



Hearing Impairment

What is Hearing Impairment?

Hearing Impairment (HI) is considered ‘significant’ when the degree of impairment is moderate grade or worse in the better ear. The impairment can be described in terms of severity, nature and involvement of the ears (unilateral or bilateral).

Severity of Hearing Impairment:

Grade	Hearing Threshold (dB HL)
Mild loss	26-40
Moderate loss	41-55
Moderately severe loss	56-70
Severe loss	71-90
Profound loss	>90

The nature of hearing impairment can be conductive, sensorineural or mixed. Conductive hearing impairment is caused by problems in the conduction of sounds in the outer and/or middle ear, such as earwax occlusion and middle ear effusion. Sensorineural hearing impairment involves impairment found in the inner ear and/or auditory nerves, whereas mixed hearing impairment includes both

conductive and sensorineural components. Management plans for hearing impairment vary from person to person, depending on the severity and nature of the problem.

How does Hearing Impairment affect children?

Auditory function:

The impact of hearing impairment follows the degree of impairment. Children with mild HI demonstrate difficulty perceiving faint sound and understanding soft-spoken speech. Children with moderate HI demonstrate understanding of speech at 3-5 feet distance but they have difficulty in perceiving conversation in a noisy environment, while those with severe HI can only understand speech at 1 foot from the ear with poor speech sound discrimination. Children with profound HI generally show lack of response to environmental sound and they cannot rely on audition as primary modality of communication.

Language development:

Hearing impairment will affect the different stages of language development. Language development of these children will depend on the severity and the onset time of the impairment. The following descriptions are mainly describing the language development of children whose hearing impairment is at a significant level with the onset at a pre-verbal stage:

Pre-verbal stage

Most normal-hearing children typically start to have cooing at around 2 to 3 months old. At around 6 months old, most of them will have early consonant and vowel combinations such as “baba” and “mama”. The pre-verbal development of children with HI usually parallels with their normal-hearing counterparts at these stages. However, because of lack of auditory feedback, these verbal outputs will gradually decrease soon afterwards.

Single-word stage

Most normal-hearing children will have their first words at around 1-year old. Their vocabulary repertoire will then improve in a very rapid pace. Children with HI however will have a significantly slower rate in their acquisition of vocabulary. They have more difficulty in acquiring abstract vocabularies, such as those describing time and mood. It is also believed that children with HI will have more difficulty in comprehending words that have multiple meanings.

2-word stage / Grammatical acquisition

Most normal-hearing children will produce 2-word combinations such as “eat bread”, “play cars” at around 2 years old. Depending upon the severity of their hearing impairment, children with HI would master 2-word combinations at a later age. Research showed that the milestones of language development of hearing impaired children parallel those of their hearing counterparts but at a slower pace. They have more difficulties with complex

grammatical structures. In the English language, since children with HI may have difficulties hearing final sounds of words such as ‘s’ or ‘ed’, they often have difficulty acquiring the meaning and usage of these grammatical markers.

Pronunciation

Hearing impairment will affect the speech perception abilities of children and thereby greatly affecting their phonological development. Those high frequency hearing impairment will have difficulties acquiring phonemes such as ‘s’ and ‘f’. Some will also have difficulties controlling their intonations or voice.

Cognitive development:

Hearing impairment itself does not hinder cognitive development but communication and language development will be affected. The lack of a solid first language (sign or spoken) and of interactive learning experience will affect acquisition of information and knowledge. These children may as a result fail to develop their full potentials.

Literacy:

Many studies have shown that children with HI are at risk of difficulties in literacy development. In addition to the delay in the growth of vocabulary, grammar and sentence structures, children with severe HI do not have solid knowledge of the sounds of words, and hence unable to “read out the words” in their brains. Reading and comprehension will therefore be more difficult.

Psychosocial development:

Because of their difficulties, children with HI may limit their communication and interactions with others, thus hampering the relationship with their caregivers and friends. Older children often have emotional or behavioral problems due to ineffective communication with peers and low self-esteem.

Motor development:

Motor coordination problems are noted in children with HI. There may be easy loss of balance, and frequent falls, hindering their functioning in the daily life. The problem is often more obvious in a dark environment.

How common is Hearing Impairment?

International data shows that the prevalence of congenital HI varies from 1-2 per 1,000 newborn infants. In Hong Kong, for every 1000 children under the age of 15 years, 1.3 was registered with significant HI in the Central Registry for Rehabilitation in 2014.

In Child Assessment Service (CAS) of Department of Health (DH), there are around 70-80 children diagnosed with significant HI every year.

What causes Hearing Impairment?

Genetic causes account for roughly 50-60% of children with HI but most cases are autosomal recessive. These include gene mutations,

chromosomal abnormalities and genetic syndromes. Studies found that many genes are related to HI, with some causing mild HI and others significant HI. Common genetic mutation testing is provided by the Clinical Genetic Service of the Hong Kong Department of Health.

