



Chapter 10

OTORHINOLARYNGOLOGICAL CONDITIONS AND THEIR CURRENT TREATMENT OPTIONS DURING PREGNANCY

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Pregnancy is a period in which considerable number of changes occur in the body. Hormonal and physiological adaptations that take place during this period can affect all organs. Conditions associated with otorhinolaryngology are no exception. Most of these changes do not cause significant harm to the mother or fetus and the complaints are mostly temporary; however, this already challenging process can significantly affect the quality of life of an individual. In this section, pregnancy- related otorhinolaryngological physiopathological manifestations, allergy in pregnancy and current treatment approaches to these conditions will be discussed.

Effect of Sex Hormones in Inner Ear Structures

Estradiol is a hormone with pronounced effects on the auditory system. In the menstrual cycle, hearing thresholds alter with the change in hormone levels.⁽¹⁾ Hearing disorders are more common in individuals with Turner syndrome partial or complete deficiency of the X chromosome.⁽²⁾ Auditory brainstem response thresholds are higher in postmenopausal women than in men and younger women.⁽³⁾ Hearing thresholds of ovariectomized rats were found to be increased compared to normal rats.⁽⁴⁾ Otoacoustic emission amplitudes were found to be higher in women compared to men.⁽⁵⁾ Hearing thresholds also

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high systemic bioavailability (44%).⁽⁸²⁾ Mometasone, on the other hand has a systemic bioavailability <0,1%, thus recommended as a safe option during pregnancy.⁽⁸²⁾ Intranasal fluticasone propionate and fluticasone furoate have low systemic bioavailability, therefore their use in pregnancy is reassuring.^(82, 85)

Among the medications for AR, The chlorpheniramine -a first generation antihistamine-is not recommended during pregnancy. Loratadine or cetirizine treatments as second generation antihistamines are advocated for allergic patients during pregnancy.⁽⁸⁵⁾ However, although there are strong evidences regarding the safety use of cetirizine at all trimesters, as a precaution they are advised to be given after the first trimester.

Additional medications such as Oxymetazoline sprays as nasal decongestants, pseudoephedrine for persistent nasal obstruction are not reassuring during pregnancy. Buffered saline irrigations of the nasal passages for nasal dryness, epistaxis, and vascular congestion could be considered as adjunctive treatments.

References

1. Haggard M, Gaston JB. Changes in auditory perception in the menstrual cycle. *British journal of audiology*. 1978 Nov;12(4):105-18. PubMed PMID: 728655. Epub 1978/11/01. eng.
2. Hultcrantz M, Stenberg AE, Fransson A, Canlon B. Characterization of hearing in an X,0 'Turner mouse'. *Hearing research*. 2000 May;143(1-2):182-8. PubMed PMID: 10771195. Epub 2000/04/20. eng.
3. Jerger J, Johnson K. Interactions of age, gender, and sensorineural hearing loss on ABR latency. *Ear and hearing*. 1988 Aug;9(4):168-76. PubMed PMID: 3169397. Epub 1988/08/01. eng.
4. Coleman JR, Campbell D, Cooper WA, Welsh MG, Moyer J. Auditory brainstem responses after ovariectomy and estrogen replacement in rat. *Hearing research*. 1994 Nov;80(2):209-15. PubMed PMID: 7896579. Epub 1994/11/01. eng.
5. McFadden D. Masculinizing effects on otoacoustic emissions and auditory evoked potentials in women using oral contraceptives. *Hearing research*. 2000 Apr;142(1-2):23-33. PubMed PMID: 10748325. Epub 2000/04/05. eng.
6. Białek M, Zaremba P, Borowicz KK, Czuczwar SJ. Neuroprotective role of testosterone in the nervous system. *Polish journal of pharmacology*. 2004 Sep-Oct;56(5):509-18. PubMed PMID: 15591638. Epub 2004/12/14. eng.
7. Kilicdag EB, Yavuz H, Bagis T, Tarim E, Erkan AN, Kazanci F. Effects of estrogen therapy on hearing in postmenopausal women. *American journal of obstetrics and gynecology*. 2004 Jan;190(1):77-82. PubMed PMID: 14749639. Epub 2004/01/30. eng.

