



Otological manifestations in pregnant women - A study at a tertiary care hospital of eastern India

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ABSTRACT

Background: There are several physiological changes found in pregnant women and amongst them, otological changes are quite important. The otological manifestations in pregnant women are mainly due to changes of sex hormones levels, which return to normal in the postpartum period.

Objective: To report otological manifestations among pregnant women.

Materials and methods: Eighty-four pregnant women participated in this prospective study. A questionnaire was administered in all participants for assessing otological manifestations. The pregnant women were in the age range of 22–35 years. They underwent thorough otological and obstetric examinations. Pure tone audiometry (PTA) was done for assessment of hearing loss.

Results: The mean age of the pregnant women in this study was 26.23 years. The most common otological manifestation was sensation of ear blockage. Eustachian tube dysfunction was common in the last trimester of pregnancy. Other manifestations included vertigo and tinnitus.

Conclusion: The alteration of hormonal milieu in pregnant women can lead to several otological manifestations, including eustachian tube dysfunction, hearing impairment, otitis externa, Bell's palsy, vertigo and tinnitus. Despite these otological manifestations found in pregnant women, yet they are often neglected in clinical practice.

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1. Introduction

Otological manifestations are often seen in pregnant women due to alteration of hormonal levels involving estrogen and progesterone (Wharton et al., 1990). Immediately following fertilization of the ovum by a sperm, female hormonal cycle starts to change. Embryo in the mother's uterus produces human chorionic gonadotrophin (hCG) which stimulates the increase of progesterone levels that fall midway through the luteal phase after ovulation. hCG begins to decrease after its peak at the end of the first trimester of pregnancy. However, progesterone levels along with human placental lactogen and estrogen continue to increase throughout

the pregnancy (Murthy et al., 2013). These hormones in pregnant women are important for growth of the fetus, but the effects of these hormones often extend beyond the uterus and can change physiological activities of the body. The majority of the changes related to hormonal level changes in pregnant women produce no harmful impacts on the mother or fetus, but some of the changes can become pathological and cause uneasiness, anxiety and discomfort (Murthy et al., 2013; Liang YX et al., 2018). The majority of otological manifestations during pregnancy are minor and temporary, but it is important for clinicians to determine the etiology of these symptoms to treat and provide assurance to pregnant women.

This study aims to evaluate otological manifestations during pregnancy to give better awareness to pregnant mothers and enhance the quality of life by avoiding unwanted medications and safely managing these symptoms without affecting the fetus.

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2. Materials and methods

This is a prospective observational study carried out at the department of Otorhinolaryngology and department of Obstetrics & Gynecology in a tertiary care teaching hospital in eastern India between August 2017 and July 2019. This study was approved by the Institutional Ethical Committee (IEC, reference number: IEC/IMS/SOAU/32/2017).

Out of the 379 pregnant women who visited authors' hospital during the study period, 84 (22.16%) attended the otorhinolaryngology outpatient clinic with presentations of otological manifestations and were included in this study after signing an informed consent agreement. The age of the participants varied from 22 to 35 years with a mean age of 26.23 years. Inclusion criteria included no previous histories/risk factors of otological manifestations/diseases, systemic diseases, toxemia during pregnancy, diabetes or hypertension. Because smoking is an irritant and adds several other changes in pregnant women and thus affects otological functions, pregnant women with smoking habits were excluded from this study.

All subjects underwent otoscopic examinations of the ear, tuning fork tests and pure tone audiometry (PTA) for assessment of hearing. Tuning fork tests included Rinne's test, Weber test and absolute bone conduction (ABC) tests at 128, 256, 512 and 1024 Hz. Air and bone conduction hearing thresholds were measured in all participants between 250 and 8000 Hz, using an Elkon Model EPA3N3 plus audiometer in a sound proof room.

3. Results

The most common otological manifestation among this group of pregnant women was a sensation of ear blockage, apparently due to eustachian tube dysfunction confirmed on impedance audiometry showing type-C curves ($n = 27$, 32.14%). All cases of ear blockage sensation and eustachian dysfunction were seen in the third trimester of pregnancy. These women were advised to perform Valsalva maneuver and prescribed topical nasal decongestants for relieve of nasopharyngeal mucosal edema to facilitate opening of the eustachian tube. Nine women presented with autophony due to patulous eustachian tube (Table 1).

Eighteen women (21.42%) showed hearing loss, including 8 showing conductive hearing loss affecting low frequencies (250, 500 and 1000 Hz) on PTA with negative Rinne's test, 7 showing sensorineural hearing loss on PTA with positive Rinne's test, and 3 cases showing mixed hearing loss (Table 2). PTA, tympanometry and tuning fork tests confirmed three cases of otosclerosis, evidenced by a notch on bone conduction audiogram along with As type tympanometry curves. The 7 cases of mild to moderate sensorineural hearing loss were all detected during the first trimester of pregnancy. Two of them were diagnosed as existing Meniere's disease before pregnancy.

