Deafness

Deafness is defined as a degree of impairment such that a person is unable to understand speech even in the presence of amplification. In profound deafness, even the loudest sounds produced by an audiometer (an instrument used to measure hearing) may not be detected. In total deafness, no sounds at all, regardless of amplification or method of production, are heard.

Hearing loss

Hearing loss exists when there is diminished sensitivity to the sounds normally heard. The term hearing impairment is usually reserved for people who have relative insensitivity to sound in the speech frequencies. The severity of a hearing loss is categorised according to the increase in volume above the usual level necessary before the listener can detect it.

Speech perception

Another aspect of hearing involves the perceived clarity of a sound rather than its amplitude. In humans, that aspect is usually measured by tests of speech perception. These tests measure one's ability to understand speech, not to merely detect sound. There are very rare types of hearing impairments which affect speech understanding alone.

Causes

The following are some of the major causes of hearing loss.

Age

There is a progressive loss of ability to hear high frequencies with increasing age known as presbycusias. This begins in early adulthood, but does not usually interfere with ability to understand conversation until much later. Although genetically variable it is a normal concomitant of aging and is distinct from hearing losses caused by noise exposure, toxins or disease agents.

Noise

Noise-induced hearing loss

Noise is the cause of half of all cases of hearing loss, causing some degree of problems in 5% of the population globally.

Populations living near airports or freeways are exposed to levels of noise typically in the 65 to 75 dB (A) range. If lifestyles include significant outdoor or open window conditions, these exposures over time can degrade hearing. The government departments and some policymakers have set noise standards to protect people from these adverse health risks. The NEPA has identified the level of 70 dB(A) for 24 hour exposure as the level necessary to protect the public from hearing loss and other disruptive effects from noise, such as sleep disturbance, stress-related problems, learning detriment, etc.

Noise-induced hearing loss (NIHL) typically is centered at 3000, 4000, or 6000 Hz. As noise damage progresses, damage spreads to affect lower and higher frequencies. On an audiogram, the resulting configuration has a distinctive notch, sometimes referred to as a "noise notch." As aging and other effects contribute to higher frequency loss (6-8 kHz on an audiogram), this notch may be obscured and entirely disappear.

Louder sounds cause damage in a shorter period of time. Estimation of a "safe" duration of exposure is possible using an *exchange rate* of 3 dB As 3 dB represents a doubling of intensity of sound, duration of exposure must be cut in half to maintain the same energy dose. For example, the "safe" daily exposure amount at 85 dB A, known as an exposure

action value, is 8 hours, while the "safe" exposure at 91 dB(A) is only 2 hours (National Institute for Occupational Safety and Health, 1998). Note that for some people, sound may be damaging at even lower levels than 85 dB A. Exposures to other autotoxins (such as pesticides, some medications including chemotherapy agents, solvents, etc.) can lead to greater susceptibility to noise damage, as well as causing their own damage. This is called a *synergistic* interaction.

Some health and safety agencies (such as OSHA-Occupational Safety and Health Administration and MSHA-Mine Safety and Health Administration), use an exchange rate of 5 dB while this exchange rate is simpler to use, it drastically underestimates the damage caused by very loud noise. For example, at 115 dB, a 3 dB exchange rate would limit exposure to about half a minute; the 5 dB exchange rate allows 15 minutes.

While OSHA, MSHA, and NEPA provide guidelines to limit noise exposure on the job, there is essentially no regulation or enforcement of sound output for recreational sources and environments, such as sports arenas, musical venues, bars, etc. This lack of regulation resulted from the defunding of research.

Many people are unaware of the presence of environmental sound at damaging levels, or of the level at which sound becomes harmful. Common sources of damaging noise levels include car stereos, home theatre system, children's toys, transportation, crowds, lawn and maintenance equipment, power tools, gun use, and even hair dryers. Noise damage is cumulative; all sources of damage must be considered to assess risk. If one is exposed to loud sound (including music) at high levels or for extended durations (85 dB A or greater), then hearing impairment will/might occur. Sound levels increase with proximity; as the source is brought closer to the ear, the sound level increases.

Genetic

Hearing loss can be inherited. Both dominant and recessive genes exist which can cause mild to profound impairment. If a family has a dominant gene for deafness it will persist across generations because it will manifest itself in the offspring even if it is inherited from only one parent. If a family had genetic hearing impairment caused by a recessive gene it will not always be apparent as it will have to be passed onto offspring from both parents. Dominant and recessive hearing impairment can be syndromic or nonsyndromic. Recent gene mapping has identified dozens of nonsyndromic dominant (DFNA#) and recessive (DFNB#) forms of deafness.

