PAEDIATRIC HEARING LOSS

Spanish: pérdida auditiva pediátrica; Portuguese: perda auditiva pediátrica

Written by: Taqwa Hayder, Reuel Maina, Jessica McGuire, PENTAfrica: Paediatric Ear, Nose & Throat Surgery in Africa

Background Information

Definitions of levels of care (in this guideline)

- Level 1: Community healthcare worker/non-doctor
- Level 2: Medical doctor
- Level 3: ENT Surgeon

Definition

Disabling hearing loss in children is a loss greater than 30dB in the better hearing ear.
It may be conductive, sensorineural or mixed and can be either congenital or acquired.(1)

Background

Childhood hearing loss not only affects language development, but also literacy, self-esteem and social skills. Affected individuals underperform academically and have less opportunities for employment later in life. Communication difficulties have far-reaching consequences for both the individuals and their families. These amount to greater psychological, economic and financial strains.(2)

Impact

The impact that hearing loss may have on an individual depends on multiple factors. These may be categorised into intrinsic and extrinsic categories.

Intrinsic factors include age of onset and the severity of the impairment. Children who manifest hearing loss before, or during the period of language acquisition will be more noticeably affected than children who develop hearing loss post-lingually (after language acquisition). Severe and profound hearing impairments are associated with a greater impact than mild or moderate impairment.(3)

Extrinsic factors refer to the world in which the child resides. This includes the greater socio-political environment and access to early identification programmes, hearing rehabilitation services, special education or supported teaching programmes, specialist otolaryngology (ENT) services and surgery for hearing loss. It also includes the child's immediate situation and the families' financial and economic well-being, social support network and psychological health, resilience and adaptability.(4)

Prevention

Hearing loss in children is largely a public health concern. Although this guideline predominantly focuses on the responsibility of individual health workers, it must be viewed within the greater context: it is essential to drive healthcare policy and political change to bring about better prevention, identification and treatment programmes for people with hearing loss. Not only will this assist affected individuals, but it has far reaching implications because it is cost effective from an educational, political, and economic stand-point.(5)

Worldwide, sixty percent of hearing loss is preventable. The proportion of preventable hearing loss is greater in low-to-middle-income countries (LMIC) than in high-income countries. (6)

Infectious causes include rubella, cytomegalovirus, mumps, bacterial meningitis, measles and chronic ear infections. Rubella and bacterial meningitis account for the majority of preventable hearing impairment from infections and could be prevented by comprehensive immunisation coverage.(7) Early identification of otitis media with effusion and chronic suppurative otitis media, and early, appropriate management is necessary to prevent the sequelae of hearing loss and speech delay.(8)

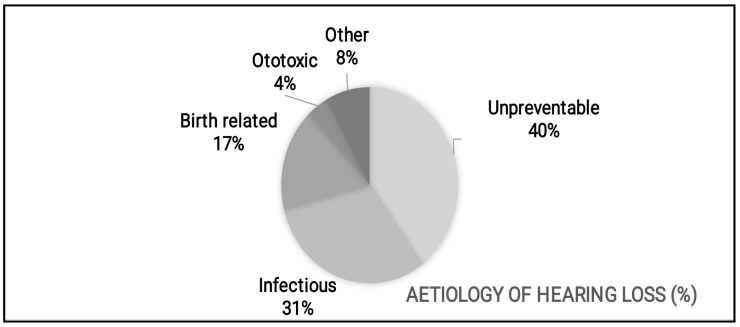


Table 1: Aetiology of hearing loss

Marriage among second degree consanguinity carries a higher risk of congenital hearing loss and also of other congenital diseases. (9)

Better obstetric and perinatal care may decrease birth related complications (hypoxia, prematurity, low birthweight and jaundice) with are associated with preventable hearing loss.(10)

Antibiotic stewardship programmes, particularly for pregnant women, neonates and infants may decrease ototoxicity-related hearing loss. Quinine may also be ototoxic and is best avoided in areas with endemic malaria. (8,11)

Hearing screening
Hearing screening is essential for the early identification of both preventable and unpreventable hearing loss. Lack of a universal newborn hearing screening programme is a major hurdle to early identification in many LMIC settings. Individuals can assist by asking whether the patients have received hearing screening and refer them for screening if it has never been performed, or if there is speech delay.