Meanwhile, many non-genetic factors can also lead to hearing impairment. Sensorineural hearing impairment may result from multiple causes, including intrauterine infections or certain drugs taken by the pregnant mother, adverse events during delivery, brain and ear infections, as well as trauma or tumors affecting related structures during infancy and childhood. Conductive hearing loss may result from infection or obstruction of the ear canal and middle ear such as impacted ear wax and secretory otitis media.

Does my child really have Hearing Impairment?

Some developmental conditions commonly seen in children may be confused with HI. These include autism spectrum disorder, severe language delay, developmental delay or intellectual disability and severe behavioral disorders.

What conditions may co-exist in children with Hearing Impairment?

Depending largely on the cause of the HI, there may also be developmental delay, intellectual disability, emotional and behavioral problem, cerebral palsy or visual impairment in

respective children with HI. HI may also be part of the features of congenital syndromes in which hearing is affected.

What is the mainstay of treatment for children with Hearing Impairment?

Auditory training:

Residual hearing should be optimized through early amplification, provisions of favorable acoustic environment and appropriate training. Effective comprehensive habilitation programs will be able to enhance these children's auditory awareness and speech discrimination ability, foster the development of speech and language, and facilitate their intellectual and social development.

Language and communication training:

The language development of children is almost always being affected by their hearing impairment to different degrees. Therefore, these children need to receive training on their speech, language and communication. The earlier the commencement of training, the better will be the outcome. However, the ultimate progress will also depend on other factors including the degree of hearing impairment, how long it took for hearing aids or cochlear implants to be effectively fitted, the learning abilities of the child, motivation of the parents, and so on.

Some children with HI may not attain a satisfactory level of verbal language development even though they have been fitted with

hearing aids or cochlear implant. Therefore, in these cases, the therapists might need to consider other modes of communication besides the verbal one. In Hong Kong, most of the aural rehabilitation programs use total communication as the basic concept. Recently, the concept of sign-oral language bilingualism has also been put into the rehabilitation programs. Auditory-verbal therapy and the cued-speech method are also widely used in western countries. Below are some descriptions of the aforesaid rehabilitation methods:

Total communication approach

This approach focuses on the training of residual hearing, sound discrimination and identification, speech perception, verbal comprehension and expression in daily communication. It also advocates the use of sign and lip-reading to facilitate communication and learning. Total communication encourages the use of all modes namely speech, signs, lip-reading and writing to facilitate communication.

Sign-oral language bilingual approach

This approach advocates for children with HI to learn both sign and oral languages as modes for communication in order to maximize language development. This is especially relevant during early life as language development has a critical period and hearing may still be limited. This bilingual approach will support effective development of language, concepts and social skills. It is believed that learning sign language as the first language of these children will not hinder future oral language

development as was thought by many. In contrast, sign language will enhance overall language abilities and will support the development of oral and written languages. Some kindergartens, primary and secondary schools in Hong Kong employ this rehabilitation approach in their curriculum. Teachers will use sign and oral languages simultaneously during teaching.

Auditory-verbal therapy

Most parents of children with HI have normal hearing, and with advances in technology, hearing aids and cochlear implants are often effective in helping these children acquire reasonable hearing levels. Most parents therefore prefer to focus on training verbal language as the main mode of communication for their children. Auditory-verbal therapy promotes the concept of fully utilizing the residual hearing and learning verbal language as the only mode of communication. This training does not encourage use of lip-reading. Parents are trained to provide environmental accommodations, to promote the awareness of children to auditory stimuli in daily activities, and to enhance their verbal comprehension and expression.

Language and communication training:

Developing a fluent first language at an early age will facilitate the child's development of cognition and written language. When reading, children need to use existing knowledge and a "top down" approach to understand the content. At the same time, children may need to use the "bottom up" approach through reading of words and

sentences to understand the article and learn new concepts. In addition, we can enhance children's reading motivation through interesting learning activities, reading different kinds of books, and use of multi-sensory methods to help word learning, promote grammar learning and enrich their background knowledge.

Medical treatment:

Treatment of the underlying cause is possible in some conditions (e.g. earwax removal, antibiotics for otitis media, grommet insertion for middle ear effusion). Genetic counselling or related medical treatment can be provided for genetic and syndromal conditions.

Hearing aids (HA) and assistive listening devices (ALD):

With overwhelming research evidence demonstrating the benefit of early aid fitting on language development, children with HI should be fitted with hearing aids as early as possible. Binaural use of hearing aid is encouraged for more effective receiving of sound signals and sound localization. However, even with advanced hearing aids, hearing cannot be fully restored. Children must receive appropriate auditory training in order to enhance the hearing and language development. In noisy environments, wireless FM systems or other assistive listening devices may be used together with hearing aids to reduce the impact of noise.

Cochlear implant (CI) and auditory brainstem implant (ABI):

For children with severe to profound hearing loss who show limited or no benefit from hearing aids, cochlear implantation (CI) may be

considered. A cochlear implant is an electronic device that is implanted surgically, allowing the recipient to receive auditory information by electrical stimulation of the cochlear portion of the ear. Another audiological intervention, auditory brainstem implant (ABI), is used to treat total deafness in both ears which cannot be improved by hearing aids or cochlear implants. The external receiver of CI and ABI is similar, but in ABI the internal device is connected to the brainstem and directly stimulates the cochlear nucleus. Both CI and ABI require intensive auditory, speech and language rehabilitation and training after implantation.