8. Swain SK, Pati BK, Mohanty JN. Otological manifestations in pregnant women - A study at a tertiary care hospital of eastern India. *Journal of otology*. 2020 Sep;15(3):103-6. PubMed PMID: 32884561. Pubmed Central PMCID: PMC7452357. Epub 2020/09/05. eng.
9. Stenberg AE, Wang H, Sahlin L, Stierna P, Enmark E, Hultcrantz M. Estrogen receptors alpha and beta in the inner ear of the 'Turner mouse' and an estrogen receptor beta knockout mouse. *Hearing research*. 2002 Apr;166(1-2):1-8. PubMed PMID: 12062753. Epub 2002/06/14. eng.
10. Shiny Sherlie V, Varghese A. ENT Changes of Pregnancy and Its Management. *Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India*. 2014 Jan;66(Suppl 1):6-9. PubMed PMID: 24533353. Pubmed Central PMCID: PMC3918343. Epub 2014/02/18. eng.
11. Uchide K, Suzuki N, Takiguchi T, Terada S, Inoue M. The possible effect of pregnancy on Ménière's disease. *ORL; journal for oto-rhino-laryngology and its related specialties*. 1997 Sep-Oct;59(5):292-5. PubMed PMID: 9279870. Epub 1997/09/01. eng.
12. Miranda A, Sousa N. Maternal hormonal milieu influence on fetal brain development. *Brain and behavior*. 2018 Feb;8(2):e00920. PubMed PMID: 29484271. Pubmed Central PMCID: PMC5822586. Epub 2018/02/28. eng.
13. Kanadys WM, Oleszczuk J. [Sudden sensorineural hearing loss during pregnancy]. *Ginekologia polska*. 2005 Mar;76(3):225-7. PubMed PMID: 16018142. Epub 2005/07/16. Nagła utrata słuchu typu odbiorczego podczas ciąży. pol.
14. Bakhshae M, Hassanzadeh M, Nourizadeh N, Karimi E, Moghiman T, Shakeri M. Hearing impairment in pregnancy toxemia. *Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery*. 2008 Aug;139(2):298-300. PubMed PMID: 18656733. Epub 2008/07/29. eng.
15. Preece PE, Richards AR, Owen GM, Hughes LE. Mastalgia and total body water. *British medical journal*. 1975 Nov 29;4(5995):498-500. PubMed PMID: 1238148. Pubmed Central PMCID: PMC1675607. Epub 1975/11/29. eng.
16. Singla P, MG, * PSM, RG. Otorhinolaryngological complaints in pregnancy: a prospective study in a tertiary care centre.
17. Schmidt PM, Flores Fda T, Rossi AG, Silveira AF. Hearing and vestibular complaints during pregnancy. *Brazilian journal of otorhinolaryngology*. 2010 Jan-Feb;76(1):29-33. PubMed PMID: 20339686. Epub 2010/03/27. eng.
18. Tsunoda K, Takahashi S, Takanosawa M, Shimoji Y. The influence of pregnancy on sensation of ear problems--ear problems associated with healthy pregnancy. *The Journal of laryngology and otology*. 1999 Apr;113(4):318-20. PubMed PMID: 10474664. Epub 1999/09/04. eng.
19. Shapiro JL, Yudin MH, Ray JG. Bell's palsy and tinnitus during pregnancy: predictors of pre-eclampsia? Three cases and a detailed review of the literature. *Acta otolaryngologica*. 1999;119(6):647-51. PubMed PMID: 10586996. Epub 1999/12/10. eng.

