
بسم الله الرحمن الرحيم

Hearing loss

Dr.H.R.khodadadi
2021

❖ Overview

- **Hearing loss**
- **Necessity of review**
- **Classification**
- **Syndromic hearing loss (SHL)**
- **Non-Syndromic hearing loss (NSHL)**
- **Methods, analysis and statistical tests**

➢ Hearing loss

- **Deafness is the most common sensory disorder**

- **360 million people worldwide, equivalent to 5% of the world's population**

- **Various factors:**

✓ **environmental(50%)**
✓ **Genetic(50%)**

- **According to research by the American Speech and Language Association (ASHA):**

✓ **hearing loss (56 to 70 dB)**
✓ **Severe hearing loss(71 to 90 dB)**
✓ **Deafness(more than 91 dB)**

➢ Necessity of review

- **35% cases of genetic deafness have not been identified**
- **In Western countries, the prevalence of congenital deafness is 1 per 1000 people**
- **In Iran, the prevalence of congenital deafness is 1 per 166 people**
- **Deafness is the second genetic defect in Iran:**

✓ **Gjb2 gene(52%)**
✓ **SLC26A4(18%)**
✓ **CDH23(15%)**
✓ **MYO7A(8%)**
✓ **MYO15A(14%)**
✓ **PCDH15(5%)**

- **Advent of next generation sequencing (NGS) technology, gene sequencing and diagnosis of unkhnown genetic diseases**
- **High frequency of consanguineous marriages**

➢ Classification

- **Syndromic hearing loss (SHL):**

✓ **20% HL genetic cases**
✓ **Appears with abnormalities in the eyes, kidneys, musculoskeletal system, pigment disorders and other conditions**

- **Non-Syndromic hearing loss (NSHL):**

✓ **80% HL genetic cases**
✓ **Mutations in the GJB2 gene causing approximately 30-50% in the Middle East and 52% in the Iran that are known to be the main ARNSHL gene.**

➢ Syndromic hearing loss (SHL):

- **Usher Syndrome:**
  - ✓ Impaired vision, balance and hearing
  - ✓ Autosomal recessive
  - ✓ Prevalence , 1 per 6000
  - ✓ three clinical types USH1, USH2 and USH3

- **Wardenburg Syndrome:**
  - ✓ Pigmentation abnormalities in eyes, hair, skin and arteries of the ear
  - ✓ Autosomal dominant
  - ✓ Prevalence , 1 per 4200
  - ✓ clinical types ,WS1,WS2, WS3 ,WS4

- **Pendred syndrome:**
  - ✓ Disorders in kidneys, inner ear and thyroid
  - ✓ Autosomal recessive
  - ✓ Prevalence , 8 per 100000

- **Other related hearing- syndromes:**
  - ✓ Branchio-oto-renal
  - ✓ CHARGE
  - ✓ And Jervell Lange-Nielsen and etc…

➢ Non-Syndromic hearing loss (NSHL):

Genes involved in cochlear homeostasis:

autosomal recessive gene, 13q11–q12, Up to date over 200 different mutations have been reported in **GJB2** gene
Pendrin, encoded by **SLC26A4**, Mutations in SLC26A4 are the second most frequent cause of ARNSHL

Genes implicated in cellular organization:

MYO7A encodes for myosin VIIA, which is ubiquitously expressed in many epithelial tissues including the inner ear and retina
Myo15a gene for development and elongation of the stereocilia through delivery of whirlin to the tips of stereocilia
Mutations in cadherin-related family, member 23 (**CDH23**) gene, are responsible for both Usher syndromesyndrome and DFNB12 NSHL. CDH23 encodes cadherin 23
Mutations in **PCDH15** cause both Usher syndrome type 1F (USH1F) and severe-to-profound ARNSHL

Genes coding for tectorial membrane-associated proteins
Genes involved in neuronal transmission
Genes implicated in cell growth, differentiation, and survival

➢ Methods, analysis and statistical tests

- **Audiometry and clinical examination**
- **DNA extraction**
- **NGS:**

✓ **WES technique**
✓ **Device used DNBSEQ_G400**
✓ **100X quality**
✓ **Twist Bioscience Kit**
✓ **33 million bp**

- **Confirmed by sanger sequencing**