental yapı ve bu sürecin tümüne uyum sağlamak için annenin anatomi ve fizyolojisinde meydana gelen değişikliklerle karakterizedir. Klinisyen, doğal olan bu fizyolojik değişiklikleri gebeliğe bağlı komplikasyonların neden olduğu değişikliklerden ayırt edebilmelidir. Bu bölümde, hemen her sistemin patolojik olmayan değişimleri sırasıyla anlatılacaktır.

GENİTAL DEĞİŞİKLİKLER

Normalde yaklaşık 70 gram olan uterus, gebelikte östrojen ve progesteronun etkisiyle kas hücrelerinin hipertrofisine bağlı giderek büyür ve termde ortalama 1100 gram olur. Aynı zamanda iç hacmi de basınçla beraber genişleyerek termde 5 litreye ulaşır. 12. haftada pelvis dışına çıkar ve terme kadar neredeyse ksifoide kadar yükselir (1).

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KAYNAKLAR

1. Cunningham FG, Leveno KJ, Bloom SL, et al (2018). Maternal physiology. In: Williams Obstetrics (25th ed) New York: McGraw-Hill Education.
2. Benirschke K, Burton GJ, Baergen RN. Pathology of the Human Placenta, 6th ed. Hiedelberg, Springer,2012.
3. Kutteh WH, Franklin RD. Quantification of immunoglobulins and cytokines in human cervical mucus during each trimester of pregnancy. *Am J Obstet Gynecol.* 2001;184(5):865-874. doi:10.1067/mob.2001.113853
4. Farage MA, Maibach HI. Morphology and physiological changes of genital skin and mucosa. *Curr Probl Dermatol.* 2011;40:9-19. doi:10.1159/000321042
5. Deng Y, Chen C, Chen S, et al. Baseline Levels of Serum Progesterone and the First Trimester Pregnancy Outcome in Women with Threatened Abortion: A Retrospective Cohort Study. *Biomed Res Int.* 2020;2020:8780253. Published 2020 Mar 2. doi:10.1155/2020/8780253
6. Schnorr JA Jr, Miller H, Davis JR, et al. Hyperreactio luteinalis associated with pregnancy: a case report and review of the literature. *Am J Perinatol.* 1996;13(2):95-97. doi:10.1055/s-2007-994300
7. Pasrija S, Sharma N. Images in clinical medicine. Benign diffuse breast hyperplasia during pregnancy. *N Engl J Med.* 2006;355(26):2771. doi:10.1056/NEJMicm040539
8. Löf M. Physical activity pattern and activity energy expenditure in healthy pregnant and non-pregnant Swedish women. *Eur J Clin Nutr.* 2011;65(12):1295-1301. doi:10.1038/ejcn.2011.129
9. Freemark M. Regulation of maternal metabolism by pituitary and placental hormones: roles in fetal development and metabolic programming. *Horm Res.* 2006;65 Suppl 3:41-49. doi:10.1159/000091505
10. Ghio A, Bertolotto A, Resi V, et al. Triglyceride metabolism in pregnancy. *Adv Clin Chem.* 2011;55:133-153. doi:10.1016/b978-0-12-387042-1.00007-1
11. Maymó JL, Pérez Pérez A, Gambino Y, et al. Review: Leptin gene expression in the placenta--regulation of a key hormone in trophoblast proliferation and survival. *Placenta.* 2011;32 Suppl 2:S146-S153. doi:10.1016/j.placenta.2011.01.004
12. Kametas N, McAuliffe F, Krampl E, et al. Maternal electrolyte and liver function changes during pregnancy at high altitude. *Clin Chim Acta.* 2003;328(1-2):21-29. doi:10.1016/s0009-8981(02)00241-3
13. de Haas S, Ghossein-Doha C, van Kuijk SM, et al. Physiological adaptation of maternal plasma volume during pregnancy: a systematic review and meta-analysis. *Ultrasound Obstet Gynecol.* 2017;49(2):177-187. doi:10.1002/uog.17360
14. Whittaker PG, Macphail S, Lind T. Serial hematologic changes and pregnancy outcome. *Obstet Gynecol.* 1996;88(1):33-39. doi:10.1016/0029-7844(96)00095-6
15. World Health Organization. Iron deficiency anaemia: Assessment, prevention, and control. A guide for programme managers. http://www.who.int/nutrition/publications/en/ida_assessment_prevention_control.pdf (Accessed on September 06, 2011).
16. Madsen H, Ditzel J. Red cell 2,3-diphosphoglycerate and hemoglobin--oxygen affinity during normal pregnancy. *Acta Obstet Gynecol Scand.* 1984;63(5):399-402. doi:10.3109/00016348409156691

