



# H1N1-Induced Sudden Sensorineural Hearing Loss in 14-Year-Old Adolescent

Petros Vrettakos, Evmorfia Koulou, Anastasia Gounari and Konstantina Chrysouli\*

Department of Otorhinolaryngology, Head and Neck Surgery, Penteli Children Hospital, Greece

## Abstract

We report a case of acute unilateral sensorineural hearing loss caused by the H1N1 virus in a 14-year-old male adolescent.

Only two cases of severe sudden sensorineural hearing loss secondary to H1N1 virus infection in pediatric population have been reported in the literature so far, with our case representing the third case and the first case related to patient in puberty.

This unfortunate outcome developed subsequent to, and was probably related to, the viral infection. Children with normal hearing and successful results in the neonatal hearing screening program in the hospital where they have been born, who develop sudden hearing loss after an acute upper respiratory infection, should be investigated for this extremely rare complication of H1N1 virus.

**Keywords:** Sacute sensorineural hearing loss; pediatric population; H1N1 virus; Rare complication

## Introduction

Viruses such as mumps, Cytomegalovirus (CMV) and herpes zoster or herpes simplex can cause sudden SSNHL (Sudden Sensorineural Hearing Loss) [1].

The common symptoms of H1N1 (Influenza A) infection are similar to those of seasonal influenza and include fever, headaches, sore throat, runny nose, sneezing, dry cough, myalgia, tiredness [2]. Rarely, it can also cause temporary and potentially permanent hearing loss [3].

We report a case of acute unilateral sensorineural hearing loss caused by the H1N1 virus in a 14-year-old male adolescent.

## Case Presentation

A 14-year-old, otherwise healthy, male adolescent presented to the pediatric clinic of our hospital with sudden vertigo, multiple episodes of vomiting (nine), feeling of right ear pressure and acute hearing loss at the right ear. During the objective clinical examination and his medical history, the patient had no fever, no signs of meningitis, only vertigo (retational dizziness) accompanied by vomiting. The patient had a history of H1N1 infection a month ago, confirmed by Polymerase Chain Reaction (PCR) and had been treated with oseltamivir (tamiflu). The patient was fully vaccinated. Neurological examination revealed an episode of peripheral type vertigo.

Prior to this illness, her hearing had been normal and her speech development had been appropriate for his age. The patient had free personal and family history. ENT clinical examination was normal. Endoscopy of both eardrums showed no pathological signs. The tympanogram was normal – there wasn't any pathology from the middle ear such as fluid or perforation of tympanic membrane (type A). The acoustic reflexes were normal in both ears. Tuning fork test: Weber was lateralized to the left ear and Rinne test at 256, 512 Hz showed air conduction greater than bone conduction on both ears. The patient had a third degree left-beating optokinetic nystagmus, compatible with right peripheral vestibulopathy. Computed tomography and Magnetic Resonance Imaging (MRI) scans of the brain and temporal bones showed no pathology of the related structures. Ondansetron 4 mg and solu-medrol 125 mg was administered to the patient. Twelve hours later, the patient presents with an improved clinical condition. Thus, audiological assessment was performed. The audiogram indicated unilateral, right ear, severe Sensorineural Hearing Loss (SNHL), especially at middle and high frequencies (Figure 1a and 1b).

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### \*Correspondence:

Konstantina Chrysouli, Department of Otorhinolaryngology, Head and Neck Surgery, Penteli Children Hospital, Greece,

E-mail: konstantinachr@hotmail.com

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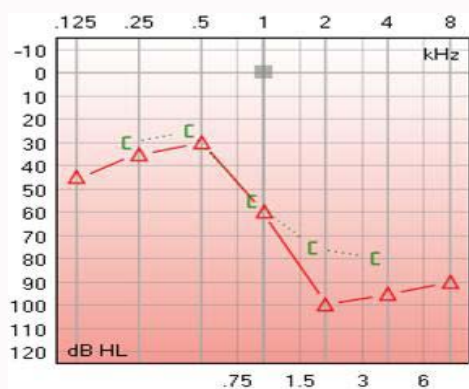


Figure 1a: Effective masking for test ear right.

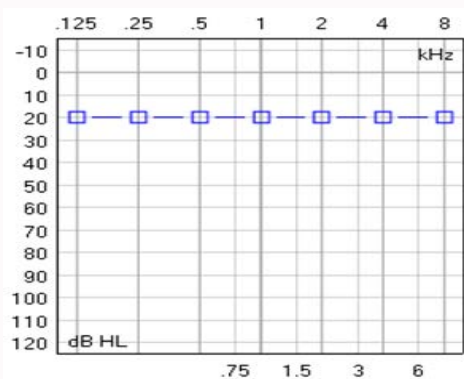


Figure 1b: Effective masking for test ear left.

