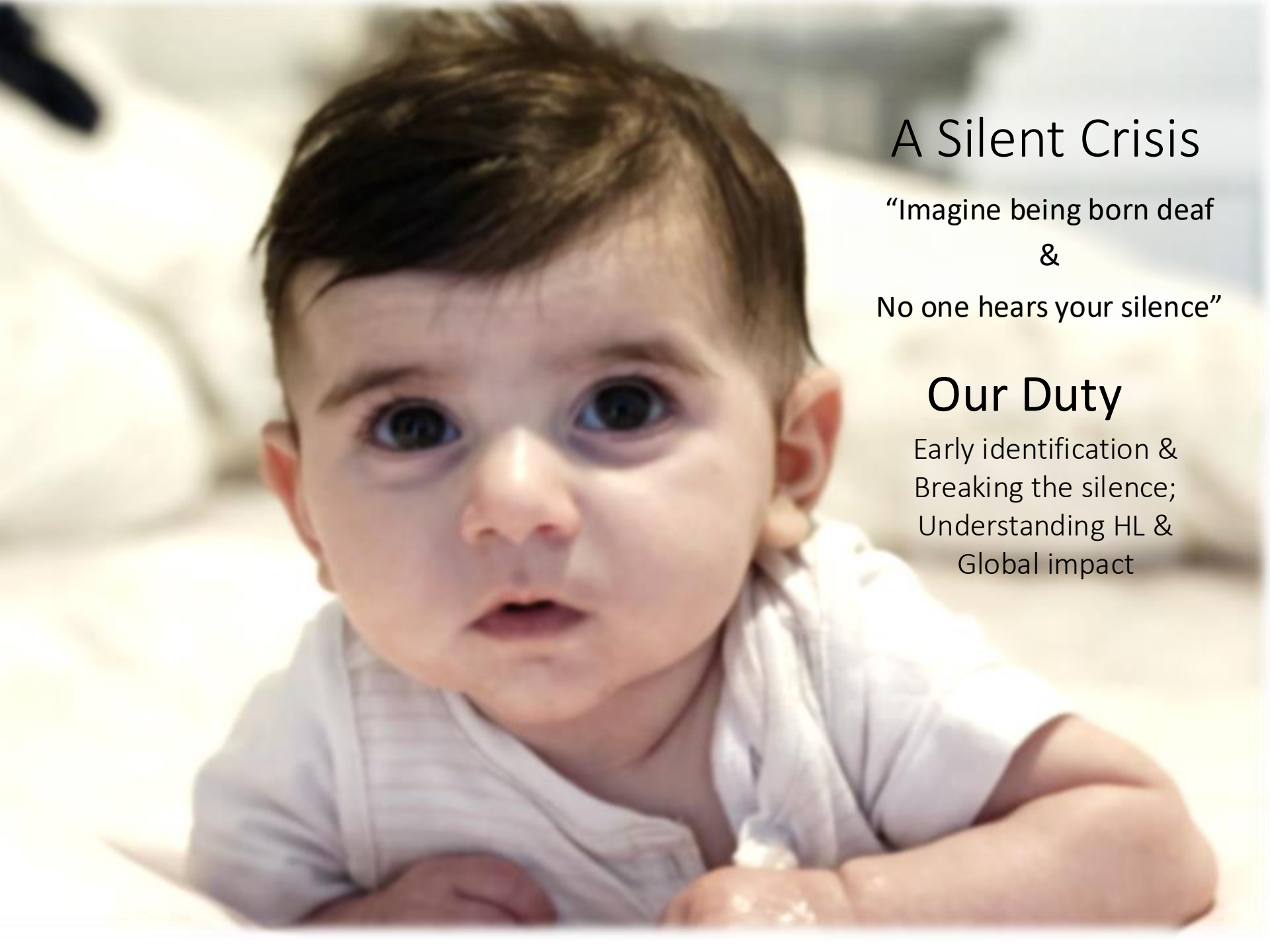
Assessment of Hearing in children

Dr. Margaret Zuriekat (ENT, MSc & PhD Audiology)
School of Medicine, University of Jordan
Feb 2026



A Silent Crisis

"Imagine being born deaf

&

No one hears your silence"

Our Duty

Early identification &
Breaking the silence;
Understanding HL &
Global impact

Why assess for and address hearing loss?

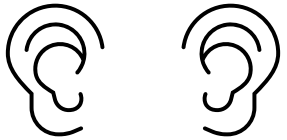
Epidemiology of Neonatal Hearing Loss

Global estimates

1–3 per 1,000 live births

NICU

Higher in NICU: ~2–4%



One or both ears?