- The first gene mapped for non-syndromic deafness, DFNA1, involves a splice site mutation in the formic related homolog diaphanous 1 (DIAPH1). A single base change in a large Costa Rican family was identified as causative in a rare form of low frequency onset progressive hearing loss with autosomal dominant inheritance exhibiting variable age of onset and complete penetrance by age 30.
- The most common type of congenital hearing impairment in developed countries is DFNB1, also known as Connexin 26 deafness or GJB2-related deafness.
- The most common dominant syndromic forms of hearing impairment include Stickler syndrome and Waardenburg syndrome.
- The most common recessive syndromic forms of hearing impairment are Pandered syndrome, large vestibular aqueduct syndrome and Usher syndrome.
- The congenital defect microbial can cause full or partial deafness depending upon the severity of the deformity and whether or not certain parts of the inner or middle ear are affected.
- Mutations in PTPRQ are a cause of Autosomal-Recessive Nonsyndromic Hearing Impairment.

Illness

- Measles may result in auditory nerve damage

- Meningitis may damage the auditory nerve or the cochlea
- Autoimmune disease has only recently been recognized as a potential cause for cochlear damage. Although probably rare, it is possible for autoimmune processes to target the cochlea specifically, without symptoms affecting other organs. Wegener's granulomatosis is one of the autoimmune conditions that may precipitate hearing loss.
- Mumps (Epidemic parotitis) may result in profound sensorineural hearing loss (90 dB or more), unilateral (one ear) or bilateral (both ears).
- Presbycusias is a progressive hearing impairment accompanying age, typically affecting sensitivity to higher frequencies (above about 2 kHz).
- Adenoids that do not disappear by adolescence may continue to grow and may obstruct the Eustachian tube, causing conductive hearing impairment and nasal infections that can spread to the middle ear.
- People with HIV/AIDS frequently experience auditory system anomalies.
- Chlamydia may cause hearing loss in newborns to whom the disease has been passed at birth.
- Fetal alcohol syndrome is reported to cause hearing loss in up to 64% of infants born to alcoholic mothers, from the ototoxic effect on the developing fetus plus malnutrition during pregnancy from the excess alcohol intake.
- Premature birth results in sensorineural hearing loss approximately 5% of the time.
- Syphilis is commonly transmitted from pregnant women to their fetuses, and about a third of the infected children will eventually become deaf.
- Otosclerosis is a hardening of the stapes (or stirrup) in the middle ear and causes conductive hearing loss.
- Medulloblastoma and other types of Brain Tumors can result in hearing loss, whether by the placement of the tumor around the Vestibulocochlear nerve, surgical resection, or platinum-based chemotherapy drugs such as cisplatin.
- Superior canal dehiscence, a gap in the bone cover above the inner ear, can lead to low-frequency conductive hearing loss, auto phony and vertigo

Neurological disorders

Neurological disorders such as multiple sclerosis and strokes can have an effect on hearing as well. Multiple sclerosis, or MS, is an autoimmune disease where the immune system attacks the myelin sheath, a covering that protects the nerves. Once the myelin sheaths are destroyed there is no possible way at present to repair them. Without the myelin to protect the nerves, nerves become damaged, creating disorientation for the patient. This is a painful process and may end in the debilitation of the affected person until they are paralyzed and have one or more senses gone. One of those may be hearing. If the auditory nerve becomes damaged then the affected person will become completely deaf in one or both ears. There is no cure for MS. Depending on what nerves are damaged from a stroke, one of the side effects can be deafness.

Medications

Some medications cause irreversible damage to the ear, and are limited in their use for this reason. The most important group is the amino glycosides (main member gentamicin) and platinum based chemotherapeutics such as cisplatin.

Some medications may reversibly affect hearing. This includes some diuretics, aspirin and NSAIDs, and macrolide antibiotics. Others may cause permanent hearing loss. Extremely heavy hydrocodone use is known to cause hearing impairment.

Chemicals

Ototoxicity

In addition to medications, hearing loss can also result from specific drugs; metals, such as lead; solvents, such as toluene (found in crude oil, gasoline and automobile exhaust, for example); and asphyxiates. Combined with noise, these ototoxic chemicals have an additive effect on a person's hearing loss. Hearing loss due to chemicals starts in the high frequency range and is irreversible. It damages the cochlea with lesions and degrades central portions of the auditory system. For some ototoxic chemical exposures, particularly styrene, the risk of hearing loss can be higher than being exposed to noise alone. Controlling noise and using hearing protectors are insufficient for preventing hearing loss from these chemicals. However, taking antioxidants helps prevent ototoxic hearing loss, at least to a degree. The following list provides an accurate catalogue of ototoxic chemicals:

- Drugs
- antimalarial, antibiotics, anti-inflammatory (non-steroidal), antineoplastic, diuretics
- toluene, styrene, xylene, n-hexane, ethyl benzene, white spirits/Stoddard, carbon disulfide, fuels, perchloroethylene, trichloroethylene, p-xylene
- carbon monoxide, hydrogen cyanide
- lead, mercury, organotins (trimethyltin)
- paraquat, organophosphates

- Solvents
- Asphyxiates
- Metals
- Pesticides/Herbicides

Physical trauma

There can be damage either to the ear itself or to the brain centers that process the aural information conveyed by the ears.

