Deafness in Paediatric Age Group

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Abstract

Incidence and predominant causes of deafness in 20 neonates, 100 infants and 1340 school going population in the northern region of the Indian subcontinent, was investigated by the E. N. T. Department. of Dayanand Medical college and Hospital, Ludhiana, Punjab.

The recorded incidence of deafness in school going children was 12.16% comprising conductive loss (98%) and S. N. loss 2%. Out of many cases more notable were chronic rhinitis, tonsillitis, adenoiditis etc.

Every child who does not respond normally to sound stimuli soon after birth or in the first six months, must undergo complete audiological assessment. since, even a completely deaf child passes through a period of crying and babbling, a serious hearing deficit begins

to be suspected when speech does not develop. Most children with hearing disorders present to the otologist between 1st and 3rd years of life.⁶

Persistence of partial deafness distorts the speech and language acquisition during late childhood. Therefore

recognition of deafness is vital during early childhood. The auditory responses of children are a complex set of reactions depending on applied testing stimuli and neurological physiological and arousal state.

The school boy or girl, perfects his or her speech only by means of careful and constant listening to sounds which are repeated very often into his ears. Deafness of almost any type and of any degree distorts the sound of speech. Because of the complex nature of speech, deafness will produce varied effects on its reception and reproduction. It may vary from distortion or omission of certain speech sound to complete absence, if the hearing loss is profound.⁷

Cardle response audiometry (CRA), evoked response audiometry (ERA), pure tone audiometry (PTA) and impedance audiometry (IA) are the workhorse of paediatric audiological evaluation now-a-days. It is feasible to assess hearing at all ages especially in babies who are at risk of having a hearing loss (due to jaundice, birth anoxia, preterm birth, positive family history) and school going children with treatable chronically discharging ears or otitis media with effusion.

A study was conducted by the Department of E.N.T., D.M.C. and H. Ludhiana from 1980 to 1995 to debit the rural and urban population in the northern region of India.

The study involved a detailed clinical examination with emphasis on tympanic membrane, ear canal and nasopharynx. 20 neonates, 100 infants and 1340 school going children formed the three primary division of our study, who were assessed by :

- Cradle response audiogram (Cribogram) (CRA) AMPLaid reactometer
- Free field audiometry (FFA) MKIV 700
- Evoked response audiometry (ERA) Nicolet CA-1000
- Impedence audiometry (IA) AZ-7
- Pure tone audiometry (PTA) MKIV - 700

Observation

Figure 1: Incidence of hearing loss in school going children

1. Incidence of hearing loss was 12.16% in the school going children.

2. Conductive loss accounted for 98.16% and neurosensory loss 1.84%.
3. Amongst the conductive loss group reduced middle ear pressure was recorded in 85.73%, active. SOM in 12%, dry Ch. SOM in 1% and acute SOM in 2%.
4. In another study involving 50 patients with secretory O.M. the rehabilitation with ventilation tube was carried out (mainly between 5-10 yrs.) In first group entailing only V.T. insertion with pre-op.AC Threshold and A-B. gap of 45.87 dB and 24.71 dB respectively which improved to 22.48 dB and 10.87 dB. In second group involving VT insertion with related surgery it improved from 49.44 and 39.50 dB to 22.21 and 12.57 dB respectively.
5. Chronic rhinitis, tonsillitis, adenoiditis were observed in 93.75% children with a conductive loss as compared to 51.96% in children with normal hearing. This study incidence of unilateral/bilateral involvement in children having hearing loss was almost equal both for conductive as well as perceptive.
6. Economically weaker section of the society have a higher incidence of hearing loss, 16.25% conductive loss and 9.88% perceptive hearing loss.
7. The higher incidence in the children from economically weaker section is due to
 - malnutrition
 - poor hygienic conditions (ear pricking; oil instillation, entry of water during bath in ponds)
 - lack of proper medical care
8. In hearing evaluation of neonates in cribogram it has been found that 1.5 KHz narrow band noise (N. B. N.) is the most useful test frequency as it has :
 - a) highest response incidence
 - i) 19.44% in new born
 - ii) 17.22 % in 7 wks of age
 - b) highest incidence of babies responding positively.