Mostly bilateral

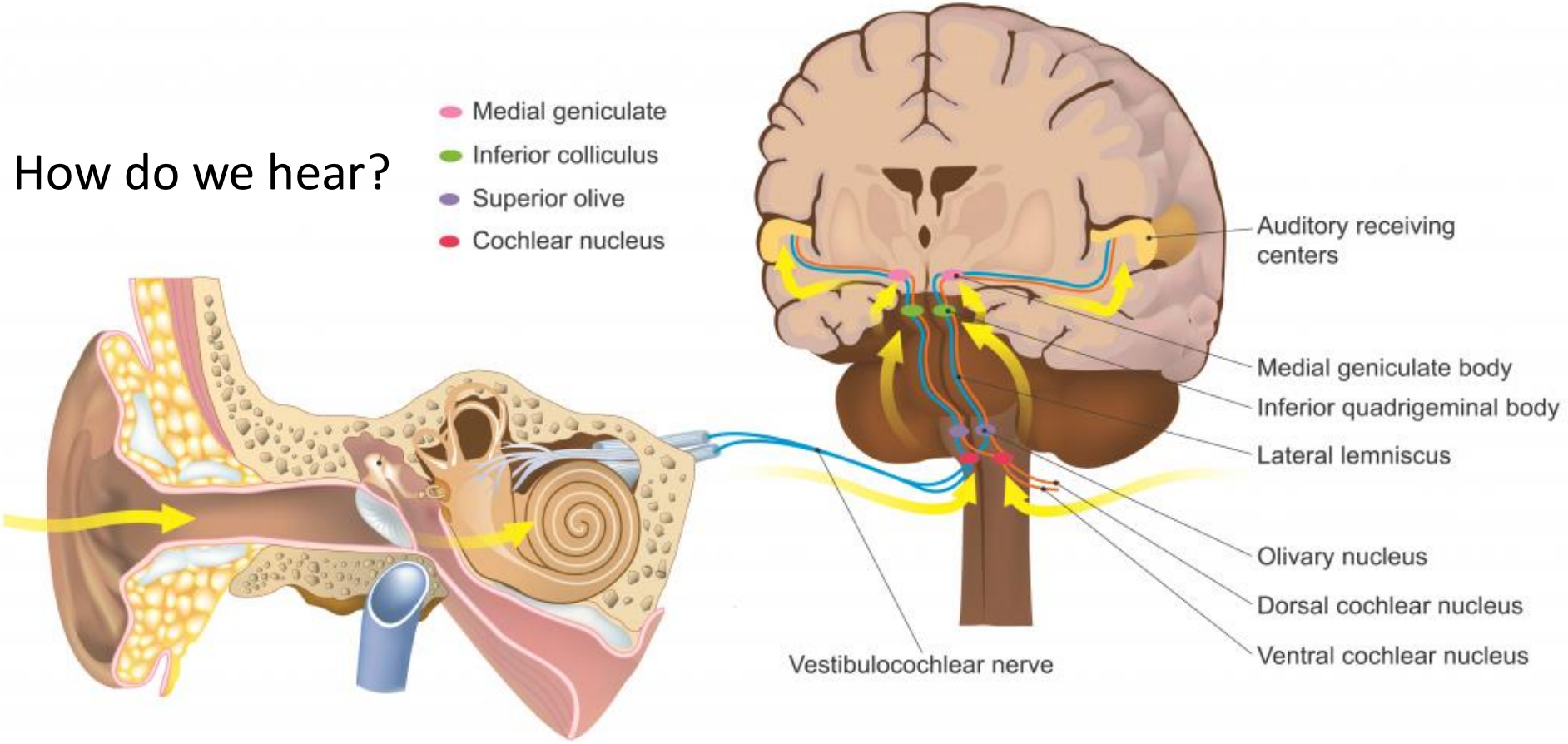
Universal Newborn Hearing Screening

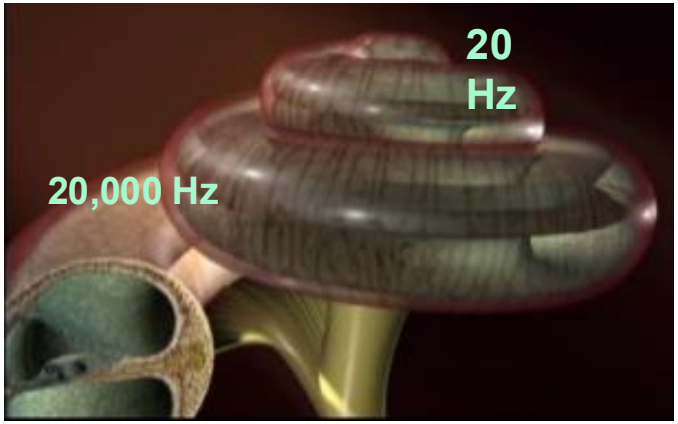
Early identification of congenital hearing loss is essential because

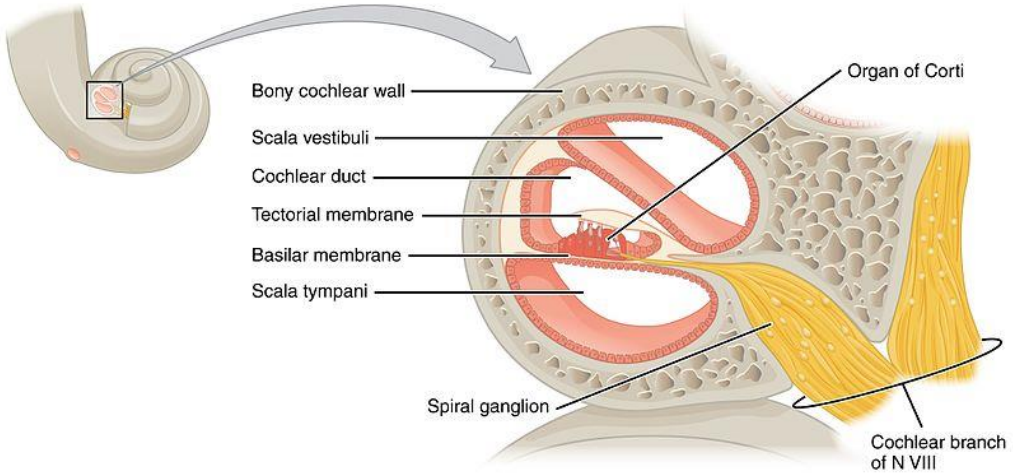
- ✓ It prevents **irreversible central auditory changes**
- ✓ Enables **normal language development**
- ✓ Supports the child's **emotional, social, and academic success**.