Psychosocial support for parents and children:

Professional advice, counseling and psychological support must be provided to parents of children with HI. Their compliance with the child's use of hearing aids, provision of adequate language stimuli and participation in parent support groups should be encouraged. Advice on school accommodations such as classroom seating arrangement and attendance at various medical reviews should be given.

What services are available in Hong Kong to help children with Hearing Impairment?

Early identification:

Family Health Service from Department of Health and neonatal units from Hospital Authority provide universal newborn hearing screening programs using the Distortion Product Otoacoustic

Emission or Automated Auditory Brainstem Response. Student Health Service (SHS) also provides hearing screening for Primary 1 to Form 7 students who join their voluntary annual health check program.

Diagnostic services:

Ear, Nose and Throat (ENT) Departments of the Hong Kong Hospital Authority, and Audiological services of CAS and SHS, Department of Health provide diagnostic assessment for children with hearing impairment.

Medical and surgical treatment and assistive devices:

Hospital Authority offers medical and surgical interventions for children with hearing impairment. Since 1995, three cochlear implantation centres have been established including at Queen Mary Hospital, Prince of Wales Hospital and Queen Elizabeth Hospital. In current practice, the age for paediatric cochlear implantation is around 1 year old. Hearing aids and assistive listening devices can be obtained through Education Bureau (EDB) or the private sector. Auditory and speech training is available in speech therapy clinics under Hospital Authority, EDB, non-government organizations and the private sector.

Preschool training:

In Hong Kong, there are early educational training centres and two special child care centres to provide pre-school habilitation training for children with HI and their parents. They provide intensive

auditory and speech training, and children are encouraged to practice their speech and communication skills into daily experience through various activities. Integrated programmes in child care centres as well as special child care centres for children with disabilities are also provided with additional resources to help children with HI.

Special school for hearing impairment:

Lutheran School for the Deaf is the only special school for hearing-impaired school-aged children in Hong Kong today. Mainstream curriculum is implemented in this school with special educational support from teachers. Total communication method is applied with emphasis on a balanced development in spoken, sign and written language. There are also continual auditory and speech training at the school.

In recent years, there has been a shift in enrolment from special schools to mainstream schools for children with HI. Mainstream schools provide varying degrees of special education support to students with HI. These include outreach services by special school or through special funding assigned to these mainstream schools.

Sign bilingualism and co-enrolment in deaf education programme:

The use of sign language together with oral language is believed to enable the children with severe hearing impairment to be better able to attain their full cognitive, linguistic and social potentials.

Since 2006 the Centre for Sign Linguistics and Deaf Studies in the Chinese University of Hong Kong has offered “Sign Bilingualism and Co-enrollment in Deaf Education Programme” which promotes simultaneous learning sign language and oral language. Besides “Sign language classes for babies”, the Centre provides “Sign bilingual Chinese reading classes” and “Parents signing classes”. The Centre partners with kindergartens, primary and secondary schools to deliver this educational programme in the school setting.

Parent support and training:

Parent resource centres, support groups and parent training programmes are organized by a wide variety of institutions including government and non-government organizations, including The Hong Kong Society for the Deaf, HA cochlear implant centres, special schools and CAS of DH.

Can children with Hearing Impairment grow up normally?

Prognosis is dependent on the degree of hearing impairment, age of onset and diagnosis, age at which amplification is introduced, developmental characteristics of the child, psychosocial factors and educational experience. Early diagnosis and timely intervention are key factors for favorable outcome.

Relevant Websites:

Education Bureau (Support for Ordinary School)	http://www.edb.gov.hk/tc/edu-system/special/support/wsa/index.html
Education Bureau (Special Education Resource Centre – Hearing Impairment)	http://www.edb.gov.hk/tc/edu-system/special/resources/serc/hi.html http://www.edb.gov.hk/attachment/tc/edu-system/special/resources/serc/download/hi_c.pdf
Hong Kong Hospital Authority	http://www.ha.org.hk/visitor/
Social Welfare Department	http://www.swd.gov.hk
Social Welfare Department (Pre-school Rehabilitation Services/Rehabilitation and Medical Social Service Branch)	http://www.swd.gov.hk/tc/index/site_pubsvc/page_rehab/
Centre for Sign Linguistics and Deaf Studies	http://www.cslds.org/v3/?lang=tc
Hong Kong Society of the Deaf	http://www.hongkongdeaf.org.hk/
Suen Mei Speech & Hearing Centre	http://www.suenmeicentre.com/
The Hong Kong Society for the Deaf	http://www.deaf.org.hk/

Y's Men's Centre for the Deaf <http://ymd.ymca.org.hk/zh-hant/>

Chinese YMCA of Hong Kong

Hong Kong Parents Association for
the Hearing-impaired (HKPAHI) <http://www.facebook.com/hkpahi>

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