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Review Article

Vertigo during pregnancy: a review

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ABSTRACT

Vertigo is defined as a false sensation of movements where a patient gets a rotating perception of the environment or oneself. Vertigo and dizziness are commonly experienced during the pregnancy period and are among the most common complaint by pregnant women to the primary care physicians. Vertigo during pregnancy affects the quality of life of women and also has an impact on the fetus. Pregnancy is an important nine-month physiological period of female life. During pregnancy, the body of the female undergoes several physiological changes that affect all systems and organs, including sensory ones. There are significant changes during pregnancy including otological and neurotological manifestations. Vertigo/dizziness is a common complaint during pregnancy to the clinicians. Benign paroxysmal positional vertigo (BPPV), Meniere's disease (MD), vestibular neuritis and vestibular migraine are common vestibular disorders result in vertigo during pregnancy. Vertigo during pregnancy directly affects the pregnant mother both mentally and physically. A multidisciplinary approach by otolaryngologists, neurologists, and gynaecologist and obstetricians is required for proper evaluation and management of vertigo in pregnant women. Currently, there are no guidelines for the management of vertigo in pregnancy. Little has been reported about vertigo during pregnancy. We performed a narrative review of vertigo in pregnant women.

Keywords: Vertigo, Pregnancy, Benign paroxysmal positional vertigo, Meniere's disease

INTRODUCTION

Pregnancy is a very important physiological condition in a female. During pregnancy, there are changes in psychological, cardiovascular, and hormonal effects on the body.[1] There are certain hormones like estrogen, progesterone, human chorionic gonadotropin, placental lactogen, and relaxin resulting in anatomical and functional changes in the cardiovascular, respiratory, gastrointestinal, musculoskeletal, dermatological, and audiovestibular systems.[1] There are multiple symptoms due to the involvement of the audiovestibular system such are hearing impairment, tinnitus, otosclerosis, autophony, facial nerve paralysis, and vertigo present for the first induce or get exacerbated during pregnancy.[2] These audiovestibular manifestations during pregnancy can be explained by the effect of estrogen and progesterone on different structures involved in hearing and balance such as the cochlea, stria vascularis, and spiral ligament, resulting in chemical and osmolar changes in the endolymphatic fluid, which is an important component involved in the regulation of the labyrinthine function.[3]

The vestibular symptoms like vertigo or dizziness in pregnant women can affect the mother and child. There are reports showing exacerbation of Meniere's disease, benign paroxysmal positional vertigo (BPPV), and vestibular neuritis during pregnancy.[2] However, there are very little data available for vertigo during the pregnancy

period. The objective of this study was to discuss the prevalence, etiopathology, and clinical presentations of different types of disorders causing vertigo during pregnancy period.

METHODS OF LITERATURE SEARCH

Current research publications on vertigo during pregnancy were found using a variety of methodical methodologies. We began by conducting an online search of the Scopus, PubMed, Medline, and Google Scholar databases. PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analysis) standards were used to create a search strategy. Other research articles were discovered manually from the citations using this search approach, which recognized the abstracts of published works. Eligible studies included randomized controlled trials, observational studies, comparative studies, case series, and case reports. The total number of articles was 58 (22 case reports; 16 cases series; 20 original articles) (Figure 1). This paper focuses solely on vertigo during pregnancy. This research looks at the prevalence, etiopathology, clinical manifestations, diagnosis, and treatment of vertigo during pregnancy. This research lays the groundwork for future prospective trials on vertigo during pregnancy. It will also serve as a springboard for further research on vertigo in pregnant women.