Delay compromises cortical organization, clinical outcomes, and family adaptation — with lifelong consequences.

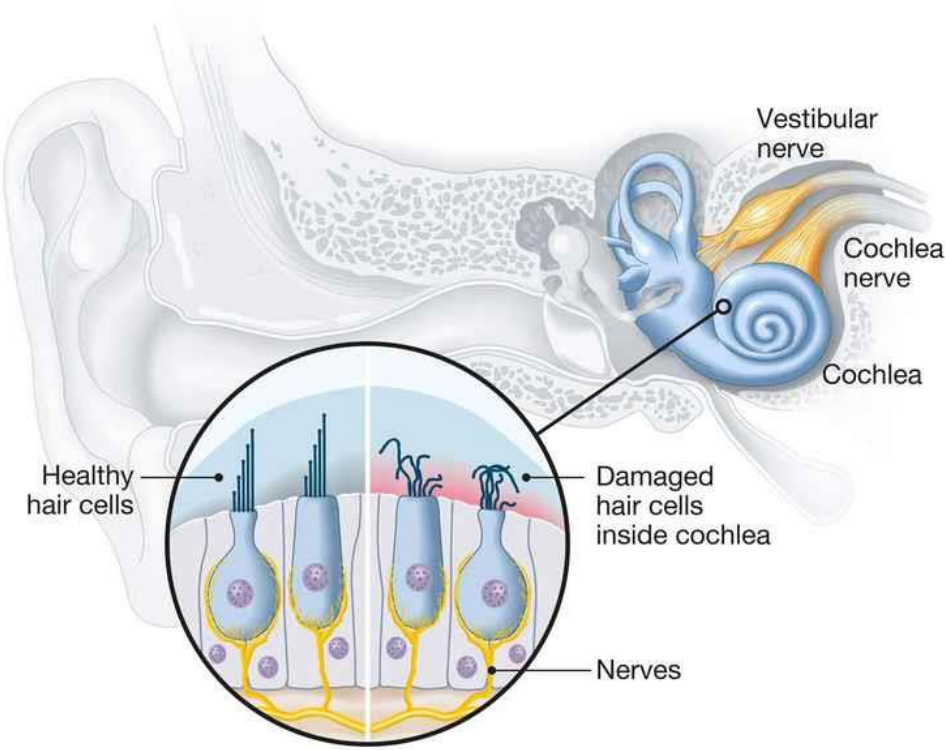
How do we hear?







The most common form of sensorineural hearing loss is due to cochlear pathology (sensory hearing loss).



Screening for Hearing loss in children

To diagnose and manage hearing loss early on.

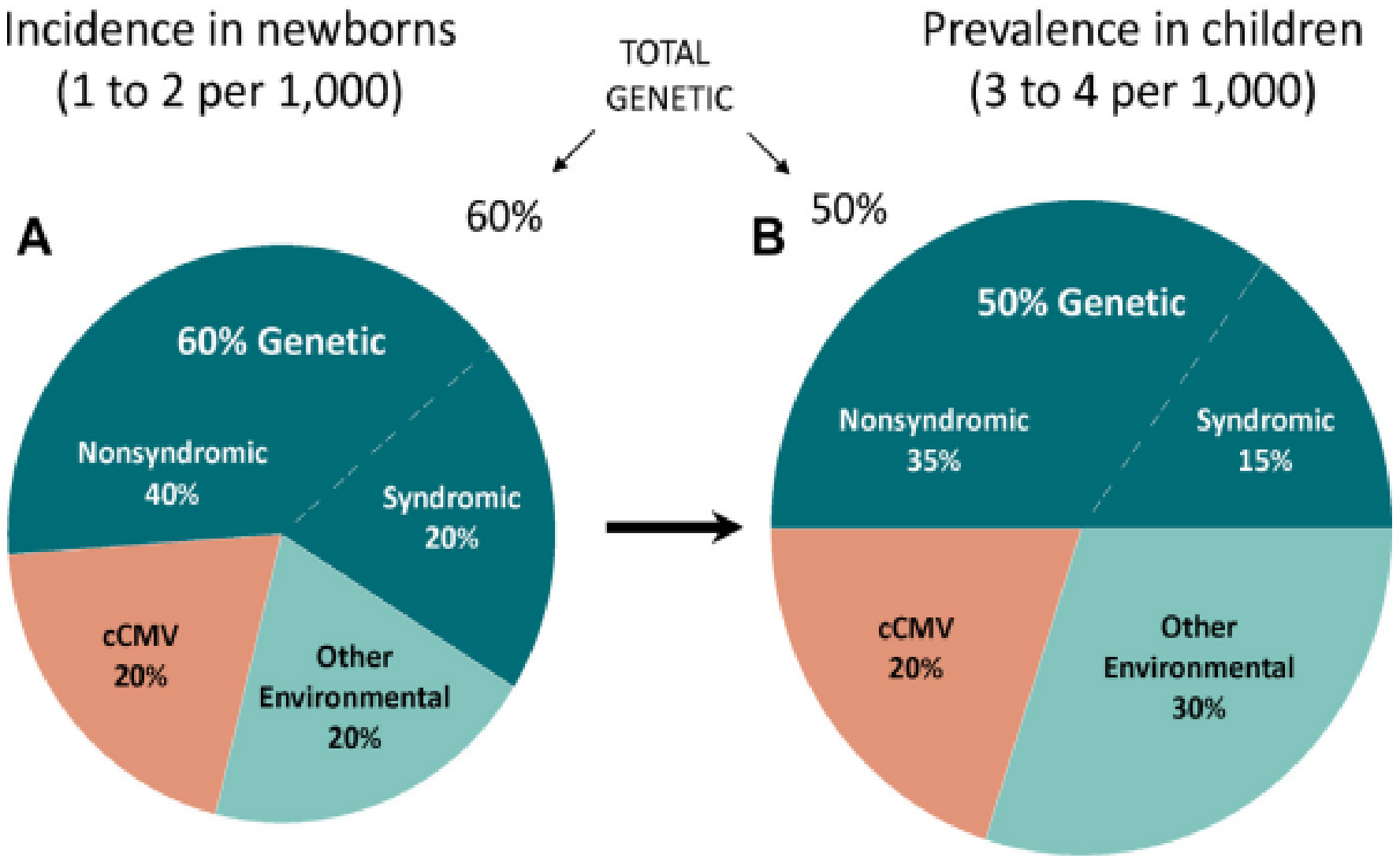
Ideally all newborn infants should be screened