20. Jago J. The Functions of the Tympanum. The British and foreign medico-chirurgical review. 1870 Jan;45(89):229-36. PubMed PMID: 30163024. Pubmed Central PMCID: PMC5163298. Epub 1870/01/01. eng.
21. Plate S, Johnsen NJ, Nødskov Pedersen S, Thomsen KA. The frequency of patulous Eustachian tubes in pregnancy. Clinical otolaryngology and allied sciences. 1979 Dec;4(6):393-400. PubMed PMID: 527242. Epub 1979/12/01. eng.
22. Weissman A, Nir D, Shenhav R, Zimmer EZ, Joachims ZH, Danino J. Eustachian tube function during pregnancy. Clinical otolaryngology and allied sciences. 1993 Jun;18(3):212-4. PubMed PMID: 8365012. Epub 1993/06/01. eng.
23. Reiss M, Reiss G. [Patulous eustachian tube--diagnosis and therapy]. Wiener medizinische Wochenschrift (1946). 2000;150(22):454-6. PubMed PMID: 11191956. Epub 2001/02/24. Das Syndrom der offenen Ohrtrompete--Diagnostik und Therapie. ger.
24. Dag EK, Gulumser C, Erbek S. Decrease in Middle Ear Resonance Frequency During Pregnancy. Audiology research. 2016 Apr 20;6(1):147. PubMed PMID: 27588163. Pubmed Central PMCID: PMC4988097. Epub 2016/09/03. eng.
25. Hall JG. Otosclerosis in Norway, a geographical and genetical study. Acta otolaryngologica Supplementum. 1974;324:1-20. PubMed PMID: 4533878. Epub 1974/01/01. eng.
26. Lippy WH, Berenholz LP, Schuring AG, Burkey JM. Does pregnancy affect otosclerosis? The Laryngoscope. 2005 Oct;115(10):1833-6. PubMed PMID: 16222205. Epub 2005/10/14. eng.
27. Gristwood RE, Venables WN. Pregnancy and otosclerosis. Clinical otolaryngology and allied sciences. 1983 Jun;8(3):205-10. PubMed PMID: 6883784. Epub 1983/06/01. eng.
28. Kumar R, Hayhurst KL, Robson AK. Ear, nose, and throat manifestations during pregnancy. Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery. 2011 Aug;145(2):188-98. PubMed PMID: 21555777. Epub 2011/05/11. eng.
29. Sennaroglu G, Belgin E. Audiological findings in pregnancy. The Journal of laryngology and otology. 2001 Aug;115(8):617-21. PubMed PMID: 11535140. Epub 2001/09/06. eng.
30. Xu M, Jiang Q, Tang H. Sudden sensorineural hearing loss during pregnancy: clinical characteristics, management and outcome. Acta oto-laryngologica. 2019 Jan;139(1):38-41. PubMed PMID: 30664387. Epub 2019/01/22. eng.
31. Lyu YL, Zeng FQ, Zhou Z, Yan M, Zhang W, Liu M, et al. Intratympanic dexamethasone injection for sudden sensorineural hearing loss in pregnancy. World journal of clinical cases. 2020 Sep 26;8(18):4051-8. PubMed PMID: 33024762. Pubmed Central PMCID: PMC7520784. Epub 2020/10/08. eng.
32. Xie S, Wu X. Clinical management and progress in sudden sensorineural hearing loss during pregnancy. The Journal of international medical research. 2020 Feb;48(2):300060519870718. PubMed PMID: 31452412. Pubmed Central PMCID: PMC7593668. Epub 2019/08/28. eng.

33. Fu Y, Jing J, Ren T, Zhao H. Intratympanic dexamethasone for managing pregnant women with sudden hearing loss. *The Journal of international medical research*. 2019 Jan;47(1):377-82. PubMed PMID: 30328358. Pubmed Central PMCID: PMC6384472. Epub 2018/10/18. eng.
34. Bousquet J, Schünemann HJ, Samolinski B, Demoly P, Baena-Cagnani CE, Bachert C, et al. Allergic Rhinitis and its Impact on Asthma (ARIA): achievements in 10 years and future needs. *The Journal of allergy and clinical immunology*. 2012 Nov;130(5):1049-62. PubMed PMID: 23040884. Epub 2012/10/09. eng.
35. Black FO. Maternal susceptibility to nausea and vomiting of pregnancy: is the vestibular system involved? *American journal of obstetrics and gynecology*. 2002 May;186(5 Suppl Understanding):S204-9. PubMed PMID: 12011887. Epub 2002/05/16. eng.
36. Jian H, Yu G, Chen G, Lin N, Wang H. Correlation between auditory-vestibular functions and estrogen levels in postmenopausal patients with Meniere's disease. *Journal of clinical laboratory analysis*. 2019 Jan;33(1):e22626. PubMed PMID: 30030864. Pubmed Central PMCID: PMC6430344. Epub 2018/07/22. eng.
37. Kenny R, Patil N, Considine N. Sudden (reversible) sensorineural hearing loss in pregnancy. *Irish journal of medical science*. 2011 Mar;180(1):79-84. PubMed PMID: 20665123. Epub 2010/07/29. eng.
38. Watters KF, Rosowski JJ, Sauter T, Lee DJ. Superior semicircular canal dehiscence presenting as postpartum vertigo. *Otology & neurotology : official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*. 2006 Sep;27(6):756-68. PubMed PMID: 16936563. Epub 2006/08/29. eng.
39. Whitehead E. Sudden sensorineural hearing loss with fracture of the stapes footplate following sneezing and parturition. *Clinical otolaryngology and allied sciences*. 1999 Sep;24(5):462-4. PubMed PMID: 10542932. Epub 1999/10/30. eng.
40. Schutt CA, Neubauer P, Samy RN, Pensak ML, Kuhn JJ, Herschovitch M, et al. The correlation between obesity, obstructive sleep apnea, and superior semicircular canal dehiscence: a new explanation for an increasingly common problem. *Otology & neurotology : official publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*. 2015 Mar;36(3):551-4. PubMed PMID: 25118577. Epub 2014/08/15. eng.
41. Çoban K, Aydın E, Özlüoğlu LN. Audio-Vestibular Findings in Increased Intracranial Hypertension Syndrome. *The journal of international advanced otology*. 2017 Apr;13(1):100-4. PubMed PMID: 28084997. Epub 2017/01/14. eng.
42. Cox L, Nelson H, Lockey R, Calabria C, Chacko T, Finegold I, et al. Allergen immunotherapy: a practice parameter third update. *The Journal of allergy and clinical immunology*. 2011 Jan;127(1 Suppl):S1-55. PubMed PMID: 21122901. Epub 2010/12/03. eng.
43. Ogun OA, Büki B, Cohn ES, Janky KL, Lundberg YW. Menopause and benign paroxysmal positional vertigo. *Menopause (New York, NY)*. 2014 Aug;21(8):886-9. PubMed PMID: 24496089. Pubmed Central PMCID: PMC4110114. Epub 2014/02/06. eng.