People who sustain head injury are especially vulnerable to hearing loss or tinnitus, either temporary or permanent.

Diagnosis

The severity of a hearing impairment is ranked according to the additional intensity above a nominal threshold that a sound must be before being detected by an individual; it is (measured in decibels of hearing loss, or dB HL). Hearing impairment may be ranked as mild, moderate, moderately severe, severe or profound as defined below:

- Mild:
- for adults: between 26 and 40 dB HL
- for children: between 20 and 40 dB HL

- Moderate: between 41 and 54 dB HL
- Moderately severe: between 55 and 70 dB HL
- Severe: between 71 and 90 dB HL
- Profound: 91 dB HL
- Totally Deaf: Have no hearing at all.

Hearing sensitivity varies according to the frequency of sounds. To take this into account, hearing sensitivity can be measured for a range of frequencies and plotted on an audiogram.

For certain legal purposes such as insurance claims, hearing impairments are described in terms of percentages. Given that hearing impairments can vary by frequency and that audiograms are plotted with a logarithmic scale, the idea of a percentage of hearing loss is somewhat arbitrary, but where decibels of loss are converted via a recognized legal formula, it is possible to calculate a standardized "percentage of hearing loss" which is suitable for legal purposes only.

Another method for quantifying hearing impairments is a speech-in-noise test. As the name implies, a speech-in-noise test gives an indication of how well one can understand speech in a noisy environment. A person with a hearing loss will often be less able to understand speech, especially in noisy conditions. This is especially true for people who have a sensorineural loss - which is by far the most common type of hearing loss. As such, speech-in-noise tests can provide valuable information about a person's hearing ability, and can be used to detect the presence of a sensorineural hearing loss.

Classification

Hearing impairments are categorised by their type, their severity, and the age of onset (before or after language is acquired). Furthermore, a hearing impairment may exist in only one ear (unilateral) or in both ears (bilateral). There are three main types of hearing impairments, conductive hearing impairment and sensorineural hearing impairment and a combination of the two called mixed hearing loss:

Conductive hearing loss

Conductive hearing loss

A *conductive hearing impairment* is present when the sound is not reaching the inner ear, the cochlea. This can be due to external ear canal malformation, dysfunction of the eardrum or malfunction of the bones of the middle ear. The ear drum may show defects from small to total resulting in hearing loss of different degree. Scar tissue after ear infections may also make the ear drum dysfunction as well as when it is retracted and adherent to the medial part of the middle ear.

Dysfunction of the three small bones of the middle ear; hammer, anvil and stapes may result in conductive hearing loss. The mobility of the ossicles may be impaired of different reasons and disruption of the ossicular chain due to trauma, infection or anchylosis may also result in hearing loss.

Many of these conditions can be helped with surgery, and an air conduction hearing aid is often a good choice of treatment. However, in some cases such an aid is not possible to use. The most obvious reason is if the patient does not have any ear canals. Where to place the ear mould? A more common reason is in patients with chronic ear infections that drain continuously or start to drain when the ear canal is obstructed with an air conduction hearing aid mould. In these patients a direct bone conduction hearing device could be an excellent solution. An implant made out of titanium is placed in the bone behind the external ear and allowed to osseointegrate and an impedance-matched hearing aid can be attached. At present there are two such hearing aids on the market; the Baha 3 by Cochlear BAS and the Ponto by Oticon Medical.

Sensorineural hearing loss

Sensorineural hearing loss

A *sensorineural hearing loss* is one resulting from dysfunction of the inner ear, the cochlea, the nerve that transmits the impulses from the cochlea to the hearing centre in the brain or damage in the brain. The most common reason for sensorineural hearing impairment is damage to the hair cells in the cochlea. As we grow older the hair cells degenerate and lose their function, and our hearing deteriorates. Depending on the definition it could be estimated that more than 50% of the population over the age of 70 has an impaired hearing. Impaired hearing is the most common physical handicap in the industrialised world.

Another common reason for hearing loss due to hair cell damage is noise-induced hearing loss. These types of hearing loss are often most pronounced in the high frequency range. This will often interfere with speech understanding, as it is in the high frequency range that we find the consonant sounds that are most important especially in noisy surroundings. Head trauma, ear infections, tumours and ototoxic drugs such as gentamycin are other reasons for sensorineural hearing loss.

