

Postnatal Risk Factors of Congenital Hearing Impairment: Otitis Media, Head Injuries and Convulsions

M. Vishnu Vardhan Reddy*, L. Hema Bindu**, P. Usha Rani** and P.P. Reddy**

* *Department of ENT, Osmania Medical College, Hyderabad, Andhra Pradesh, India*

** *Institute of Genetics and Hospital for Genetic Diseases, Ameerpet,
Hyderabad 500 016, Andhra Pradesh, India*

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ABSTRACT Hearing impairment is the most prevalent sensory disability and is caused by a variety of genetic and environmental factors. Many studies have proposed otitis media, head injury, convulsions, respiratory problems and infections to the infants as the important antecedents of neonatal deafness or hearing impairment. A prospective etiological study of adverse postnatal conditions leading to bilateral sensorineural neonatal hearing impairment was conducted. In this study 1076 children below 14 years of age with congenital hearing loss were investigated. The results showed adverse postnatal history in 20.26% (218) of the cases out of 1076. High risk factors included otitis media, head injury and convulsions and respiratory distress. Majority (126/11.71%) of the cases showed otitis media followed by head injury in 4.83% (52) of the cases, convulsions in 2.78% (30) of the cases and respiratory problems in 0.92% (10) of the cases. It can be concluded that careful monitoring of the child during the first few years and vaccination against all the infections is necessary.

INTRODUCTION

Hearing loss is relatively common in human population and is caused by multiple factors. The incidence of hearing disability is 2-3 per 1000 live births in India and 1 per 1000 babies is profoundly deaf at birth or in the prelingual childhood period (Kundu 2000). Approximately 50% of the cases are thought to be due to genetic factors, upto 40% due to environmental factors and the remaining are due to unknown causes. Otitis media is one of the major etiological factors of congenital conductive hearing loss. Chronic suppurative otitis media is most often reported in the Indian scenario. It is defined as a stage of chronic ear infection of the middle ear cleft, a non-intact tympanic membrane and discharge (otorrhea). It is an insidious and potentially dangerous disease. It is a serious bacterial infection of the middle ear that can follow untreated acute otitis media. The prevalence of chronic suppurative otitis media (CSOM) around

the world ranges from 1-46% in developing and developed countries (WHO, 1996). The various risk factors for the development of CSOM include young age, poor hygiene, lack of breast feeding, poor nutrition, nasopharyngeal colonization with potentially pathogenic bacteria, Eustachian tube dysfunction and inadequate health care. Chronic suppurative otitis media is known for its chronicity and difficulty to achieve dry ear. The recurrent otitis media or chronic otitis media may result in large perforation of tympanic membrane or gross adhesive changes leading to ossicular necrosis and irreversible hearing loss, mostly conductive which may also lead to delayed development of speech and language in young children. Children who survive adverse perinatal conditions such as premature birth, very low birth weight, birth asphyxia, instrumentation during delivery often develop serious neurodevelopmental disabilities such as neonatal seizures/late onset of convulsions, respiratory problems, impaired mental development, cerebral palsy, blindness or deafness. In many cases any one of these impairments can also be associated with late onset or delayed progressive sensorineural hearing loss. Hence proper care during birth and proper monitoring after birth of the child is required to prevent adverse postnatal conditions leading to direct hearing loss or indirect disease related sensorineural hearing loss that can cause

Address for correspondence: Prof. P.P. Reddy,
Institute of Genetics and Hospital for Genetic Diseases,
Department of Environmental Toxicology, Ameerpet,
Hyderabad 500 016, Andhra Pradesh, India
Telephone: +91-040-30914208/23403681
(Off) / +91-040-23113092 (Res)
Mobile: 9392434664
E-mail: reddypenagaluru@rediffmail.com
bindurao@rediffmail.com

permanent disability in survivors of adverse perinatal conditions. In India very few studies have been taken up on congenital hearing loss due to adverse postnatal conditions. Hence an attempt is made to study the role of otitis media, head injury and convulsions in the causation of congenital hearing impairment.

MATERIALS AND METHODS

The study was conducted from January 2003 to July 2005 in Govt ENT hospital and schools for deaf in and around Hyderabad. Etiological evaluation was carried out in children with congenital hearing impairment. 1076 children below 14 years of age with congenital bilateral hearing impairment formed the study group. The clinical diagnosis of the patients was made after a detailed examination and audiological screening using Puretone audiometry (PTA), Oto acoustic emissions (OAE) and Brainstem auditory evoked responses (BAER). The data collected on epidemiological factors included medical history of the proband, socio-economic status, age, sex of the proband, birth order, sibship size, sib mortality and details of milestones. Details regarding parental ages at conception of the proband, maternal health, reproductive history (including gestation time), history of teratogens used during conception, exposure to X-rays, maternal infections, neonatal infections, birth trauma, birth asphyxia, birth weight, injury etc, were recorded using a standard questionnaire. The study was approved by the institutional ethical committee and the parents or guardians of the patients were informed about the study and their consent was obtained.