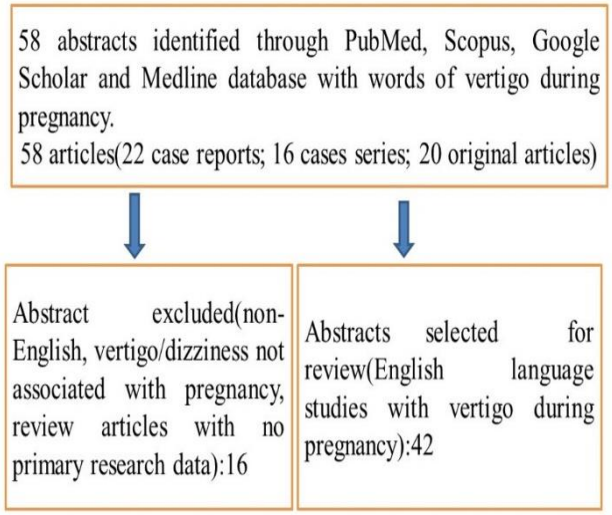

Figure 1: Flow chart showing methods of literature search.

PREVALENCE

At least 80% of the global population has suffered from vertigo, at least one episode of vertigo in their lifetime, and it is considered as most common clinical presentation in the emergency department and office consultations.[4] The annual incidence of vertigo globally is approximately 7% and rises to 30% per year.[4] Vertigo is more commonly seen during the first trimester followed by the second trimester where instability and gait imbalance are more common.[5] In the third trimester, instability is more frequent followed by a tendency to fall.[5] The exacerbation of Meniere's disease (MD) is often found in the third trimester of pregnancy in up to 57% of the patients, and vestibular migraine (VM) in up to 50% of the patients.[6] BPPV is the most common cause of vertigo in the general population and accounts for 20 to 40% of all case, with a reported incidence of 0.6% per year, a prevalence between 10.7 and 64.0 cases per one lakh and a lifetime prevalence of 2.4%.[7]

ETIOPATHOLOGY

The physiological alterations during pregnancy have been considered as a possible substrate for the development of vestibular manifestations such as vertigo.[8] During pregnancy, retention of the fluid in endolymph and perilymph, modulation of the immune system resulting in viral reactivation, hypercoagulability, and direct effect of gestational hormones on the labyrinthine system are some pathophysiological mechanisms that have been suggested as responsible for certain ear disorders in pregnancy such as Meniere's disease, sudden sensorineural hearing loss, eustachian tube dysfunction, benign paroxysmal positional vertigo, and vestibular schwannoma.[9] The most consistent findings in MD are endolymphatic hydrops. The severity of vertigo in MD is aggravated during early pregnancy due to decreased serum osmolality. Although the mechanism for reduced serum osmolality in early pregnancy remains unknown, aggravates the vertigo episodes in MD. The sudden decline of serum osmolality induces an osmotic gradient between the outer and inner endolymphatic sac so that free water can enter the endolymphatic sac, leading to exacerbation of endolymphatic hydrops. It seems that pregnancy can become a natural experimental situation for studying the relation of serum osmolality to MD. The exact pathophysiology of the BPPV during pregnancy is still debated. Trauma to the head contributes to the etiology of about half of the patients with BPPV.[10]

Prolonged bed rest is also thought of as the etiology of BPPV.[11] Recently, there are reports that calcium and vitamin D metabolism disorders act as risk factors for BPPV. Calcium and vitamin D metabolism is often affected in pregnancy, particularly in the late trimesters because of the rapid growth of the fetus. This may be an important risk factor for pregnant females suffering from BPPV.[12] BPPV has multiple etiologies, but hormonal abnormalities or hormonal changes as aggravating factors are not enough to explain the etiology in pregnancy. Hormonal changes during the menstrual period, pregnancy, and menopause induce different homeostatic and metabolic effects. There are a few theories related to estrogen effects that have been proposed and the estrogen receptors are found in the inner ear of the normal mice.[13] These receptors are found in spiral ganglion and stria vascularis which are vital for the transmission of sound and inner ear homeostasis.[14]

Alterations in the estrogen levels are thought to impair the endolymphatic fluid electrolyte concentration, resulting in degeneration of otoconial fibers, or induce endolymphatic pH liabilities, resulting in otoconial degeneration.[15] Estrogen is thought to affect endolymphatic ionic and anionic homeostasis by controlling ion and anion channels.[16]