Nine women showed true vertigo with spinning sensations, of whom 2 were diagnosed with Meniere's disease, 4 with benign

Table 1
Otological manifestations in pregnant women ($n = 84$).

Otological manifestations	Number	Percentage(%)
Blockage feeling in ear	27	32.14
Hearing loss	18	21.42
Tinnitus	12	14.28
Autophony	9	10.71
Vertigo	9	10.71
Otitis externa	5	5.95
Bell's palsy	4	4.76

Table 2
Hearing loss in pregnant women ($n = 18$).

Types of hearing loss	Number	Percentage(%)
Conductive hearing loss	8	44.44
Sensorineural hearing loss	7	38.88
Mixed hearing loss	3	16.66

paroxysmal vertigo as confirmed by Dix-Hall pike test, and 3 with vestibular neuritis (Table 3).

4. Discussion

Female sex hormones are unique because of their cyclic variations observed during pregnancy, menopause and menstrual period. Physiological alterations in the female body are common because of variation in levels of estrogen and progesterone. During pregnancy, a number of organs in the body are affected by hormonal changes of a pregnant mother including the otological system. The sex hormones also influence the central nervous system of the pregnant women (Miranda et al., 2018). During pregnancy, there are osmotic variations in the body where fluid and sodium retention can occur. Circulating sex hormones can affect the hearing system by retention of fluid in the labyrinth during pregnancy (MacDonald et al., 1993) Eustachian tube dysfunction can occur due to mucosal edema, which leads to obstruction of the eustachian tube and formation of glue ear or otitis media with effusion (Swain et al., 2014). A common clinical symptom of eustachian tube dysfunction is sensation of ear blockage and reduced hearing. This is often treated with oral or topical nasal decongestants, and less so by the insertion of grommet or ventilation tube. Autophony is a classical complaint among pregnant women due to patulous eustachian tube. A study demonstrated a relation among patulous eustachian tube, weight gain in pregnant women and raised serum estriol levels (Plate et al., 1979). In our study, about 1/3 of pregnant women with otological manifestations complained of a sensation of ear blockage and about 1 out of 10 presented with autophony.

Hearing loss during pregnancy does not appear to be a common clinical manifestation, although this may reflect the paucity of available literatures. Eustachian tube dysfunction is the key etiology behind the development of conductive hearing loss where fluid in middle ear leads to otitis media with effusion and manifests as hearing loss. In this study, 8 cases of conductive hearing loss were identified among the 18 pregnant women with hearing loss, of which 3 were diagnosed as otosclerosis. Pregnancy is significantly associated with low frequency sensorineural hearing loss that mimics cochlear pathology. involving 125, 250 and 500 Hz. This hearing loss begins at the 1st trimester and progresses in the 2nd and 3rd trimesters. Seven pregnant women presented with sensorineural hearing loss in this study. There is no major difference between the trimester and postpartum periods for hearing loss at or above 1000 Hz (Gonca et al., 2001). During pregnancy, speech audiometric findings are usually within normal limits, and the low frequency hearing loss never touches pathological levels and usually returns to normal in the postpartum period. Reduction in hearing level during pregnancy may occur due to retention of

Table 3
Etiological factors for causing vertigo/Giddiness among pregnant women ($n = 9$).

Etiology	Number	Percentage(%)
Benign Paroxysmal vertigo	4	44.44
Vestibular neuritis	3	33.33
Meniere's disease	2	22.22

excess fluid and sodium. Although such hearing loss mimics Meniere's disease, the audiological outcome is often within physiological limits. Preexisting Meniere's disease may worsen during the gestational period and patients may have more attacks during pregnancy. Episodes of vertigo may increase with fall in serum osmolality in pregnancy. These findings reveal the involvement of the labyrinth or inner ear during pregnancy (Gonca et al., 2001).