RESULTS

The role of postnatal factors in the causation of congenital hearing impairment was studied in

the Indian population and the results indicated that among the postnatal factors, children with otitis media were predominant (126/11.71%) followed by children with head injury in 4.83% (52) of the cases. Convulsions associated with fever were observed in 2.78% (30) of the cases. Respiratory distress was reported in 0.92% (10) children (Table 1). Among 218 children with adverse postnatal conditions, majority (92/42.20%) of the children had profound hearing loss followed by severe hearing loss in 38.07% (83) of the cases. Moderately severe degree of hearing impairment was observed in 10.09% (22) of the cases followed by mild loss of hearing in 5.96% (13) and moderate loss in 3.67% (8) of the cases (Table 2).

Table 1: Postnatal factors involved in the causation of deafness in children with HI

<i>Postnatal</i>	<i>No of children</i>	<i>%</i>
Head injury	52	4.83
Otitis media	126	11.71
Convulsions	30	2.78
Respiratory problems	10	0.92
Grand Total	218	20.24

DISCUSSION

Hearing loss can occur due to genetic or environmental factors. Congenital hearing loss can be primarily due to viral diseases like rubella, measles, cytomegalovirus, etc. The key to control over this aspect is regular and proper immunization schedules. Other factors leading to congenital hearing loss may be associated with abnormal pregnancy or pre and perinatal events. Postnatal events such as convulsions, otitis media, respiratory problems occur mostly due to adverse perinatal events.

Hearing impairment mainly conductive is attributable mostly to chronic otitis media and is the most common health problem in parts of arctic (Bowd 2005). The principle bacteriological

Table 2: Postnatal factors Vs degree of hearing impairment

<i>Postnatal factor</i>	<i>Degree of HI</i>					
	<i>Mild No.</i>	<i>Moderate No.</i>	<i>Moderately Severe No.</i>	<i>Severe No.</i>	<i>Profound No.</i>	<i>Total No.</i>
Head injury	3 (5.77)	-	5 (9.62)	19 (36.53)	25 (48.08)	52 (23.85)
Otitis media	10 (7.94)	6 (4.76)	9 (7.14)	51 (40.48)	50 (39.68)	126 (57.80)
Convulsions	-	-	5 (16.67)	10 (33.33)	15 (50)	30 (13.76)
Respiratory problems	-	2 (20)	3 (30.0)	3 (30)	2 (20)	10 (4.59)
Total	13 (5.96)	8 (3.67)	22 (10.09)	83 (38.07)	92 (42.2)	218 (100)

The values in the parenthesis indicate the percentages.

organisms in chronic suppurative otitis media are *betahaemolytic streptococci*, *Pseudomonas aeruginosa*, *Citrobacter*, *Esch.coli* and *Streptococcus aureus* (Nwabuisi 2002; Yang et al. 2001; Khanna et al. 2000; Yuen et al. 1995; Campos et al. 1995; Fliss et al. 1992). *Pseudomonas aeruginosa* forms a biofilm in the middle ear mucosal surface of the infected ear in chronic suppurative otitis media (Dohar, 2005). In the present study otitis media was observed in 11.71% (126) of the cases. Studies from Canada reported that children were more susceptible to this condition due to immune defects and variety of environmental factors such as poverty, poor hygiene, exposure to cigarette smoke and decline in initiation and maintenance of breast feeding (Bowd 2005; Hasselt 2002). Some other studies from Greenland indicate no association of breast feeding, dietary habits and passive cigarette smoking in the causation of COM (Homoe 2001). In a study carried out in Inuit the prevalence of children with chronic otitis media was high in the age group of 12-16years (Ayukawa et al. 2004). The observation was in close agreement with the result obtained in this study where high percentage of children with this condition was noticed in the age group of 11-15 years.

Convulsions during childhood could be as a result of German measles during early pregnancy or Rh incompatibility. Childhood seizures also occur due to oxygen deprivation at birth or due to head injuries, measles, encephalitis, whooping cough, meningitis etc during early childhood. In the present study 4.83% (52) of the cases, reported head injuries after birth. All of them reportedly developed hearing loss after the ear trauma caused due to head injury. History of convulsions was reported in 2.78% (30) of the children in the present study. All the children had convulsions associated only with fever. Only 0.92% (10) children suffered respiratory problems such as asthma. Although that could be hereditary, they might have also developed respiratory distress due to low oxygen supply during the birth.

CONCLUSIONS

It is essential to monitor young children from

time to time and should be kept under good hygiene practices. Children with head injuries should undergo thorough medical examinations so that early intervention is possible for any damage occurred in the brain or other sensory organs.

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