17. Abu-Raya B, Michalski C, Sadarangani M, et al. Maternal Immunological Adaptation During Normal Pregnancy. *Front Immunol.* 2020;11:575197. Published 2020 Oct 7. doi:10.3389/fimmu.2020.575197
18. Reese JA, Peck JD, Deschamps DR, et al. Platelet Counts during Pregnancy. *N Engl J Med.* 2018;379(1):32-43. doi:10.1056/NEJMoa1802897
19. Bremme KA. Haemostatic changes in pregnancy. *Best Pract Res Clin Haematol.* 2003;16(2):153-168. doi:10.1016/s1521-6926(03)00021-5
20. Saha P, Stott D, Atalla R. Haemostatic changes in the puerperium '6 weeks post-partum' (HIP Study) - implication for maternal thromboembolism. *BJOG.* 2009;116(12):1602-1612. doi:10.1111/j.1471-0528.2009.02295.x
21. Meah VL, Cockcroft JR, Backx K, et al. Cardiac output and related haemodynamics during pregnancy: a series of meta-analyses. *Heart.* 2016;102(7):518-526. doi:10.1136/heartjnl-2015-308476
22. Green LJ, Mackillop LH, Salvi D, et al. Gestation-Specific Vital Sign Reference Ranges in Pregnancy. *Obstet Gynecol.* 2020;135(3):653-664. doi:10.1097/AOG.0000000000003721
23. Degner K, Magness RR, Shah DM. Establishment of the Human Uteroplacental Circulation: A Historical Perspective. *Reprod Sci.* 2017;24(5):753-761. doi:10.1177/1933719116669056
24. Brosens I, Pijnenborg R, Vercruyse L, et al. The "Great Obstetrical Syndromes" are associated with disorders of deep placentation. *Am J Obstet Gynecol.* 2011;204(3):193-201. doi:10.1016/j.ajog.2010.08.009
25. Uptodate (2020). Maternal adaptations to pregnancy: Cardiovascular and hemodynamic changes 2020. (01.02.2021 tarihinde https://www.uptodate.com/contents/maternal-adaptations-to-pregnancy-cardiovascular-and-hemodynamic-changes?search=maternal%20adaptations&source=search_result&selectedTitle=3~150&usage_type=default&display_rank=3 adresinden ulaşılmıştır)
26. Hegewald MJ, Crapo RO. Respiratory physiology in pregnancy. *Clin Chest Med.* 2011;32(1):1-13. doi:10.1016/j.ccm.2010.11.001
27. Kazma JM, van den Anker J, Allegaert K, et al. Anatomical and physiological alterations of pregnancy. *J Pharmacokinet Pharmacodyn.* 2020;47(4):271-285. doi:10.1007/s10928-020-09677-1
28. Wolfe LA, Kemp JG, Heenan AP, et al. Acid-base regulation and control of ventilation in human pregnancy. *Can J Physiol Pharmacol.* 1998;76(9):815-827. doi:10.1139/cjpp-76-9-815
29. McAuliffe F, Kametas N, Costello J, et al. Respiratory function in singleton and twin pregnancy. *BJOG.* 2002;109(7):765-769. doi:10.1111/j.1471-0528.2002.01515.x
30. Uptodate (2020). Maternal adaptations to pregnancy: Physiologic respiratory changes and dyspnea 2020. (03.02.2021 tarihinde https://www.uptodate.com/contents/maternal-adaptations-to-pregnancy-physiologic-respiratory-changes-and-dyspnea?source=mostViewed_widget adresinden ulaşılmıştır)
31. Szkodziak P. Ultrasound screening for pyelectasis in pregnant women. Clinical necessity or "art for art's sake"? *J Ultrason.* 2018;18(73):152-157. doi:10.15557/JoU.2018.0022