However, estrogen also enhances the vascular supply to the macula and otoconia due to varied glucose and lipid metabolism.[16] Calcium and vitamin D metabolism is often affected during pregnancy, particularly in the last trimester due to the rapid growth of the fetus. This is an important risk factor in pregnant women diagnosed with BPPV.[17] The normal serum concentration of vitamin D is required for the development of normal otoconia by keeping the calcium concentration in the vestibular endolymph at a normal critical level, as either high or low calcium would lead to abnormal otoconia. This is achieved by the epithelial calcium channel transport system found in the labyrinth, which is maintained by vitamin D receptors.[18] Vitamin D deficiency leads to the production of abnormal otoconia, which results in otolith dysfunction.

DISORDERS CAUSING VERTIGO DURING PREGNANCY

Benign paroxysmal positional vertigo

Benign paroxysmal positional vertigo (BPPV) is a common clinical condition characterized by sudden, brief paroxysmal attacks of rotation vertigo occurred by changing the head position.[19] In BPPV, there is degenerative debris dislocated from the utricle into the semicircular canals increasing the density of the cupula.[20] This may happen either when the deposits are abnormally attached to the cupula (cupulolithiasis) or when the dense particles freely move in the endolymphatic fluid in the semicircular canals(canalolithiasis).[20] Estrogen alteration is thought to impair endolymphatic fluid electrolytes concentration, resulting in degeneration of otoconial fibers, or induce endolymphatic pH liabilities, causing degeneration of otoconia.[21]

Meniere's disease

Meniere's disease (MD) is a vestibular disorder characterized by vertigo, tinnitus, fullness in the ear, and sensorineural hearing loss.[22] MD occurs due to disturbances in the regulation of endolymphatic fluid in the labyrinth resulting in obstruction, so increased endolymphatic sac pressure.[22] (M)There are some environmental, metabolic, and genetic causes associated with MD.[22]

During the period of pregnancy, there is decreased in the osmolality of systemic and local fluids in the inner ear, leading to a raised and turbulent osmotic gradient known as hydrops to the endolymphatic sac, saccule, cochlea and the semicircular canals.[23] During pregnancy, MD has often attributed to the acute onset of vertigo or hearing loss in the second and third trimesters. Many pregnant women present MD which may reverse after labor. In the case of MD diagnosed previously, may be exacerbated during the second and third trimesters.[24] MD is diagnosed based on Barany Society criteria such as two or more episodes of spontaneous vertigo for 20 minutes to 12 hours; low and mid-frequency sensorineural hearing loss recorded with pure tone audiometry in one ear, defining the affected ear, and at least one episode before, during or after one of the vertigo attacks; fluctuating auditory symptoms such as hearing loss, aural fullness and tinnitus; there is no other vestibular diagnosis which better explains the symptoms.[25]

Vestibular migraine

The characteristic features of vestibular migraine (VM) are episodic vertigo, phonophobia, intolerance to light, auras, and headache.[26] Before pregnancy, many of them are diagnosed with migraine.[26] It can occur in any age group with a prevalence of 1.1 to 3.2%.[26] VM is more common in females compared to males with a ratio of 1.5:5.[26] The exact cause of VM is not clear and there are several theories proposed such as neurochemical, genetic, and inflammatory mechanisms, all are derived from the etiopathology of migraine.[27,28]

Up to 40% of pregnant women experience VM and the duration of vertigo may range from minutes to hours.[29] Other than classical features of VM, the patient may complain of tinnitus in bilateral ears in comparison to nonpregnant females.[27] Videonystagmography often shows persistent positional nystagmus or saccadic pursuits in case of long-standing VM.[26] Other features in VNG include reduced caloric response, increased contralateral preponderance, and raised vestibular unilateral deficits in 10 to 20% of the pregnant women.[26]

