*The Journal of Laryngology & Otology (2012)*, ***126***, *337–339*.

doi:10.1017/S0022215112000114

**REVIEW ARTICLE**

# Sudden hearing loss and pregnancy: a review

A Y GOH[1], S S M HUSSAIN[2]

*Departments of [1]Obstetrics and Gynaecology, and [2]Otolaryngology, Ninewells Hospital and University of Dundee Medical School, Dundee, Scotland, UK*

## Abstract

*Background*: Acute hearing loss is a distressing albeit rare occurrence in pregnancy. Due to its infrequent presentation, little is known of its cause, and the best management is unclear.

*Objective*: To present a summary of current knowledge regarding sudden hearing loss in pregnancy and its management, by reviewing the published literature.

*Data sources*: The following electronic databases: PubMed (MEDLINE), Ovid (MEDLINE), all EBM Reviews (Cochrane DSR, ACP Journal Club, DARE and CCTR) and Embase; plus a hand search of reference lists of retrieved papers.

*Study selection and data extraction*: All papers retrieved using key word searches for 'sudden hearing loss and pregnancy' and 'sudden deafness and pregnancy' were reviewed. Due to the scarcity of literature, all studies identified were included in this review.

*Data synthesis and conclusions*: All retrieved papers were reviewed. Sudden hearing loss is a rare occurrence during pregnancy, leading to a dearth of literature due to limited clinical experience. Audiological investigation findings for such patients remain equivocal. Recovery can be spontaneous during the postpartum period. In patients who require medical treatment, a dextran 40 infusion can be employed. There remains scope for further research, in the form of larger studies, to ascertain the best management option for this clinical problem.

**Key words:** Hearing Loss; Pregnancy; Neuroma, Acoustic

## Introduction

The pregnant woman goes through a series of physiological changes throughout her pregnancy which affect her in a variety of ways. The changing levels of sex hormones exert an influence on the functioning of the sensory nervous system, which can result in hearing problems.[1]

Sudden deafness is a distressing albeit rare occurrence in pregnancy. It is defined as a rapid decline in hearing (i.e. more than 30 dB sensorineural hearing loss over less than three days) in at least three contiguous frequencies, without any accountable cause.[2]

The management of sudden deafness occurring in pregnant patients has proved challenging due to limited clinical experience. This is compounded by obstetric complexities such as potential fetal adverse effects of treatment.

This paper aims to address the quandary of sudden deafness in pregnancy and its management by reviewing the existing literature on the subject. Specific focus has been given to the aetiology, investigation findings and treatment of this clinical problem.

## Methods

Relevant articles were identified from electronic databases (PubMed (MEDLINE), Ovid (MEDLINE), all EBM Reviews (Cochrane DSR, ACP Journal Club, DARE and CCTR) and EMBASE) using key word searches for 'sudden hearing loss and pregnancy' and 'sudden deafness and pregnancy'. Due to the scarcity of literature pertinent to this subject, all studies identified were included in this review. A hand search of the reference lists of retrieved papers was also conducted. Studies that examined hearing loss in non-pregnant women with varied hormone profiles were also assessed in order to better understand the effects of female hormonal changes on hearing loss.

## Aetiology

The hormonal system in the pregnant woman undergoes unique changes to maintain an optimal condition for pregnancy. Such changes include considerably increased oestrogen and progesterone production rates compared with the non-pregnant state.[1] This marked increase in hormone levels is the basis of many theories explaining the possible relationship between hearing loss and pregnancy.