(1 month).

People at high risk should be screened repeatedly.

50% of patient with hearing loss do not have any known risk factor

Sensorineural hearing loss (SNHL)



Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: www.elsevier.com/locate/ijporl

Sensorineural hearing loss among children at risk: A 16-year audiological records review in a tertiary referral center

Baeth Al-Rawashdeh [a,1], Margaret Zuriekat [a,1,*], Sara Alhanbali [b], Lubna Alananbeh [a], Doaa Rammaha [a], Mohammad Al-Zghoul [a], Mohammad Darweesh [a], Amer Sawalha [a], Qais Al-Bakri [a], Mohamad Tawalbeh [a], Khader Abdul-Baqi [a,b]

[a] Department of Special Surgery, School of Medicine, The University of Jordan & Jordan University Hospital, Amman, Jordan
[b] Department of Hearing and Speech Sciences, School of Rehabilitation Sciences, The University of Jordan, Amman, Jordan

ARTICLE INFO

Keywords:
Childhood hearing loss
Congenital hearing loss
Risk factors
Neonatal screening
Jordan

ABSTRACT

Objectives: Hearing loss (HL) constitutes an increasing worldwide health problem. Neonatal hearing screening improved early detection and management to alleviate HL detriments on the person and society. Still, HL in childhood, beyond infancy, is under-investigated, especially in developing countries. This study aimed to explore the prevalence of HL in childhood amongst Jordanian children with HL risk factors and investigate the associated risk factors.

Methods: Retrospective cross-sectional review of audiological records in a tertiary public and teaching hospital. The data of 1307 children aged 0–15 years who underwent audiological assessment from 2000 to 2016 were included. A review of diagnostic audiological and medical records was conducted to investigate the prevalence of sensorineural HL in high-risk (HR) children and the most contributing risk factors.

Results: Descriptive statistical analysis showed that the prevalence of sensorineural HL was 29.2% in the study sample. The HL was bilateral in 95% and mild to moderate HL in 73%. The mean age at the diagnosis was around 4.5 years. The most common risk factors were parental concern about their child's hearing, ototoxic drug use, and developmental and speech delay. The Chi-squared test showed that parental concern and ototoxic drug use were associated with an increased probability of having HL.

Conclusion: The prevalence of HL amongst at-risk children in Jordan is relatively high, and the diagnosis is delayed. The results highlight the importance of implementing a hearing screening program in at-risk children. This needs to start from birth and include a serial follow-up to detect cases of delayed-onset HL.

Risk factors for hearing loss among children

Maternal infection: toxoplasmosis, rubella, cytomegalovirus, herpes simplex, syphilis, septicemia	Childhood infectious disease (e.g., bacterial meningitis)
Intrauterine exposure to radiation	Stigma of syndromes or craniofacial anomalies
Maternal or child ototoxic drug use	Head trauma
Hypoxia and prolonged mechanical ventilation	Family history
Birth weight <1500 g	Children with neurodegenerative disorders
Prematurity	Parental suspicion of hearing loss
Hyperbilirubinemia	Parents concern of delayed language and speech

History and physical examination

Audiologic tools of hearing assessment

- Otoacoustic emissions (OAE)
- Auditory Brainstem Response Audiometry (ABR)
- Pure Tone Audiometry (PTA)
- Play Audiometry
- Visual Reinforcement Audiometry (VRA)
- Tympanometry

Infants and children who cannot give behavioural response

- Otoacoustic emissions (OAE)
- Auditory Brainstem Response Audiometry (ABR)

Older children who can perform the behavioural tests

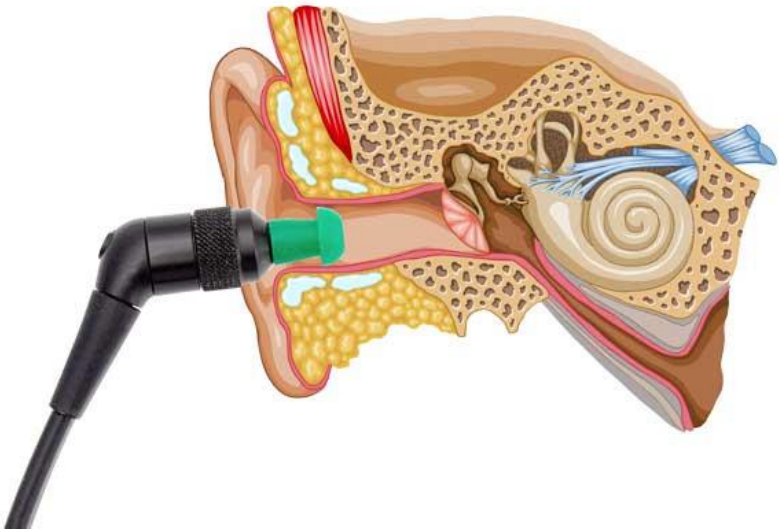
- Pure Tone Audiometry (PTA)
- Play Audiometry
- Visual Reinforcement Audiometry (VRA)