44. Bhavana G, Kumar K, E A. Assessment of otolith function using vestibular evoked myogenic potential in women during pregnancy. *Brazilian journal of otorhinolaryngology*. 2020 Sep 28. PubMed PMID: 33067134. Epub 2020/10/18. eng.
45. Talaat HS, Abuhadied G, Talaat AS, Abdelaal MS. Low bone mineral density and vitamin D deficiency in patients with benign positional paroxysmal vertigo. *European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*. 2015 Sep;272(9):2249-53. PubMed PMID: 24973969. Epub 2014/06/30. eng.
46. Kansu L, Avci S, Yilmaz I, Ozluoglu LN. Long-term follow-up of patients with posterior canal benign paroxysmal positional vertigo. *Acta oto-laryngologica*. 2010 Sep;130(9):1009-12. PubMed PMID: 20297928. Epub 2010/03/20. eng.
47. Danielides V, Skevas A, van Cauwenberge P, Vinck B, Tsanades G, Plachouras N. Facial nerve palsy during pregnancy. *Acta oto-rhino-laryngologica Belgica*. 1996;50(2):131-5. PubMed PMID: 8767258. Epub 1996/01/01. eng.
48. Vrabec JT, Isaacson B, Van Hook JW. Bell's palsy and pregnancy. *Otolaryngology--head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery*. 2007 Dec;137(6):858-61. PubMed PMID: 18036410. Epub 2007/11/27. eng.
49. Walling AD. Bell's palsy in pregnancy and the puerperium. *The Journal of family practice*. 1993 May;36(5):559-63. PubMed PMID: 8482941. Epub 1993/05/01. eng.
50. Peitersen E. Bell's palsy: the spontaneous course of 2,500 peripheral facial nerve palsies of different etiologies. *Acta oto-laryngologica Supplementum*. 2002 (549):4-30. PubMed PMID: 12482166. Epub 2002/12/17. eng.
51. Ellegård E, Hellgren M, Torén K, Karlsson G. The incidence of pregnancy rhinitis. *Gynecologic and obstetric investigation*. 2000;49(2):98-101. PubMed PMID: 10671815. Epub 2000/02/15. eng.
52. Ellegård EK. The etiology and management of pregnancy rhinitis. *American journal of respiratory medicine : drugs, devices, and other interventions*. 2003;2(6):469-75. PubMed PMID: 14719986. Epub 2004/01/15. eng.
53. Ellegård E, Karlsson G. IgE-mediated reactions and hyperreactivity in pregnancy rhinitis. *Archives of otolaryngology--head & neck surgery*. 1999 Oct;125(10):1121-5. PubMed PMID: 10522505. Epub 1999/10/16. eng.
54. Shushan S, Sadan O, Lurie S, Evron S, Golan A, Roth Y. Pregnancy-associated rhinitis. *American journal of perinatology*. 2006 Oct;23(7):431-3. PubMed PMID: 17001552. Epub 2006/09/27. eng.
55. Hamano N, Terada N, Maesako K, Ikeda T, Fukuda S, Wakita J, et al. Expression of histamine receptors in nasal epithelial cells and endothelial cells--the effects of sex hormones. *International archives of allergy and immunology*. 1998 Mar;115(3):220-7. PubMed PMID: 9531164. Epub 1998/04/08. eng.
56. Schatz M, Zeiger RS. Asthma and allergy in pregnancy. *Clinics in perinatology*. 1997 Jun;24(2):407-32. PubMed PMID: 9209810. Epub 1997/06/01. eng.