Vestibular schwannoma

Vestibular schwannoma may be diagnosed during pregnancy and can rapidly increase its volume in that period. Approximately thirty cases of vestibular schwannoma were reported in the medical literature. It is unclear whether the rapid growth of the vestibular schwannoma during pregnancy might be due to the direct impact of hormones in a small part of the tumors or to an indirect effect of raised vascular supply. A study on estrogen receptors in sporadic vestibular tumors showed negative results.[26]

Vestibular neuritis

Vestibular neuritis is the commonest cause of acute spontaneous vertigo. Vestibular neuritis is characterized by acute onset of vertigo, nausea, and vomiting.[30] There are no auditory symptoms such as hearing loss and tinnitus.[30]

The pure tone audiogram is normal. It may be due to the reactivation of the herpes simplex virus in the vestibular ganglia. This reactivation may occur during pregnancy by hormonal or metabolic exacerbation.

Postpartum vertigo

Postpartum vertigo is associated with several causes and most of them are non-otological, with few cases due to abrupt changes in the middle ear and intracranial pressure. It may be due to the Valsalva maneuver during labor which can result in the vestibular system including perilymph fistula formation and superior semicircular canal dehiscence.[31]

CLINICAL MANIFESTATIONS

Pregnancy is an important physiological period of a female life where the symptoms should be carefully reasoned for avoiding the possible consequences for mother and fetus. During the gestational period, nausea and vomiting are often physiological. Certain endocrinological, metabolic, and physiologic changes might exacerbate certain otolaryngological manifestations such as a patulous eustachian tube, nasal congestion, nasal bleeding, nasal congestion, gingivitis, and reflux esophagitis. Change of head position provokes episodes of vertigo in BPPV.[32]

The vertigo attacks occur when the patient rolls over onto the affected side or tilts the head back while looking in an upward direction. There may be associated symptoms such as nausea and vomiting. Patients often present with dizziness, nausea, and vomiting. There may be associated hearing loss and tinnitus in the case of MD. The duration of vertigo is 20 minutes to 20 hours in MD whereas a few seconds in BPPV. Estrogens and progesterone cause changes in the mucosal membrane of the nose and nasopharynx. It results in nasal discharge, and nasal blockage and eventually causes eustachian tube dysfunction and manifest sensation of ear blockage and autophony during pregnancy.[33] These manifestations are transient and recover fully after delivery. Pregnant women with MD present with episodic vertigo, fluctuating sensorineural hearing loss, and roaring or hissing type of tinnitus.[22]

IMPACT OF VERTIGO DURING PREGNANCY

Vertigo affects the routine life involving family, social and professional environment thus resulting in a deterioration of physical and psychological well-being with the onset of frustration, depression, lack of self-confidence, and failure of concentration at the workplace.[34] Vertigo and dizziness are commonly reported symptoms in the general population and pregnant women.[35] Nausea and vomiting associated with a normal pregnancy may be precipitated or influenced by the vestibular disorders; however, the evidence for this is presently under observation.[36] The course of MD in pregnancy is poorly reported in the medical literature but it has been found to be exacerbated during the late luteal phase of the menstrual cycle.[37] So, it may have some relationship with hormonal changes that cause fluid retention.

DIAGNOSIS

The diagnostic evaluation of vertigo in pregnant women needs complete history taking regarding medical diseases, proper audiovestibular examination, and investigations. All pregnant women with vertigo require audiological and vestibular assessment after the otoscopic examination. The history of the patient should be taken on related pathologies like hypotension/hypertension, cardiovascular pathologies, hypoglycemia, neuropathies, and ophthalmological disorders. If anybody with hearing loss, tinnitus, otorrhea, otalgia, and diplopia should be documented. The onset and duration of vertigo should be documented for assessment of vertigo.

