

Audiological characteristics and aetiology in children with congenital unilateral hearing loss

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Background

PROBLEM

- Unilateral hearing loss may potentially affect the development of auditory function, communication, as well as academic development for some children.
- There is limited understanding of when accurate hearing degree can be confirmed and how hearing loss may change in both ears for children with UHL, particularly in early childhood.
- The relationship between etiologic factors and the risk of progressive hearing loss is inconclusive.

NEED OF STUDY

Understanding the aetiology characteristics and changes in hearing levels is crucial for effective clinical management and intervention.

Aims

- To describe the audiological characteristics and aetiology of children with congenital unilateral hearing loss
- To examine the age at which reliable behavioral audiograms can be obtained
- To explore the changes in hearing sensitivity from diagnosis at birth to the first reliable behavioral audiogram

Methods

Participants: 91 children with UHL

- Diagnosed via universal newborn hearing screening
- Enrolled in the *Children with Unilateral Hearing Loss Project* at National Acoustic Laboratories.
- Had frequency-specific audiometric thresholds estimated from electrophysiological testing at diagnosis, and reliable behavioral audiograms in early childhood, at least at one low frequency (0.5 or 1kHz) and one high frequency (2 or 4kHz).
- Excluded children with auditory neuropathy spectrum disorder.

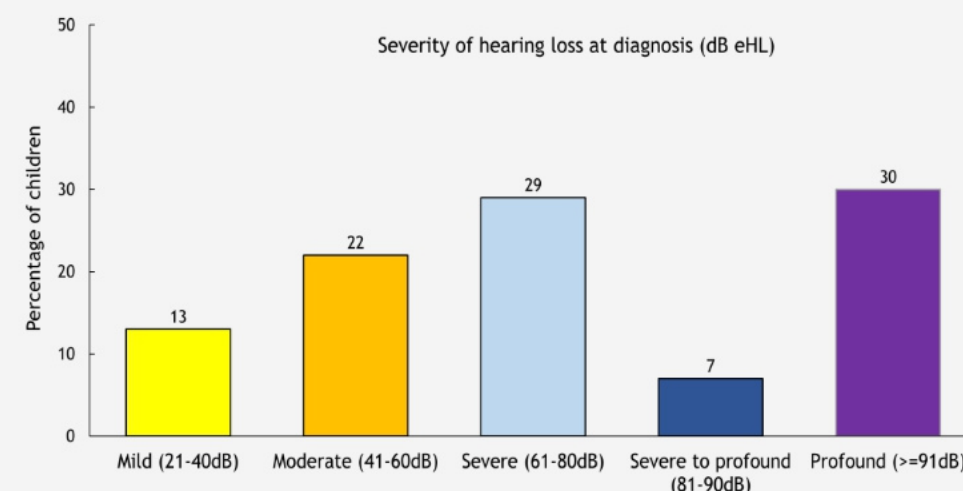
Information about diagnosis, audiological characteristics, etiological details were extracted from hospital reports and clinical database.