A complete hematological and biochemical blood test examination was performed, including thyroid function (FT3, FT4, TSH, Anti-TG, and Anti-TPO). All patients' laboratory values were normal. Moreover serologic tests that detect antibodies (IgM and IgG) against Varicella, CMV, HSV, Rubella, Toxoplasma, and EBV were negative. Cortizone, labyrinth suppressants, gastroprotective agents and amoxicillin with clavulanic acid were systematically administered for 14 days.

## Outcome and Follow-Up

After two months of follow up, the patient had complete recovery of his balance and some notable recovery of the function of the right auditory nerve at middle and high frequencies (Figure 2a and 2b).

## Discussion

One study of idiopathic sudden hearing loss found influenza virus group B in 14 patients (18%), rubella in 12 (16%), herpes simplex type1 in 6 (8%), mumps virus in 6 (8%), influenza group A in 6 (8%), rubella virus in 5 (7%) and cytomegalovirus in 5 (7%).

There have been very few published studies of influenza A (H1N1) virus and its clinical manifestations in the pediatric population [4-18].

Influenza A infection can block the Eustachian tubes and fluid enters the middle ear, which normally is filled with air. The result in this case is bilateral conductive hearing loss, which is temporary.

Sensorineural hearing loss can be caused as a rare complication of Influenza A. Inflammation can cause damage to the inner hair cells in the organ of Corti [11].

The last decade cultured human Schwann cells were exposed to human influenza A virus *in vitro*. Sudden sensorineural hearing loss and vestibular neuronitis have been associated with a viral etiology, due to the infection of nerve cells.

A retrospective review of 365 patients with influenza A(H1N1) infection and central nervous system manifestations at Texas Children's Hospital between April 2009 and June 2010 showed that 32 patients (8,8%) had central nervous system manifestations, while only one among the above 32 patients developed sensorineural hearing loss (n=1; 3.1%) [18].

Following a review of the literature, two pediatric patients developed bilateral, sever sensorineural and permanent hearing loss secondary to H1N1 virus infection [3]. A two-year-old girl presented with a history of deafness which was noted by her family to have began two months previously, after she had suffered bronchopneumonia caused by influenza A (H1N1).

The second patient was a three-month-old male infant was brought in by his family because he had stopped responding to sound. This had begun after the child had suffered a high fever and had been admitted to hospital for investigation.

In the two reported cases, the deafness was bilateral, severe, sensorineural and permanent. Clinical ENT examination of both patients was normal. Influenza an infection was confirmed by polymerase chain reaction. Both patients had been treated with oseltamivir due to N1N1 infection. The patient had free personal and family history. Both children had passed the neonatal hearing screening program in the hospital where they had been born. Congenital infection screening tests and thyroid function tests were both normal. Auditory brain stem responses of both ears in two cases, showing a V wave detectable at a threshold of 85 dB in both ears. The final diagnosis was bilateral, severe, Sensorineural Hearing Loss (SNHL) secondary to H1N1 virus infection. No specific radiological features of the temporal bone were seen in these cases: Computed tomography and Magnetic Resonance Imaging (MRI) scans of the brain and temporal bones were normal.

Our case represents the third case of severe sudden sensorineural hearing loss secondary to H1N1 virus infection in pediatric population and the first case related to patient in puberty referred in the literature till date.

There are some similarities with our case: Influenza an infection was confirmed by polymerase chain reaction in all case and patients had been treated with oseltamivir. There was no other personal or family history in all children. All children had passed the neonatal hearing screening program in the hospital where he had been born. Congenital infection screening tests and thyroid function tests were normal. The clinical examination was normal. Computed tomography and Magnetic Resonance Imaging (MRI) scans of the brain and temporal bones were without any pathology from the related structures. No specific radiological features of the temporal bone were detected in these three cases.