One hypothesis is that increased sex hormones pose a thrombogenic risk and can interrupt cochlear

Accepted for publication 18 July 2011 First published online 6 February 2012

microcirculation, leading to the development of sudden deafness.[3] Similarly, pregnancy causes a hypercoagulable state in which there is decreased erythrocyte deformability, increased plasma viscosity and erythrocyte aggregation.[2] All these factors lead to an increased risk of thromboembolic episodes of the cochlear artery.[3] Such hormonal alterations also lead to an increase of approximately 6.5 l of extracellular fluids and 1.2 l of intracellular fluid, resulting in osmotic disturbances due to water and sodium retention.[1,4] Sennaroglu and Belgin[1] have proposed that this shift in fluid osmolarity could affect the inner ear and cause a low frequency hearing loss pattern resembling Ménière's disease.

The above assumptions are based on the systemic effect of sex hormones. Much effort has been made to investigate the direct effects of oestrogen on the auditory pathway. There are two intracellular oestrogen receptors, labelled α and β.[5] Stenberg *et al.*[6] have shown that oestrogen receptor α is present in the spiral ganglion and oestrogen receptor β in the stria vascularis, locations vital for hearing transmission and inner ear homeostasis. However, it is still unclear whether these structures have true target cells, as the direct effect of oestrogen on such cells has not been proven to date.[5]

Case reports of the hearing levels of women with different hormonal levels have given conflicting findings, making it difficult to draw a conclusion.[5] Cyclic hearing alterations during different stages of the menstrual cycle have been reported by Yadav *et al.*,[7] Cox,[8] and Swanson and Dengerink.[9] Kilicdag *et al.*[10] have shown that oestrogen therapy, in the form of hormone replacement therapy (HRT), appears to slow down hearing loss in postmenopausal women. This proposal has been supported by Kim *et al.*,[11] who have reported that lower levels of oestradiol seem to impede hearing sensitivity in postmenopausal women. However, there have been isolated case reports of acute deafness caused by the use of the oral contraceptive pill[12] and HRT,[13] both situations in which oestrogen levels are increased.

Despite the above reports, the oestrogen surge during pregnancy is unique, making it difficult to determine from previous case descriptions whether acute deafness in pregnancy is due to the direct effects of oestrogen on the auditory pathway.

## Audiological investigations

There are few published reports correlating audiological investigation findings with sudden hearing loss in pregnancy.

Sennaroglu and Belgin[1] investigated the effect of pregnancy on hearing levels by studying 20 pregnant women with no hearing complaints. A gradual decrease in pure tone averages (at 125, 250 and 500 Hz) from the first trimester (i.e. up to 14 weeks) to the third trimester (i.e. 29–42 weeks) was found. However, this hearing loss did not reach pathological levels, and hearing returned to normal in the postpartum period. Hearing at frequencies higher than 500 Hz showed no significant change.

On the other hand, Tsunoda *et al.*[14] found that pure tone audiometry and impedance audiometry showed normal hearing in all their 56 pregnant women complaining of ear problems.

The only study assessing brainstem auditory evoked potential responses in pregnancy was performed by Tandon *et al.*[15] These authors demonstrated an increase in the evoked wave V threshold in eight pregnant women. The wave I–V interpeak latencies were also significantly greater than in the control group. However, the authors did not comment on whether these changes in brainstem auditory evoked potential could contribute to sudden hearing loss in pregnancy.

## Treatment options

There is no current consensus on the treatment of sudden hearing loss in pregnancy, as patient groups are small.

The only successful treatment agent reported thus far is dextran 40, a form of colloid solution used as a plasma expander. Wang and Young[2] have shown that this treatment significantly improved the incidence of hearing improvement in a group of pregnant patients with acute deafness. Dextran 40 decreases blood viscosity and enhances microcirculation, and hence reduces cochlear hypoxia.[2] Although Wang and Young's study found a significant difference in hearing improvement between the dextran and control groups (83 versus 20 per cent, respectively), patient numbers were small (with six patients in the dextran group and five in the control group) due to the rarity of this clinical problem. Unfortunately, dextran does not come without adverse effects; those reported include renal failure, coagulopathy and non-cardiogenic pulmonary oedema.[16] Thus, the potential benefits and risks need to be weighed before commencing treatment.