Examination and Investigations

General:

History
- Onset
- Duration
- Pattern
- Associated ear symptoms – otalgia (ear pain), otorrhea (ear discharge), vertigo (spinning dizziness), tinnitus (hearing a noise that has no source - eg. a buzzing or ringing noise)
- Nasal symptoms – snoring, nasal blockage

- Oral / neck symptoms
- Speech delay[12]
- Risk factors for hearing loss[13]
    - Prenatal/perinatal infections, prematurity, very low birth weight, hypoxia at birth, neonatal jaundice, neonatal sepsis with administration of antibiotics, neonatal intensive care admission, oxygen therapy
    - Syndromic children
    - Family history of hearing loss

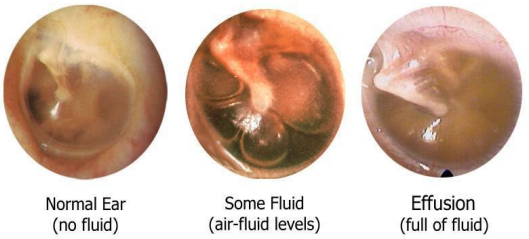
Examination

Level 1:

- Gently pull the ear lobe towards the back of the head to inspect the ear canal with a light to look for discharge

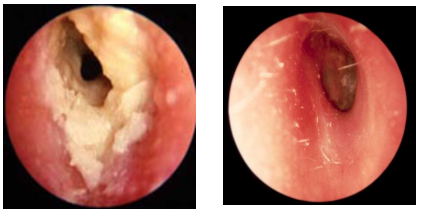
Level 2/3:

- Perform otoscopy to look for a perforation or otitis media with effusion.



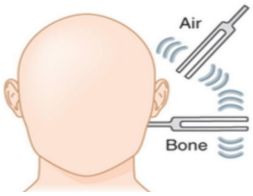
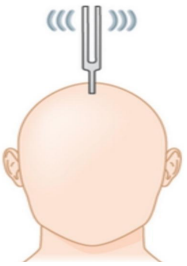
- Pneumatic otoscopy greatly improves diagnostic accuracy. Otitis media with effusion will be associated with a hypomobile (less mobile) or immobile eardrum.

- Dry-mop or ear-wick the ear if there is copious purulent discharge to obtain a clearer view.



- If wax is obstructing the view, syringe wax out of the ear. The aim is for the water to soften the wax, move past the wax, reflect off the eardrum and help move the wax out of the canal.

- Tuning fork tests may be beneficial in older children (Rinné and/or Weber tests).

Hearing loss	**Rinne test**  **Compares air conduction to bone conduction**	**Weber test**  **Localisation of unilateral hearing loss**
None	Air>bone (positive)	Usually midline
Sensorineural	Air>bone (positive)	Normal ear
Conductive	Bone>air (negative)	Affected ear

**Please note that otoscopy is not always possible at level 2 services*

Investigation

Level 1:

- In older children "the whisper test"
- HearWHO app on smartphone

Level 2:

- In older children use the HearWHO app on smartphone

Level 3:

- Hearing thresholds should be obtained
- This can be done by referring a child to an audiologist (especially those below 3 years of age).
- HearScreen/HearTest is an affordable alternative to office-based hearing tests in resource-limited settings when an audiologist is not available. This may be performed on children as young as 3 years old (with proper priming).
- Children requiring hearing rehabilitation need accurate hearing thresholds to programme their amplification devices (hearing aids) and will require audiological assessment.

Management

Level 1:

- Otorrhoea: ear-wick, water precautions, 2% acetic acid drops 12 hourly, review in 1 week, if persists, refer to level 2

- Wax: sweet oil or olive oil drops

Level 2:

- Chronic suppurative otitis media with a perforation, actively discharging: treat with topical quinolone antibiotic drops, dry mopping and advise water precautions. If there is no resolution, refer to level 3
- Wax: ear irrigation

Level 3:

- Chronic suppurative otitis media with a perforation, once dry: tympanoplasty
- Otitis media with effusion without speech delay: watchful waiting for 3 months with audiology/hearing screening
- Otitis media with effusion with speech delay: audiology and ventilation tubes (grommets)
- Identify centres where access to more higher level support is available for patients needing more advanced ear surgery (such as ossiculoplasty, cholesteatoma surgery) for referral.
- Cochlear implantation surgery is an option for some children with profound hearing loss; there are however several challenges in resource-limited settings. These include lack or poor coverage of neonatal screening, cost and lack of the required specialised rehabilitation services.