Results

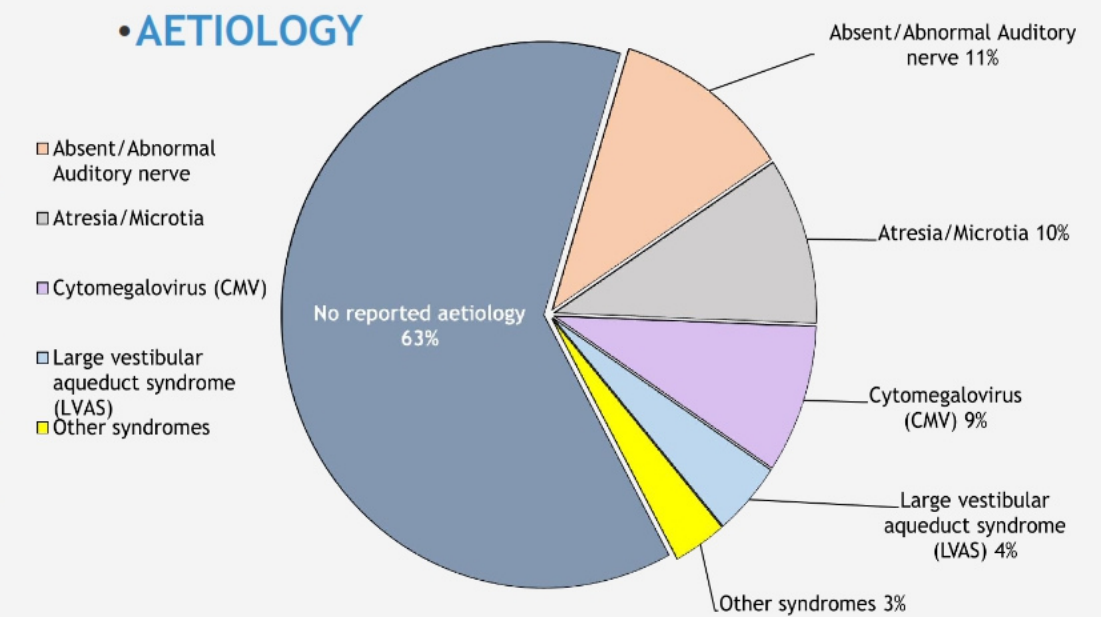
• DEMOGRAPHIC CHARACTERISTICS

Characteristics	Children
Gender, Male (n, %)	46 (50.5%)
Birthweight (kg), Mean (SD)	3.2 (0.7)
Gestation (weeks), Mean (SD)	38.1 (2.8)
Affected ear at diagnosis, Left (%)	52.7%
Age at diagnosis (months), Mean (SD)	2.1 (1.2)

• DEGREE OF HEARING LOSS AT DIAGNOSIS



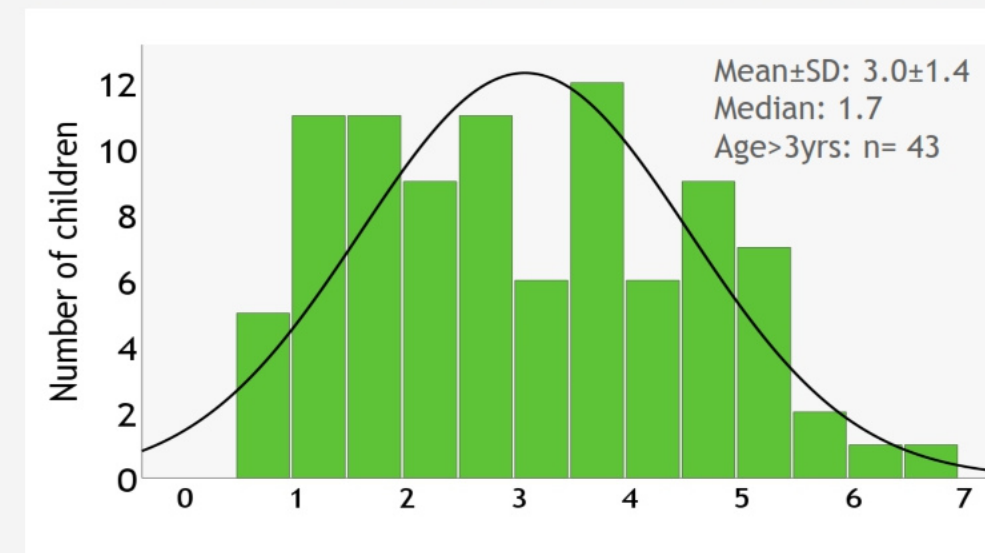
• AETIOLOGY



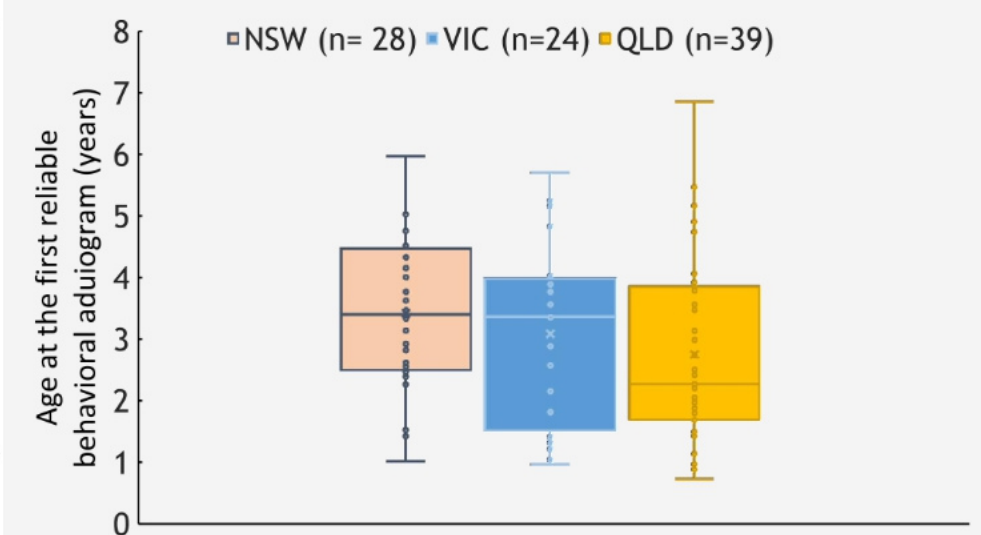
Severity of hearing loss degree	Number of Children (n, %)
Mild to moderate (21-60 dB)	32 (35%)
Severe (61-80 dB)	26 (29%)
Severe to profound (>=81)	33 (37%)
Total	91