Most need to be accompanied by middle ear testing by Tympanometry

Otoacoustic Emissions (OAE)

- Sounds are produced by the cochlea.
- Outer hair cell motility generates mechanical energy within the cochlea and propagates to the external ear canal via the middle ear which can be measured by sensitive microphones.
- Cost-effective objective screening tool.
- 80-90% sensitivity and specificity.
- Cannot detect auditory neuropathy.
- Results can be affected by external and middle ear conditions.

If refer, we should check the ears



What could ‘Refer’ indicate?

Refer

Poor testing technique

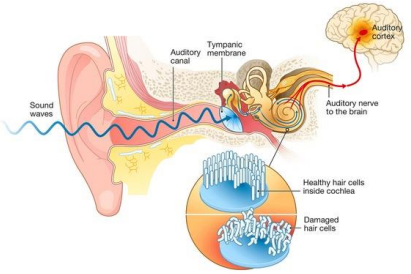
- Inappropriate size of used tip.
- Inappropriate placment of the tip.
- Faulty device or dirt inside.
- Noisy environment.

Middle or external ear problem

- External ear stenosis or atresia
- External ear vernix or meconium
- Middle ear fluid

Hearing loss

Congenital sensorineural hearing loss



What is next if refer?

Repeat screening

Ideally asap and before 1 month old

Diagnostic audiological evaluation

Ideally before 3 months old

Tympanometry
ABR

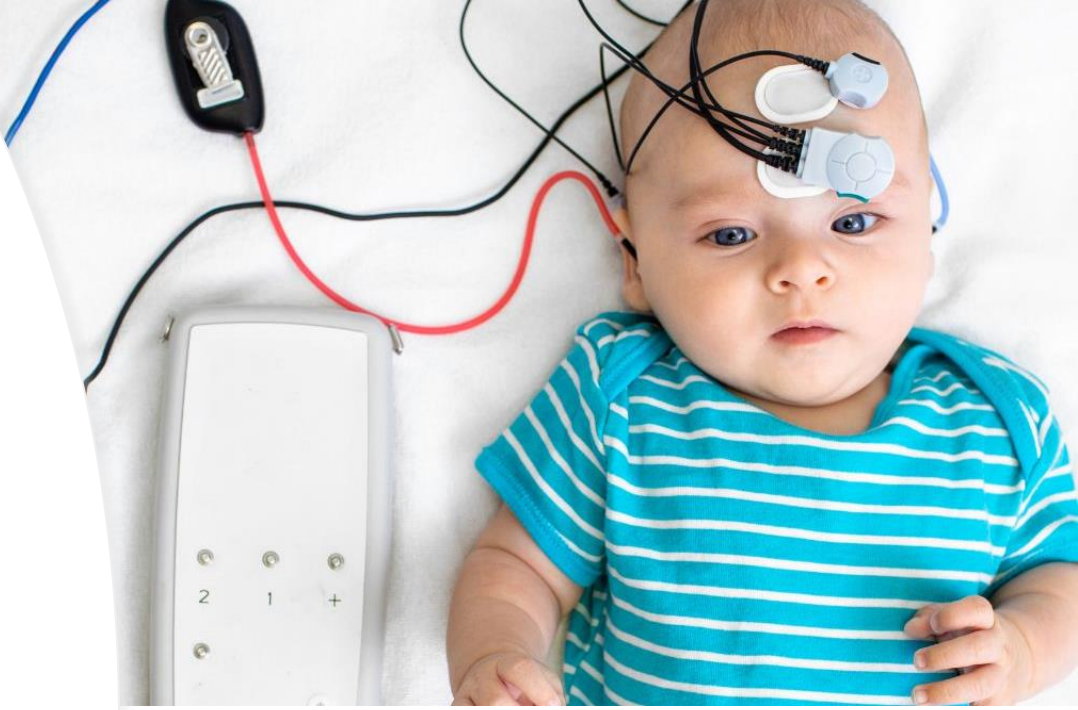
If hearing loss is confirmed

- ENT assessment
- Early intervention before 6 months old (hearing aid/cochlear implant)

Family couselling

- Communicating bad news
- Communication options.
- Cultural and emotional carefulness

Auditory Brainstem Response Audiometry (ABR)