A diagnosis of posterior semicircular canal BPPV is confirmed by a transient, up beating, torsional nystagmus with eyes beating towards the underlying ear when the patient is rapidly positioned into a lateral hanging position (Dix-Hallpike test).[38] Audiological investigation such as pure tone audiometry is useful to rule out hearing loss in pregnant women. Magnetic resonance imaging (MRI) is useful to find out the pathology in the brain. Glycerol test, electrocochleography (ECoG), caloric test, eye-tracking test, auditory brain stem response (ABR), and computed tomography (CT) scan are the useful test to confirm the diagnosis of MD. There are no confirmatory diagnostic tests are available for vestibular neuritis and the primary diagnosis of it is a diagnosis of exclusion. The diagnosis of vestibular neuritis is usually based on a constellation of bedside and laboratory findings. The diagnostic hallmarks of vestibular neuritis are spontaneous horizontal torsional nystagmus beating away from the side of the lesion, abnormal head impulse test for the affected semicircular canals, ipsilateral caloric hypofunction, reduced response of vestibular evoked myogenic potentials during stimulation of the affected ear, and unsteadiness with a falling tendency to the affected side.[39]

TREATMENT

The treatment of vertigo during pregnancy often makes a challenging situation. Appropriate medications may be avoided to prevent their harmful effects on the fetus. The majority of patients with BPPV are self-limiting.[40] The canal repositioning procedure is considered an efficient and long-standing noninvasive treatment option for BPPV. Treatment of BPPV is usually done by the Epley maneuver and Semont's maneuver. However there some controversy still exists as to whether these maneuvers are effective other than central habituation. Some resistant cases of BPPV and variants of the disease may create a significant problem. The treatment of MD during

pregnancy is appropriately conservative. During pregnancy, the treatment recommendation for MD is done by salt and caffeine reduction.[41]

The objective of the treatment in MD is always to reduce the endolymphatic pressure. The intake of prochlorperazine is an acute attack of vertigo and must be used during pregnancy with caution because of its antipsychotic effects like extrapyramidal effects in the newborn if used in the third trimester.[41] To control vertigo in MD, dimenhydrinate (Dramamine) and meclizine are relatively safe in minimal doses. Isosorbide is also very effective for controlling the MD. Isosorbide is usually a safe drug during pregnancy. In MD, intratympanic treatment of steroids through the round window is supposed to provide adequate effect and avoid harmful effects of systemic medications.[42]

Vestibular-evoked myogenic potential (VEMP) is a useful test to determine whether the saccular, inferior vestibular nerve, and central connections are working normally. Diazepam can be used as a vestibular suppressant. However, it is contraindicated in pregnancy, if used for a long time or high dose as it causes side effects like floppy infant syndrome and benzodiazepine withdrawal syndrome.[43]

Corticosteroid is very effective in vestibular diseases like vestibular neuritis as an anti-inflammatory effect, rapidly and significantly decreasing the nerve inflammation and improving the recovery of vestibular deficit.[44] Dexamethasone/Betamethasone may be prescribed to pregnant women at risk of premature birth to promote maturation of the fetal lungs.[45]

Cawthorne-Cooksey exercises is a very good home exercise for patients with vestibular neuritis. These exercises include standing with eyes open or closed on a platform moving, relative to the subjects, in the anteroposterior or mediolateral direction. These exercises should be done twice daily, 30 minutes per session, for five days. The most commonly used canalith repositioning maneuver is the Epley maneuver.[38] Patients should avoid standing for a long period and make sure to keep moving when standing to enhance circulation. Pregnant women should avoid lying on their backs in the second and third trimesters. Pregnant women should eat healthy food frequently for avoiding low blood glucose levels. The pregnant women should drink plenty of water to avoid dehydration. She should be supplemented with vitamin D3 in BPPV.[46]

CONCLUSION

Hormonal changes during pregnancy can cause vertigo. It has significant morbidity and psychosocial impact on the patient's life. There should be cooperation among otolaryngologists, gynaecologists, and neurologists for proper diagnosis and the appropriate rehabilitation and/or pharmacological treatment. Conservative management is appropriate for treating vertigo during pregnancy. To improve the quality of life during gestation, clinicians should consider this clinical entity in their differential diagnosis, which will help to avoid vertigo-related morbidity which compromises both maternal and fetal status.

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