Note:
 ○ Hearing aid was fitted before or within one month of obtaining the first reliable audiogram (n=64, 70%)
 ○ Hearing aids fitted long after, or not fitted with any hearing devices (27, 30%)

• AGE AT THE FIRST RELIABLE BEHAVIORAL AUDIOGRAM



Histogram of age at the first reliable behavioral audiogram (years old)



Age at the first reliable audiogram in each state
 $F = (2,88) = 1.71, p = 0.19$

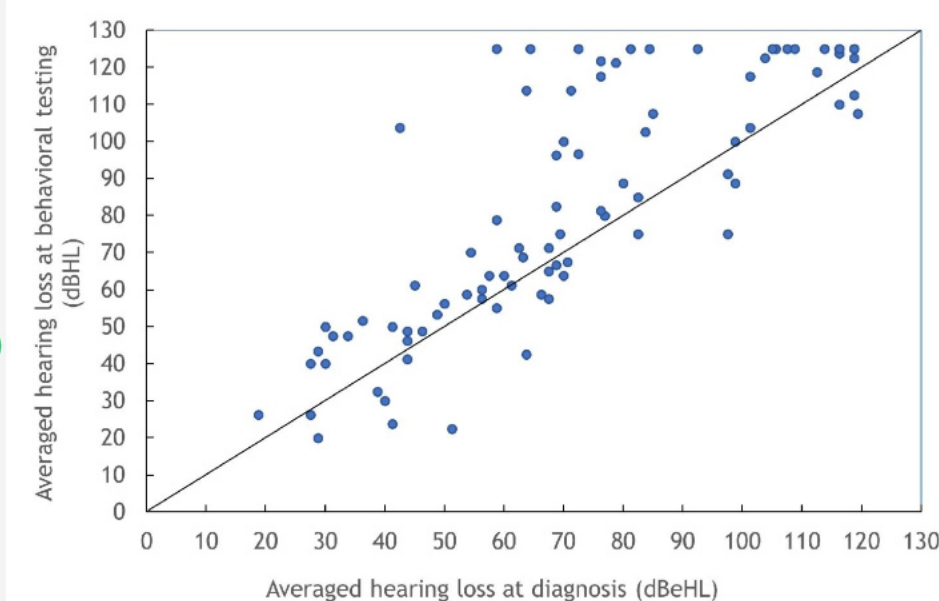
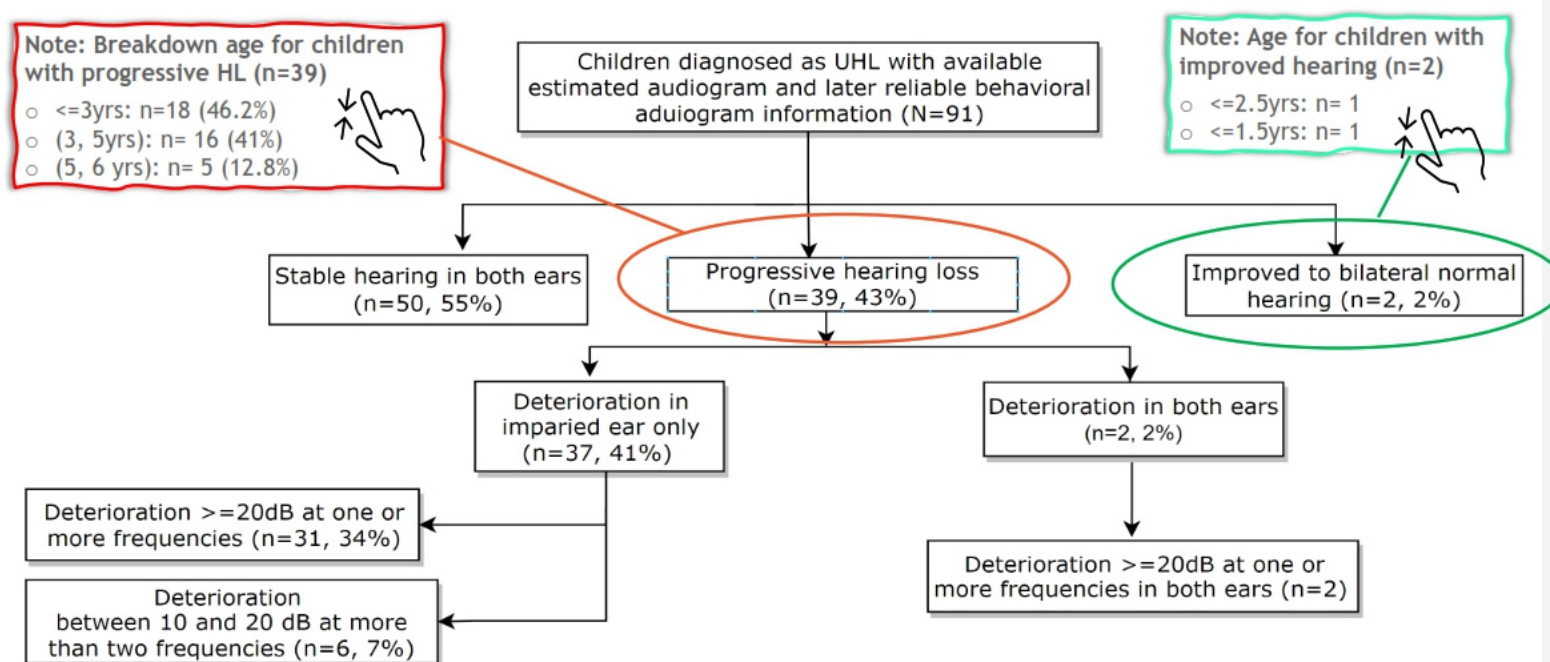
• POTENTIAL REASONS FOR DELAYING IN GETTING A RELIABLE BEHAVIORAL AUDIOGRAM