Sudden sensorineural hearing loss may be seen in pregnancy, which may be due to perilymph fistula secondary to fracture of the footplate of the stapes at the hour of effort in parturition leading to sudden onset of sensorineural hearing loss (Kenny et al., 2011; Whitehead, 1999). The hypercoagulable state during pregnancy may lead to occlusion of microcirculation in the labyrinth or inner ear which may cause sudden deafness (Kanadys et al., 2005). Changes of estrogen and progesterone hormone levels in pregnancy can influence the hearing mechanism and sensory nervous system (Bakar et al., 1977). Otosclerosis is a common cause of acquired hearing loss and commonly found in female. Otosclerosis is widely accepted as being associated with pregnancy where it is aggravated during the gestational period (Markou et al., 2009). Tinnitus or ringing sound in the ear is a frequent auditory symptom found during pregnancy. Different theories for etiopathology of tinnitus during pregnancy have been proposed, including hyperdynamic circulation, raised perilymphatic fluid pressure and hormonal changes in the body of the pregnant women (Singla et al., 2015; Nappi et al., 1992). One study showed 33% of the pregnant women complaining of tinnitus in comparison to 11% of non-pregnant women in the control group, with relieve of symptoms after delivery (Schmidt et al., 2010). In this study, 12 women (14.28%) presented with tinnitus. Severe tinnitus in pregnant women can even lead to early cesarean delivery of the baby at 34 weeks with resolution of tinnitus after delivery (Mukhopadhyay et al., 2007). Tinnitus may be an early warning sign for gestational hypertension or pre-eclampsia. It is prudent to have such type of cases monitored carefully, although there lacks complete logical investigation aside from a few case reports (Shapiro et al., 1999). In this study, no history of gestational hypertension or pre-eclampsia was found in the 12 cases of tinnitus.

Otitis externa or infection of the external auditory canal is usually seen in the third trimester of pregnancy, probably due to increase in sebum secretion in the ear canal under the influence of estrogen. The rate of sebum secretion in pregnancy with twins or triplets is not higher than in pregnancy with singlet, suggesting that the sebaceous factor originates from the pituitary gland rather than placenta (Millington et al., 2010). In this study, five pregnant women (5.95%) presented with otitis externa.

Bell's palsy is a unilateral lower motor neuron facial palsy with sudden onset and non-progressive in nature. There is a 3.3 times increased risk of developing Bell's palsy during the third trimester of pregnancy (Danielides et al., 1996). The increased risk for development of Bell's palsy during pregnancy is due to edema of the facial nerve and surrounding soft tissue from raised interstitial fluid volume which can lead to compression and ischemia of the facial nerve in the fallopian canal. Another hypothesis for the development of facial palsy is gestational immunosuppression induced by raised cortisol levels, which leads to reactivation of latent herpes simplex virus. In this study, four cases (4.76%) of Bell's palsy were identified in the third trimester. In another study, six cases of Bell's palsy were documented during the third trimester (Husban et al., 2008). It appears that the third trimester is the common period for onset of Bell's palsy during pregnancy.

Dizziness or vertigo is a common clinical problem during pregnancy. Incidence of vertigo during pregnancy increases with decline in serum osmolality in pregnancy, which may be influenced by alterations of hormonal levels and fluid-volume affecting the

vestibular systems (Black et al., 2002). One study documented that the most common vestibular symptom is vertigo in the first trimester (22.72%), instability in the second trimester (12.12%) and gait imbalance in the third trimester (12.12%), followed by falling tendency (11.11%) (Schmidt et al., 2010). These results reveal a possible vestibular change stemming from altered hormonal levels in pregnant women that can lead to vertigo in the first trimester. and the vertigo symptom can change in the following trimesters through labyrinthine habituation. As evidenced in the literature, these vestibular changes will normalize throughout the pregnancy period, leading us to assume that there is habituation of labyrinthine activities. Instability or falling tendency during the third trimester can be explained by increase of body weight and changing of posture of the pregnant women that increase with progression of gestation. This is supported by another study where a greater antero-posterior oscillation during the third trimester in comparison to the first trimester of pregnancy was found, indicating a decrease in balance in this phase (Ribas et al., 2007). Meniere's disease or endolymphatic hydrops is a disorder of the inner ear where the endolymphatic system is extended by endolymph retention. It is characterized by vertigo, sensorineural hearing loss, aural fullness and tinnitus. Estrogen and progesterone can probably worsen the clinical scenario of Meniere's disease. In an acute attack, dimenhydrinate and meclizine can be safely prescribed to pregnant women. Histamines and diuretics are usually avoided in pregnancy for treating Meniere's disease as these can cause hypotension, hypovolemia and decrease the cardiac output. In case of intractable vomiting, metaclopramide can be used (Sherlie et al., 2014). Two cases were confirmed as Meniere's disease in this study.

We did not find similar studies for the eastern India region and the current study showed pregnant women can have several otological manifestations which can be easily managed by clinicians in day to day clinical practice.

5. Conclusion

In conclusion, this study shows that auditory and vestibular complaints such as hearing loss, vertigo and tinnitus are not uncommon among pregnant women. These otological symptoms are often due to alterations of sex hormones in pregnancy. The majority of these otological symptoms can be treated conservatively as they usually disappear after delivery of the baby. Avoidance of unnecessary medications or interventions can decrease the risk to the fetus.

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