57. Namazy JA, Schatz M. Diagnosing rhinitis during pregnancy. *Current allergy and asthma reports*. 2014 Sep;14(9):458. PubMed PMID: 25086578. Epub 2014/08/05. eng.
58. Ellegård EK. Pregnancy rhinitis. *Immunology and allergy clinics of North America*. 2006 Feb;26(1):119-35, vii. PubMed PMID: 16443147. Epub 2006/01/31. eng.
59. Adam MP, Polifka JE, Friedman JM. Evolving knowledge of the teratogenicity of medications in human pregnancy. *American journal of medical genetics Part C, Seminars in medical genetics*. 2011 Aug 15;157c(3):175-82. PubMed PMID: 21766440. Epub 2011/07/19. eng.
60. Boothby LA, Doering PL. FDA labeling system for drugs in pregnancy. *The Annals of pharmacotherapy*. 2001 Nov;35(11):1485-9. PubMed PMID: 11724104. Epub 2001/11/29. eng.
61. Ellegård EK. Special considerations in the treatment of pregnancy rhinitis. *Women's health (London, England)*. 2005 Jul;1(1):105-14. PubMed PMID: 19803951. Epub 2005/07/01. eng.
62. Flaxman SM, Sherman PW. Morning sickness: a mechanism for protecting mother and embryo. *The Quarterly review of biology*. 2000 Jun;75(2):113-48. PubMed PMID: 10858967. Epub 2000/06/20. eng.
63. Nordin S, Broman DA, Olofsson JK, Wulff M. A longitudinal descriptive study of self-reported abnormal smell and taste perception in pregnant women. *Chemical senses*. 2004 Jun;29(5):391-402. PubMed PMID: 15201206. Epub 2004/06/18. eng.
64. Nwankwo U, Fasunla AJ, Oladokun A, Nwaorgu OG. Comparison between olfactory function of pregnant women and non-pregnant women in reproductive age group in Ibadan, Nigeria. *Nigerian journal of clinical practice*. 2017 May;20(5):610-5. PubMed PMID: 28513522. Epub 2017/05/18. eng.
65. Fornazieri, M.A., Prina, D.M.C., Favoreto, J.P.M. et al. Olfaction During Pregnancy and Postpartum Period. *Chem. Percept*. 12, 125–134 (2019).
66. Koufman JA, Aviv JE, Casiano RR, Shaw GY. Laryngopharyngeal reflux: position statement of the committee on speech, voice, and swallowing disorders of the American Academy of Otolaryngology-Head and Neck Surgery. *Otolaryngology-head and neck surgery : official journal of American Academy of Otolaryngology-Head and Neck Surgery*. 2002 Jul;127(1):32-5. PubMed PMID: 12161727. Epub 2002/08/06. eng.
67. Hamdan AL, Ziade G, Tabet G, Btaiche R, Fakhri G, Yatim F, et al. Vocal Symptoms and Acoustic Findings in Menopausal Women in Comparison to Pre-menopause Women with Body Mass Index as a Confounding Variable. *Journal of menopausal medicine*. 2017 Aug;23(2):117-23. PubMed PMID: 28951860. Pubmed Central PMCID: PMC5606909. Epub 2017/09/28. eng.
68. Sivasankar M, Fisher KV. Oral breathing increases Pth and vocal effort by superficial drying of vocal fold mucosa. *Journal of voice : official journal of the Voice Foundation*. 2002 Jun;16(2):172-81. PubMed PMID: 12150370. Epub 2002/08/02. eng.
69. Garbis H, Elefant E, Diav-Citrin O, Mastroiacovo P, Schaefer C, Vial T, et al. Pregnancy outcome after exposure to ranitidine and other H2-blockers. A collaborative study of the European Network of Teratology Information Services. *Reproductive*