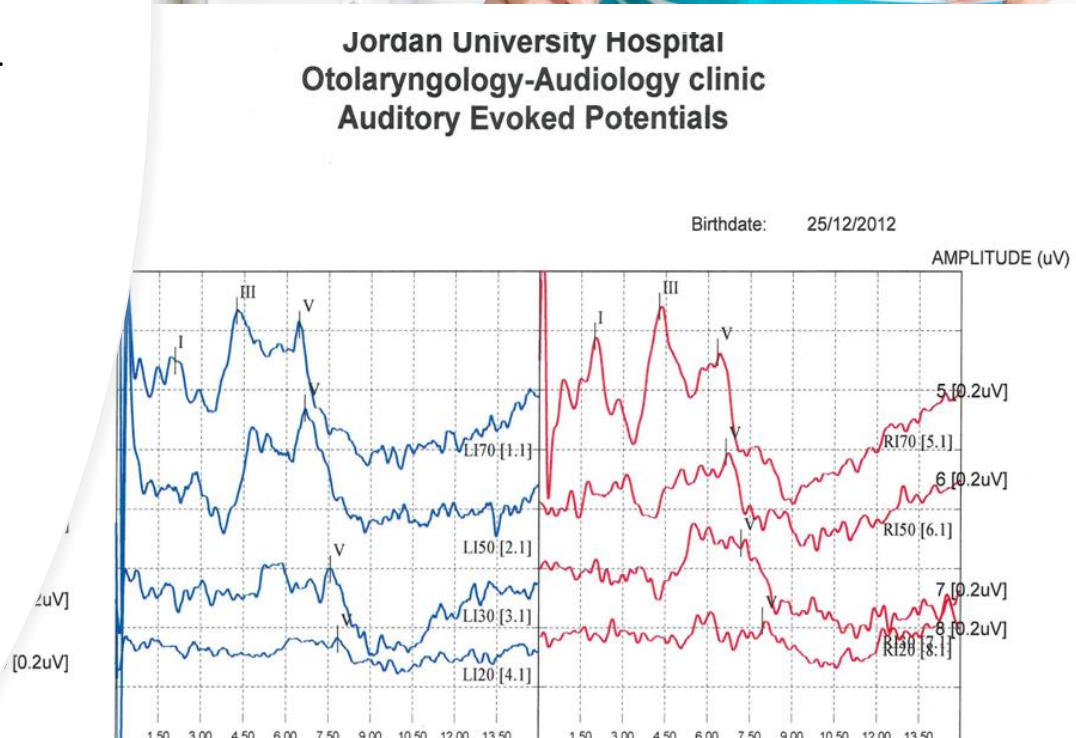


- Auditory evoked potentials extracted from ongoing electrical activity in the brainstem and brain, after acoustic stimulation.
  - Recorded via electrodes placed on the scalp.
  - It is a test of synchronous neural function. However, it can be used to estimate hearing sensitivity.

✓ Detects auditory neuropathy.

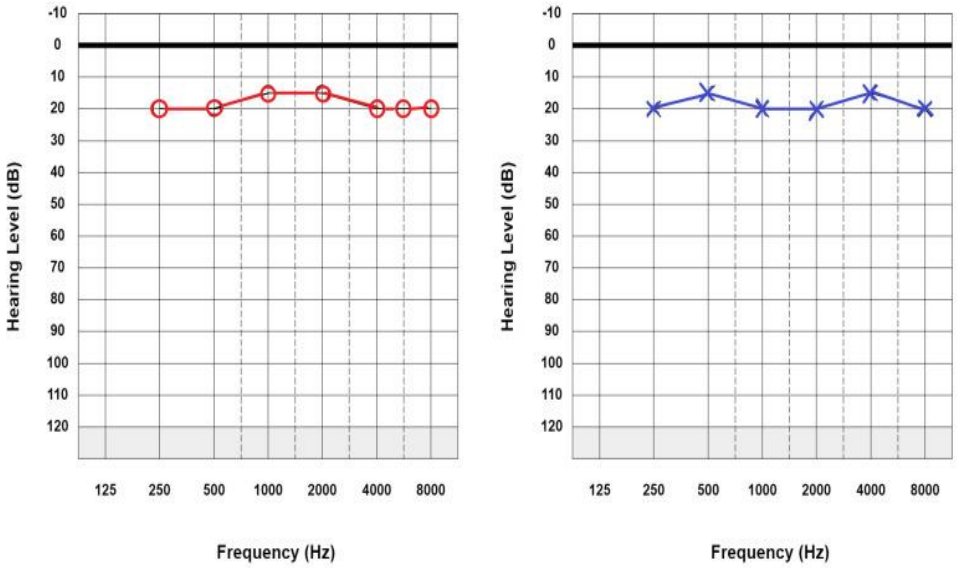
✓ More specific but more expensive.

✓ Needs the individual to be sleeping or completely relaxed. Sometimes sedation.



Pure tone audiometry PTA

- Needs the child to understand and cooperate.
- Mental age above 4 years.