To help us identify potential reasons for delays and develop protocols to better improve clinical management in children with unilateral hearing loss, we kindly request your participation in a brief 1-minute survey. Please scan the QR code below to access the survey. Thank you for your time!



Results: CHANGE OF HEARING DEGREE FROM DIAGNOSIS TO THE FIRST RELIABLE BEHAVIORAL AUDIOGRAM

NUMBER (%) OF CHILDREN WITH CHANGES IN THE DEGREE OF HEARING LOSS



Comparison of hearing loss levels at diagnosis and at the first reliable behavioral assessment
 $(r = 0.84, p < 0.001)$

Aetiology information for children with progressive hearing loss (n=39):

- 5 (13%) absent/abnormal auditory nerves,
- 4 (10%) CMV,
- 2 (5%) LVAS,
- 1 (3%) syndromic,
- 27 (69%) no reported etiology

These results indicate that the majority of the children who demonstrated progressive hearing loss had no identifiable aetiology.

Summary and Impact

- The mean age of getting reliable behavioral audiogram is around 3 years old, although children were identified as UHL at about 2 months old. The findings on potential reasons for delays in getting reliable behavioral audiogram will be reported in future.
- Almost 43% of children with UHL may experience hearing deterioration in one or both ears. About 46% of hearing changes were observed before the age of 3, and additional 41% of hearing deterioration occurred between 3 and 5 years of age.
- The results suggest that careful monitoring of UHL especially in the early years is important to ensure optimal benefit from early hearing loss detection.

References

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2. Hearing Australia. Degrees of Hearing Loss (cir 075). April 2022.
3. Fitzpatrick, E. M., Al-Essa, R. S., Whittingham, J., & Fitzpatrick, J. (2017). Characteristics of children with unilateral hearing loss. *International Journal of Audiology*, 56(11), 819-828.
4. Horrocks, L. M., Kitterick, P. T., Jayasinghe, D. S., Willis, K. R., Martin, K. R., Dixit, A., & Thornton, S. K. (2022). Multiple congenital anomalies and adverse developmental outcomes are associated with neonatal intensive care admission and unilateral hearing loss. *Frontiers in Pediatrics*, 10.

Funding bodies