Further Reading

Primary Ear and Hearing Care Training Manual for Health Workers.
https://vula.uct.ac.za/portal/site/71c5a59c-8b14-4c0d-9968-cb1d01c254aa/tool/294fd7ac-6548-4b76-b200-d00073a8caca?null.

Open Access Guide to Audiology and Hearing Aids for Otolaryngologists
http://www.entdev.uct.ac.za/guides/open-access-guide-to-audiology-and-hearing-aids-for-otolaryngologists

References

1. World Health Organization. Addressing the Rising Prevalence of Hearing Loss. Geneva: World Health Organization; 2018. Available from: http://www.who.int/pbd/deafness/estimates/en/ [cited 2019 Apr 1].
2. Moeller MP. Early intervention and language development in children who are deaf and hard of hearing. Pediatrics. 2000 Sep;106(3):E43. doi: 10.1542/peds.106.3.e43. PMID: 10969127.Ching TYC, Dillon H, Button L, Seeto M, Van Buynder P, Marnane V, Cupples L, Leigh G. Age at Intervention for Permanent Hearing Loss and 5-Year Language Outcomes. Pediatrics. 2017 Sep;140(3):e20164274. doi: 10.1542/peds.2016-4274. Epub 2017 Aug 3. PMID: 28864712; PMCID: PMC5574730.
3. Dalzell L, Orlando M, MacDonald M, Berg A, Bradley M, Cacace A, et al. The New York State universal newborn hearing screening demonstration project: ages of hearing loss identification, hearing aid fitting, and enrollment in early intervention. Ear Hear. 2000 Apr;21(2):118-30. doi: 10.1097/00003446-200004000-00006. PMID: 10777019.
4. Olusanya BO, Newton VE. Global burden of childhood hearing impairment and disease control priorities for developing countries. Lancet. 2007 Apr 14;369(9569):1314-1317. doi: 10.1016/S0140-6736(07)60602-3. Erratum in: Lancet. 2007 Jun 2;369(9576):1860. PMID: 17434407.

5. Alberti PW. The prevention of hearing loss worldwide. Scand Audiol Suppl. 1996;42:15-9. PMID: 8668900.
6. Abdalla FM, Omar MA. The role of the health system in the prevention of hearing loss among children in Sub-Saharan Africa. Sudan J Paediatr. 2011;11(1):8-19. PMID: 27493301; PMCID: PMC4949789.
7. Abdalla FM, Omar MA. The role of the health system in the prevention of hearing loss among children in Sub-Saharan Africa. Sudanese Journal of Paediatrics. 2011;11(1):8.
8. Alberti PW. The prevention of hearing loss worldwide. Scand Audiol Suppl. 1996;42:15-9. PMID: 8668900.
9. Olusanya BO, Okolo AA. Adverse perinatal conditions in hearing-impaired children in a developing country. Paediatr Perinat Epidemiol. 2006 Sep;20(5):366-71. doi: 10.1111/j.1365-3016.2006.00733.x. PMID: 16911014.
10. Freeland A, Jones J, Mohammed NK. Sensorineural deafness in Tanzanian children--is ototoxicity a significant cause? A pilot study. Int J Pediatr Otorhinolaryngol. 2010 May;74(5):516-9. doi: 10.1016/j.ijporl.2010.02.010. Epub 2010 Mar 15. PMID: 20227774.
11. Olusanya BO, Neumann KJ, Saunders JE. The global burden of disabling hearing impairment: a call to action. Bull World Health Organ. 2014 May 1;92(5):367-73. doi: 10.2471/BLT.13.128728. Epub 2014 Feb 18. PMID: 24839326; PMCID: PMC4007124.
12. Smith RJ, Bale JF Jr, White KR. Sensorineural hearing loss in children. Lancet. 2005 Mar 5-11;365(9462):879-90. doi: 10.1016/S0140-6736(05)71047-3. PMID:157 52533.