- c) Highest response rate per responding baby (100 dB intensity elicited positive responses more commonly)
9. Partial Moros was the commonest response followed by Moro's :
- Partial (1) 149 in neonates / 62 in infants
- Moro's (2) 54 in neonates / 35 in infants classical response occurred at higher intensity stimuli
10. On assessing the high risk infants the incidence of deafness was 4.5% (4.89) tested with behavioural cribogram screening.
11. 1.5 KHz narrow band was the stimulus which gave highest response rate and 100 dB intensity elicited positive response more often.
12. In a cross sectional study involving 25 higher risk newborns and similar number and normal newborns for assessing neurological maturation with brain stem audiometry evoked response (BSAER), it was found that the Brain stem conduction time in the two groups was not significantly different. However, BSCT was shorter in males.
- Bera one preterm baby recorded a threshold of 35 dB, three jaundiced babies, 2 had a threshold of 103 dB and one 35 dB.
- A twins had a threshold of 75 db with a positive family history.
13. The individual wave latencies in the two groups i.e. normal and high risk did not show any significant difference. However, further sub-grouping on basis of stimulus intensity revealed that the group requiring higher stimuli to respond were high-risk babies indicating immaturity of brain stem and the interpeak latencies was significantly lower indicating acceleration of CNS development.

Discussion

In assessing deafness in children, those who returned air conduction threshold of 20 dB or better were considered normal hearing children. In calculating mean threshold and threshold range we did not find

any significant difference attributable to ambient noise. It has been found that air conduction thresholds of normal hearing ears have tended to improve with increase in age from 5 years towards 12 years. This improvement may be due to gradual improvement with age of capacity to concentrate on sound stimuli continuously during the monotonous test procedure.

Age distribution amongst the affluent and economically weaker societies show children of latter start schooling few years later.

The overall incidence of hearing loss was found to be 12.16% (M=54.25%) more in economically weaker class (16.25% wrt 9.88% in affluent societies) and that too of severer grade. The commonest abnormality on cases of conductive hearing loss was reduced middle ear pressure with intact drum. Type B tympanometry curve being associated with more severe conductive loss as compared to type-C curve. If the reduced middle ear pressure is not accompanied by fluid formation then conductive loss is not pronounced.

Hearing assessment in neonates suggests that all 7 weeks of age infants response were quantitatively and quantitatively identical to those recorded in them earlier in neonatal period (sound stimulus generator being 'Amplaid Infant Reactometer'). None of the acoustic stimuli used produced response in 100% neonates. Thus there is need to have more than one type of stimulus to assess hearing. 1.5 KHz N.B.N. produced max incidence and max average response. In perceptive hearing loss there is usually an elevation of threshold or loss of response in high freq. area. Thus 1.5 KHz being in high freq. area is good material to rely upon for detection of perceptive hearing loss. Partial Moro's and Moro's reflex are the commonest response and can be picked up by movement sensing transducer. So movement sensing transducer should be employed in routine neonatal screening. In assessment of high risk babies it was found that the descending intensity stimuli is better. This is due to the fact that the response, in the behavioural screening is a Moro's reflex. When the intensity is built up slowly in an ascending method the baby may acquire adaptation which does not happen in descending intensity stimuli. In yet another study, BSAER was carried out in newborns between ages of 0-10. days

of life in a cross-sectional study. The study did not reveal significant correlations of BSAER with other events of perinatal period except kernicterus. The mean latency of wave-I in normal neonates was 1.94 msec at .75 dB and 1.90 msec in high risk babies. Discrepancy in wave-I latency in published reports are due to the fact that wave I and II coalesce to form slow excursion. It appears that as the age advances from neonatal period to adulthood the wave V and interpeak latencies go on decreasing and threshold diminishes. The cause of failure to respond to the threshold stimuli at 75 dB in normal group but responding to 103 dB is immaturity of brain stem.

Conclusion

The noteworthy feature of our study is the high incidence of conductive hearing loss in the paediatric population as compared to similar studies in the West.

Results of similar regional studies in India are summarised as follows :

- 1) Kapur et al. (1965) study from Vellore area - 900 subjects - 5N incidence 1.65%
 - 2) Misra et al. (1964) study from Lucknow area - 1230 children - SN incidence 34%
 - 3) Mehra and Mann (1974) study from Punjab area - Conductive loss incidence 65.3%, SN loss incidence 34.7%
- Studies of the West exhibit and comparative high incidence of neurosensory loss in the paediatric population.
- 1) Maran (1966) study - 802 subjects - conductive loss 52% incidence and SN loss 58% incidence
 - 2) Whitnell and Fry (1964) study - 3047 subjects - conductive loss 1.7%
 - 3) Ancona and Tomaino (1964) study - 26% incidence of SN loss.

Chronic tonsillitis, adenoiditis, chronic rhinitis play an important role in conductive hearing loss in the Indian studies.

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Congratulation

Dr. P.N. Tejankar has opened up a new clinic at Mahashwaeta Nagar, M.P. for rendering free ENT services to Retd Naval, Infantry and Air force personnel.