In the two above reported cases, the hearing loss was bilateral, severe and permanent at all frequencies. The patients were fitted with hearing aids. The difference in our case is that the patient had sudden unilateral right ear sensorineural hearing loss and symptoms of lavyrinthitis, affecting the corresponding right vestibular nerve, such as nausea and vomiting. Audiological assessment with audiogram

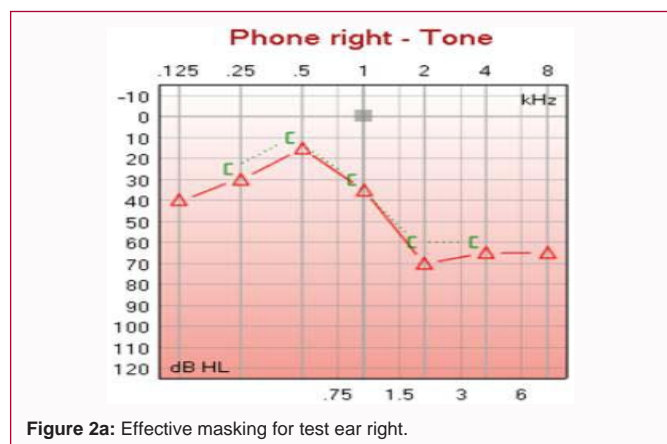


Figure 2a: Effective masking for test ear right.

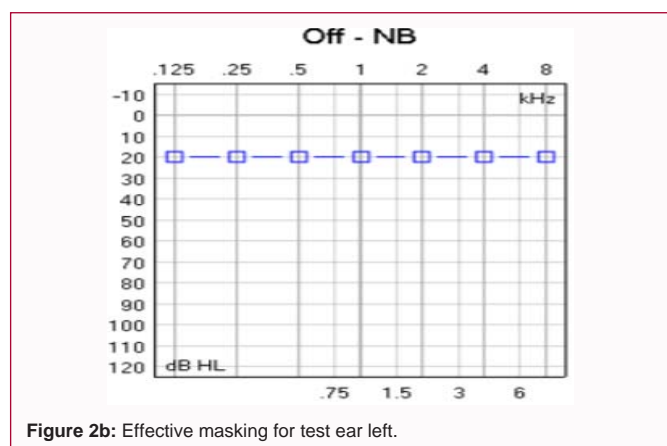


Figure 2b: Effective masking for test ear left.

indicated unilateral right ear severe, sensorineural hearing loss, especially at middle and high frequencies. The patient had complete recovery of his balance and some notable recovery of the function of his right auditory nerve.

The cause of sudden sensorineural hearing loss is difficult to detect. More often the examination is negative. Viral infections are related to acute sensorineural hearing loss, unilateral or bilateral, mild to severe. In our case the recent history of H1N1 infection is responsible for this complication. Although the references of the literature are extremely rare, the high incidence of this serotype of virus, forces us to think of it as a possible cause.

The above three patients are the first reported cases of severe sensorineural hearing loss as a rare complication of H1N1 virus infection reported in children so far. Our case is the first reported in patient in puberty secondary to H1N1 infection. This unfortunate outcome developed subsequent to, and was probably related to, the viral infection.

More such cases have been described in adults and not in children and adolescents [9]. A 73-year-old man developed sudden, right ear sensorineural deafness. His daughter was diagnosed with H1N1 infection four days and before and was admitted to the intensive care unit due to bilateral massive pneumonia and acute respiratory distress syndrome. Because of the family relationship the man was examined with PCR analyses of throat and nose swab cultures. The influenza diagnostic testing was positive. After 24 h of treatment with high dose of prednisolone (60 mg daily), the patient recovered completely and was discharged from the hospital. He continued prednisolone per os in a tapering form.

Hearing loss due to vaccination has been also report [12].

A 17-year-old female developed acute bilateral hearing loss after a H1N1 influenza vaccination [13]. Thimerosal, a component of H1N1 vaccine, increases intracellular calcium in the outer hair cells of the cochlear in pigs [14,15]. Audiometry showed a hearing threshold of 55 decibel (dB) bilateral. After six days of therapy with prednisolone 1 mg/kg/d the patient's hearing improved impressively.

A second reported case of a 79-year-old woman presented at the hospital with sudden bilateral hearing loss after an vaccination with Xanaflu<sup>®</sup> [12]. It is known that Xanaflu<sup>®</sup> consists of the inactivated surface antigens of the Influenza virus type a strains H1N1 and H3N2, and of the type B strain [16]. Audiological assessment showed bilateral severe sensorineural hearing loss. The patient had no improvement of his hearing and finally received a cochlear implant.

A third reported case was a 30-year-old man who presented with acute right-sided tinnitus and hearing loss after receiving a Trivalent Inactivated Influenza Vaccine (TIV) [17]. Audiogram revealed severe sensorineural hearing loss in high frequencies in the right ear. He was treated with a prednisone taper, without any sign of improvement eventually.

## Conclusion

Children with normal hearing and passed the neonatal hearing screening program in the hospital where they have been born, who develop sudden hearing loss after an acute upper respiratory infection, should be investigated for this extremely rare complication of H1N1 virus.

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