32. 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
33. Gant NF, Chand S, Whalley PJ, MacDonald PC. The nature of pressor responsiveness to angiotensin II in human pregnancy. *Obstet Gynecol.* 1974;43(6):854.
34. Conrad KP, Jeyabalan A, Danielson LA, et al. Role of relaxin in maternal renal vasodilation of pregnancy. *Ann N Y Acad Sci* 2005; 1041:147.
35. Larsson A, Palm M, Hansson LO, et al. Reference values for clinical chemistry tests during normal pregnancy. *BJOG* 2008; 115:874.
36. Kattah A, Milic N, White W, et al. Spot urine protein measurements in normotensive pregnancies, pregnancies with isolated proteinuria and preeclampsia. *Am J Physiol Regul Integr Comp Physiol* 2017; 313:R418.
37. Osmundson SS, Lafayette RA, Bowen RA, et al. Maternal proteinuria in twin compared with singleton pregnancies. *Obstet Gynecol* 2014; 124:332.
38. Alto WA. No need for glycosuria/proteinuria screen in pregnant women. *J Fam Pract* 2005; 54:978.
39. Akbari A, Wilkes P, Lindheimer M, et al. Reference intervals for anion gap and strong ion difference in pregnancy: a pilot study. *Hypertens Pregnancy* 2007; 26:111.
40. Wijma J, Potters AE, de Wolf BT, et al. Anatomical and functional changes in the lower urinary tract following spontaneous vaginal delivery. *BJOG* 2003; 110:658.
41. Bulchandani S, Coats AC, Gallos ID, et al. Normative bladder diary measurements in pregnant women. *Eur J Obstet Gynecol Reprod Biol* 2017; 210:319.
42. Van Geelen H, Ostergard D, Sand P. A review of the impact of pregnancy and childbirth on pelvic floor function as assessed by objective measurement techniques. *Int Urogynecol J.* 2018;29(3):327-338. doi:10.1007/s00192-017-3540-z
43. Laine MA. Effect of pregnancy on periodontal and dental health. *Acta Odontol Scand* 2002; 60:257.
44. Jafarzadeh H, Sanatkhanani M, Mohtasham N. Oral pyogenic granuloma: a review. *J Oral Sci* 2006; 48:167.
45. Thaxter Nesbeth KA, Samuels LA, Nicholson Daley C, et al. Ptyalism in pregnancy - a review of epidemiology and practices. *Eur J Obstet Gynecol Reprod Biol* 2016; 198:47.
46. Chiloiro M, Darconza G, Piccioli E, et al. Gastric emptying and orocecal transit time in pregnancy. *J Gastroenterol.* 2001;36(8):538-543. doi:10.1007/s005350170056
47. Richter JE. Review article: the management of heartburn in pregnancy. *Aliment Pharmacol Ther* 2005; 22:749.
48. Larsson A, Palm M, Hansson LO, et al. Reference values for clinical chemistry tests during normal pregnancy. *BJOG* 2008; 115:874.
49. Derbyshire EJ, Davies J, Detmar P. Changes in bowel function: pregnancy and the puerperium. *Dig Dis Sci.* 2007;52(2):324-328. doi:10.1007/s10620-006-9538-x
50. O'Boyle AL, O'Boyle JD, Magann EF, et al. Anorectal symptoms in pregnancy and the postpartum period. *J Reprod Med* 2008; 53:151.
51. Feldt-Rasmussen U, Mathiesen ER. Endocrine disorders in pregnancy: physiological and hormonal aspects of pregnancy. *Best Pract Res Clin Endocrinol Metab.* 2011;25(6):875-884. doi:10.1016/j.beem.2011.07.004

52. Brunton PJ, Russell JA. Endocrine induced changes in brain function during pregnancy. *Brain Res.* 2010;1364:198-215. doi:10.1016/j.brainres.2010.09.062
53. Cooper MS. Disorders of calcium metabolism and parathyroid disease. *Best Pract Res Clin Endocrinol Metab.* 2011;25(6):975-983. doi:10.1016/j.beem.2011.07.001
54. Jung C, Ho JT, Torpy DJ, et al. A longitudinal study of plasma and urinary cortisol in pregnancy and postpartum. *J Clin Endocrinol Metab.* 2011;96(5):1533-1540. doi:10.1210/jc.2010-2395
55. Kumari R, Jaisankar TJ, Thappa DM. A clinical study of skin changes in pregnancy. *Indian J Dermatol Venereol Leprol* 2007; 73:141.
56. Geraghty LN, Pomeranz MK. Physiologic changes and dermatoses of pregnancy. *Int J Dermatol* 2011; 50:771.
57. Nakama T, Hashikawa K, Higuchi M, et al. Pigmentary demarcation lines associated with pregnancy. *Clin Exp Dermatol* 2009; 34:e573.
58. Motosko CC, Bieber AK, Pomeranz MK, et al. Physiologic changes of pregnancy: A review of the literature. *Int J Womens Dermatol.* 2017;3(4):219-224. Published 2017 Oct 21. doi:10.1016/j.ijwd.2017.09.003
59. Rebora A, Guarrera M, Drago F. Postpartum telogen effluvium. *J Eur Acad Dermatol Venereol.* 2016;30(3):518. doi:10.1111/jdv.12914
60. Forczek W, Ivanenko Y, Curyło M, et al. Progressive changes in walking kinematics throughout pregnancy-A follow up study. *Gait Posture* 2019; 68:518.
61. Marnach ML, Ramin KD, Ramsey PS, et al. Characterization of the relationship between joint laxity and maternal hormones in pregnancy. *Obstet Gynecol* 2003; 101:331.
62. Henry JF, Sherwin BB. Hormones and cognitive functioning during late pregnancy and postpartum: a longitudinal study. *Behav Neurosci.* 2012;126(1):73-85. doi:10.1037/a0025540