Another proposed treatment for idiopathic sudden hearing loss is steroid therapy,[17] which works via either a reduction in inflammation or a direct effect on the inner ear neuroepithelium.[2] Despite promising research findings, this treatment method has never been tested on pregnant women. It is in fact not recommended in this patient group, as excessive prenatal exposure can cause detrimental fetal effects such as alteration of the metabolic and endocrine balance of various organs.[2]

The natural history of sudden sensorineural hearing loss in pregnant women has not been established, although spontaneous resolution is common in adult men and non-pregnant women in up to 75 per cent of cases.[18] Recovery may be complete or partial.

## Acoustic neuroma

Wang and Young[2] have reported a case of acoustic neuroma which presented as ipsilateral sudden

https://doi.org/10.1017/S0022215112000114 Published online by Cambridge University Press

deafness, facial palsy and vertigo in a pregnant woman of 31 weeks' gestation.

Acoustic neuroma is a benign intracranial tumour of the vestibular nerve myelin sheath. Even though it presents infrequently in pregnant women, this tumour has been shown to expand rapidly during pregnancy, possibly due to hormonal changes.[19,20] The increase in size and vascularity of the lesion can lead to acute bleeding, which causes exacerbation of symptoms.[21] Non-specific symptoms of headache, nausea and tinnitus, commonly attributed to pregnancy itself, may delay the diagnosis of acoustic neuroma in pregnant women.[19,22]

Once the diagnosis is made via magnetic resonance imaging, as in Wang and Young's case,[2] a multidisciplinary approach is required involving obstetricians, neurosurgeons and anaesthetists. Management is dependent on the gestational stage of the pregnancy and the neurological status, with severe symptoms necessitating urgent surgical intervention.

Surgery performed during the first trimester poses the greatest anaesthetic risk to the fetus, in terms of spontaneous abortion and fetal teratogenicity.[2,19,20]

The anaesthetic risk to the mother increases during the later stages of pregnancy, due to physiological changes such as reduction in functional residual respiratory capacity and expansion of blood volume causing alteration of anaesthetic drug distribution.[20] Provided there are no impending neurological complications, surgical intervention can be safely delayed until the postpartum period.[22] If the lesion is large and symptoms are severe due to obstructive hydrocephalus, early ventriculoperitoneal shunting alone could be performed, followed by tumour resection after delivery.[23]

If the patient is in an advanced stage of pregnancy, the best fetal and maternal outcomes are provided by emergency Caesarean section after drainage of cerebrospinal fluid, followed by definitive neurosurgery.[19]

## Conclusion

Sudden hearing loss is a rare occurrence during pregnancy, leading to a dearth of literature due to limited clinical experience. The audiological investigation findings of such patients remain equivocal. Spontaneous recovery may occur during the postpartum period. In patients who require medical treatment, dextran 40 infusion can be employed, after careful weighing of potential benefits versus adverse effects. The diagnosis of acoustic neuroma needs to be considered in patients presenting with associated symptoms which manifest at the time of presentation of sudden deafness. There remains scope for further research, in the form of larger studies, to ascertain the best management option for this clinical problem.