- toxicology (Elmsford, NY). 2005 Mar-Apr;19(4):453-8. PubMed PMID: 15749258. Epub 2005/03/08. eng.
70. Diav-Citrin O, Arnon J, Shechtman S, Schaefer C, van Tonningen MR, Clementi M, et al. The safety of proton pump inhibitors in pregnancy: a multicentre prospective controlled study. *Alimentary pharmacology & therapeutics*. 2005 Feb 1;21(3):269-75. PubMed PMID: 15691301. Epub 2005/02/05. eng.
 71. McGlashan JA, Johnstone LM, Sykes J, Strugala V, Dettmar PW. The value of a liquid alginate suspension (Gaviscon Advance) in the management of laryngopharyngeal reflux. *European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS): affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*. 2009 Feb;266(2):243-51. PubMed PMID: 18506466. Epub 2008/05/29. eng.
 72. Coombs RRA, and Gell PGH. Classification of allergic reactions responsible for clinical hypersensitivity and disease. In *Clinical Aspect of Immunology*, 3rd ed. Gell PGH, Coombs RRA, and Lachman PJ (Eds). Oxford, U.K.: Blackwell Scientific Publications, 575–596, 1975.
 73. Schöll I, Kalkura N, Shedziankova Y, Bergmann A, Verdino P, Knittelfelder R, et al. Dimerization of the major birch pollen allergen Bet v 1 is important for its in vivo IgE-cross-linking potential in mice. *Journal of immunology (Baltimore, Md : 1950)*. 2005 Nov 15;175(10):6645-50. PubMed PMID: 16272319. Epub 2005/11/08. eng.
 74. Dvorak AM, Schleimer RP, Lichtenstein LM. Morphologic mast cell cycles. *Cellular immunology*. 1987 Mar;105(1):199-204. PubMed PMID: 2434250. Epub 1987/03/01. eng.
 75. Ogawa Y, Grant JA. Mediators of anaphylaxis. *Immunology and allergy clinics of North America*. 2007 May;27(2):249-60, vii. PubMed PMID: 17493501. Epub 2007/05/12. eng.
 76. Pali-Schöll I, Namazy J, Jensen-Jarolim E. Allergic diseases and asthma in pregnancy, a secondary publication. *The World Allergy Organization journal*. 2017;10(1):10. PubMed PMID: 28286601. Pubmed Central PMCID: PMC5333384. Epub 2017/03/14. eng.
 77. Mortensen LH, Helweg-Larsen K, Andersen AM. Socioeconomic differences in perinatal health and disease. *Scandinavian journal of public health*. 2011 Jul;39(7 Suppl):110-4. PubMed PMID: 21775367. Epub 2011/08/04. eng.
 78. Strachan DP. Family size, infection and atopy: the first decade of the «hygiene hypothesis». *Thorax*. 2000 Aug;55 Suppl 1(Suppl 1):S2-10. PubMed PMID: 10943631. Pubmed Central PMCID: PMC1765943. Epub 2000/08/16. eng.
 79. Simons FE, Schatz M. Anaphylaxis during pregnancy. *The Journal of allergy and clinical immunology*. 2012 Sep;130(3):597-606. PubMed PMID: 22871389. Epub 2012/08/09. eng.
 80. Lazzarini R, Duarte I, Ferreira AL. Patch tests. *Anais brasileiros de dermatologia*. 2013 Nov-Dec;88(6):879-88. PubMed PMID: 24474094. Pubmed Central PMCID: PMC3900336. Epub 2014/01/30. eng.

81. Bérard A, Sheehy O, Kurzinger ML, Juhaeri J. Intranasal triamcinolone use during pregnancy and the risk of adverse pregnancy outcomes. *The Journal of allergy and clinical immunology*. 2016 Jul;138(1):97-104.e7. PubMed PMID: 27045580. Epub 2016/04/06. eng.
82. Gluck PA, Gluck JC. A review of pregnancy outcomes after exposure to orally inhaled or intranasal budesonide. *Current medical research and opinion*. 2005 Jul;21(7):1075-84. PubMed PMID: 16004676. Epub 2005/07/12. eng.
83. Dawes M, Chowienczyk PJ. Drugs in pregnancy. Pharmacokinetics in pregnancy. *Best practice & research Clinical obstetrics & gynaecology*. 2001 Dec;15(6):819-26. PubMed PMID: 11800526. Epub 2002/01/22. eng.
84. Alhussien AH, Alhedaithy RA, Alsaleh SA. Safety of intranasal corticosteroid sprays during pregnancy: an updated review. *European archives of oto-rhino-laryngology : official journal of the European Federation of Oto-Rhino-Laryngological Societies (EUFOS) : affiliated with the German Society for Oto-Rhino-Laryngology - Head and Neck Surgery*. 2018 Feb;275(2):325-33. PubMed PMID: 29164323. Epub 2017/11/23. eng.