Play Audiometry

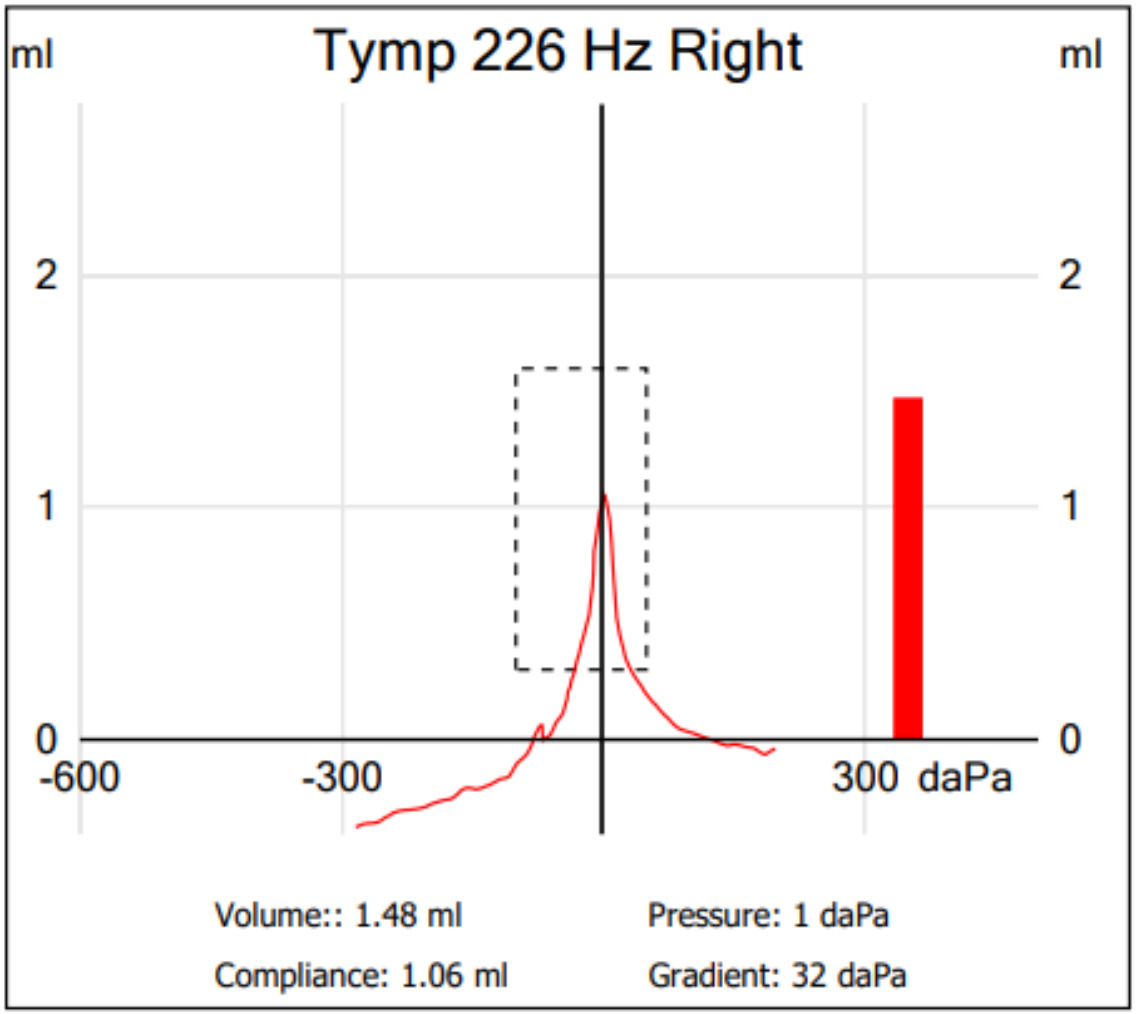
- A modification of standard pure tone audiometry.
- Play audiometry conditions the child to respond to the sound by playing e.g. placing a toy in a container.

Visual reinforcement audiometry VRA

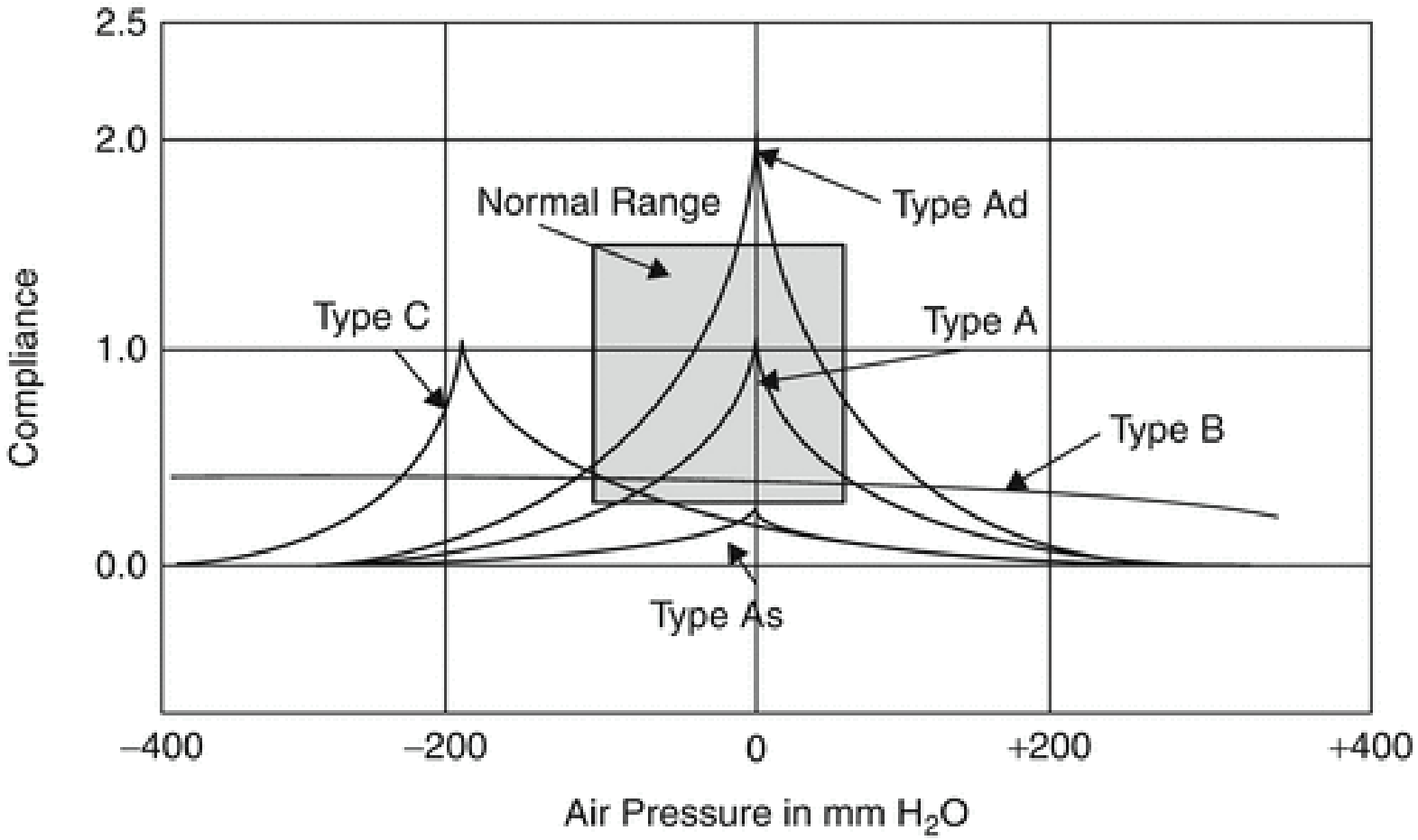
- A modification of standard pure tone audiometry.
- For younger children.
- Encourage the child to respond to the sound by giving a visual stimulus when the child responds correctly to the sound.