### Reference


1 Sennaroglu G, Belgin E. Audiological findings in pregnancy. *J Laryngol Otol* 2001;**115**:617–21
2 Wang YP, Young YH. Experience in the treatment of sudden deafness during pregnancy. *Acta Otolaryngol* 2006;**126**: 271–6
3 Lavy JA. Sudden onset deafness: two cases associated with pregnancy. *Int J Clin Pract* 1998;**52**:129–30
4 Pawlak-Osinska K, Burduk PK, Kopczynski A. Episodes of repeated sudden deafness following pregnancies. *Am J Obstet Gynecol* 2009;**200**:e7–9
5 Hultcrantz M, Simonoska R, Stenberg AE. Estrogen and hearing: a summary of recent investigations. *Acta Otolaryngol* 2006;**16**:10–14
6 Stenberg AE, Wang H, Fish J 3rd, Schrott-Fischer A, Sahlin L, Hultcrantz M. Estrogen receptors in the normal adult and developing human inner ear and in Turner's syndrome. *Hear Res* 2003;**182**:19–23
7 Yadav A, Tandon OP, Vaney N. Auditory evoked responses during different phases of menstrual cycle. *Indian J Physiol Pharmacol* 2002;**46**:449–56
8 Cox JR. Hormonal influence on auditory function. *Ear Hear* 1980;**1**:219–22
9 Swanson SJ, Dengerink HA. Changes in pure-tone thresholds and temporary threshold shifts as a function of menstrual cycle and oral contraceptives. *J Speech Hearing Res* 1988;**31**: 569–74
10 Kilicdag EB, Yavuz H, Bagis T, Tarim E, Erkan AN, Kazanci F. Effects of estrogen therapy on hearing in postmenopausal women. *Am J Obstet Gynecol* 2004;**190**:77–82
11 Kim SH, Kan BM, Chae HD, Kim CH. The association between serum estradiol level and hearing sensitivity in postmenopausal women. *Obstet Gynecol* 2002;**99**:726–30
12 Hanna GS. Sudden deafness and the contraceptive pill. *J Laryngol Otol* 1986;**100**:701–6
13 Strachan D. Sudden sensorineural deafness and hormone replacement therapy. *J Laryngol Otol* 1996;**110**:1148–50
14 Tsunoda K, Takahashi S, Takanosawa M, Shimoji Y. The influence of pregnancy on sensation of ear problems – ear problems associated with healthy pregnancy. *J Laryngol Otol* 1999;**113**: 318–20
15 Tandon OP, Misra R, Tandon I. Brainstem auditory evoked potentials (BAEPs) in pregnant women. *Indian J Physiol Pharmacol* 1990;**34**:42–4
16 Kuo ST, Hsu WC, Young YH. Dextran-induced pulmonary edema in patients with sudden deafness. *Otol Neurotol* 2002; **23**:661–4
17 Wilson WR, Byl FM, Laird N. The efficacy of steroids in the treatment of idiopathic sudden hearing loss. *Arch Otolaryngol* 1980;**106**:772–6
18 Cinamon U, Bendet E, Kronenberg J. Steroids, carbigen or placebo for sudden sensorineural hearing loss: a prospective double-blind study. *Eur Arch Otorhinolaryngol* 2001;**258**: 477–80
19 Beni-Adani L, Pomeranz S, Flores I, Shoshan Y, Ginosar Y, Ben-Shachar I. Huge acoustic neurinomas presenting in late stage of pregnancy. Treatment options and review of literature. *Acta Obstet Gynecol Scand* 2001;**80**:179–84
20 Doyle KJ, Luxford WM. Acoustic neuroma in pregnancy. *Am J Otol* 1994;**15**:111–13
21 Kachhara R, Devi CG, Nair S, Bhattacharya RN, Radhakrishnan VV. Acoustic neurinomas during pregnancy: report of two cases and review of literature. *Acta Neurochir* 2001;**143**: 587–91
22 Gaughan RK, Harner SG. Acoustic neuroma and pregnancy. *Am J Otol* 1993;**14**:88–91
23 Sharma JB, Pundir P, Sharma A. Acoustic neuroma in pregnancy: emergency cesarean section and definitive neurosurgery. *Int J Gynaecol Obstet* 2003;**80**:321–3



Address for correspondence:
Mr S S Musheer Hussain,
Consultant Otolaryngologist, Honorary Reader,
Ward 26,
Ninewells Hospital and Medical School,
Dundee DD1 9SY, Scotland, UK

Fax: +44 (0)1382 632 816,
E-mail: musheer.hussain@nhs.net



Mr S S M Hussain takes responsibility for the integrity of the content of the paper
Competing interests: None declared