Tympanometry

Tympanometry



Tympanograms: normal & abnormal shapes

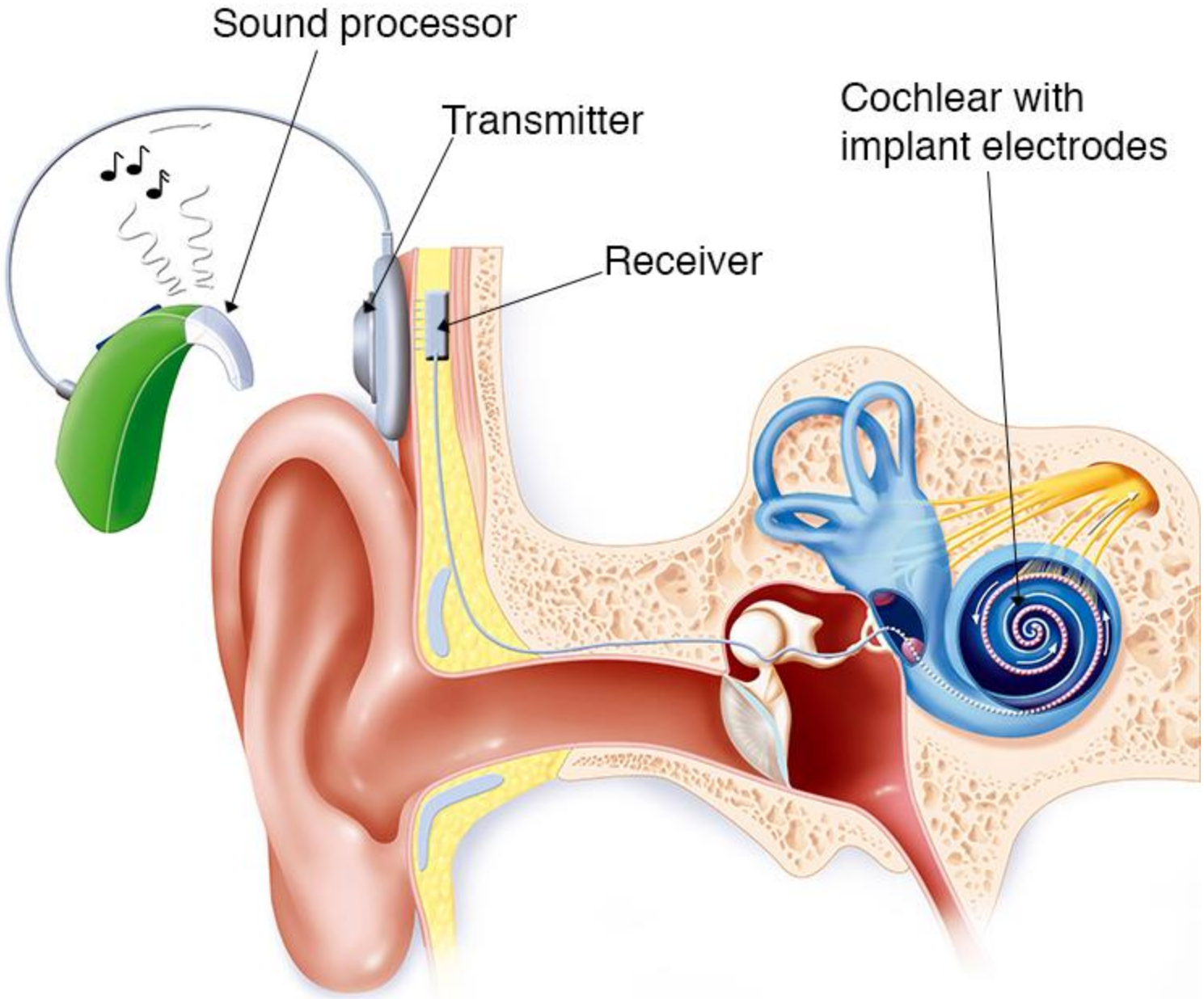


Rehabilitation Options

- Hearing Aids
- Cochlear implants
- Hearing rehabilitation; sign language, school for deaf people, lip reading


Pediatric
Hearing Aid
Devices

Cochlear implant



Cochlear implant

The end