Hair cells that are damaged cannot be replaced with any surgical procedure, though research with stem cell treatment is presently on-going in many institutions. The clinical application of this will however not yet be available for many years. Protection from noise exposure is at present the only way to reduce the hair cell damage. Conventional air conduction hearing aids are often prescribed for patients with sensorineural hearing loss. The outcome with modern types of hearing aids is often excellent, but speech understanding could still be a problem in demanding situations.

Total or near total sensorineural deafness could be the result of congenital malformations, head trauma or inner ear infection. In patients with total or near total deafness, an air conduction aid could not be used even if the drum and middle ear are normal. For these patients a cochlear implant could be a treatment option. This means that a thin electrode is placed into the cochlea and is stimulated electrically through a small microprocessor under the skin behind that ear.

Mixed hearing loss

Mixed hearing loss is a combination of the two types discussed above. Chronic ear infection (a fairly common diagnosis) could result in a defective ear drum or middle-ear ossicle damages, or both. Surgery is often attempted but not always successful. On top of the conductive loss, a sensory component is often added. If the ear is dry and not infected, an air conduction aid could be tried; if the ear is draining, a direct bone condition hearing aid is often the best solution. If the conductive part of the hearing loss is more than 30-35 dB, an air conduction device could have problems overcoming this gap. A direct bone conduction aid like the Baha or the Ponto could, in this situation, be a good option.

Before language

Prelingual deafness

Prelingual deafness is hearing impairment that is sustained prior to the acquisition of language, which can occur as a result of a congenital condition or through hearing loss in early infancy. Prelingual deafness impairs an individual's ability to acquire a *spoken* language. Children born into signing families rarely have delays in language development, but most prelingual hearing impairment is acquired via either disease or trauma rather than genetically inherited, so families with deaf children nearly always lack previous experience with sign language. Cochlear implants allow prelingually deaf children to acquire an oral language with remarkable success if implantation is performed within the first 2-4 years.

In children, hearing loss can lead to social isolation for several reasons. First, the child experiences delayed social development that is in large part tied to delayed language acquisition. It is also directly tied to their inability to pick up auditory social cues. This can result in a deaf person becoming generally irritable. A child who uses sign language, or

identifies with the Deaf sub-culture does not generally experience this isolation, particularly if he/she attends a school for the deaf, but may conversely experience isolation from his parents if they do not know sign language. A child who is exclusively or predominantly oral (using speech for communication) can experience social isolation from his or her hearing peers, particularly if no one takes the time to explicitly teach her social skills that other children acquire independently by virtue of having normal hearing. Finally, a child who has a severe impairment and uses some sign language may be rejected by Deaf peers, because of an understandable hesitation in abandoning the use of existent verbal and speech-reading skills. Some in the Deaf community can view this as a rejection of their own culture and its mores, and therefore will reject the individual pre-emptively.

After language

Post-lingual deafness

Post-lingual deafness is hearing impairment that is sustained after the acquisition of language, which can occur as a result of disease, trauma, or as a side-effect of a medicine. Typically, hearing loss is gradual and often detected by family and friends of affected individuals long before the patients themselves will acknowledge the disability. Common treatments include hearing aids, cochlear implants and learning lip reading. Post-lingual deafness is far more common than pre-lingual deafness. Those who lose their hearing later in life, such as in late adolescence or adulthood, face their own challenges, living with the adaptations that make it possible for them to live independently. They may have to adapt to using hearing aids or a cochlear implant, develop speech-reading skills, and/or learn sign language. The affected person may need to use a TTY (teletypewriter), interpreter, or relay service to communicate over the telephone. Loneliness and depression can arise as a result of isolation (from the inability to communicate with friends and loved ones) and difficulty in accepting their disability. The challenge is made greater by the need for those around them to adapt to the person's hearing loss.

Many relationships can suffer because of emotional conflicts that occur when there are general miscommunications between family members. Generally, it's not only the person with a hearing disability that feels isolated, but others around them who feel they are not being "heard" or paid attention to, especially when the hearing loss has been gradual. Family members then feel as if their hearing loss partner doesn't care about them enough to make changes to reduce their disability and make it easier to communicate.

Unilateral and bilateral

People with unilateral hearing loss or single-sided deafness (SSD) have difficulty in:

- hearing conversation on their impaired side
- localising sound
- Understanding speech in the presence of background noise.

In quiet conditions, speech discrimination is approximately the same for normal hearing and those with unilateral deafness; however, in noisy environments speech discrimination varies individually and ranges from mild to severe.

A similar effect can result from King-Kopetzky syndrome (also known as *Auditory disability with normal hearing* and *obscure auditory dysfunction*), which is characterized by an inability to process out background noise in noisy environments despite normal performance on traditional hearing tests.

One reason for the hearing problems these patients often experience is due to the head shadow effect. Newborn children with no hearing on one side but one normal ear could still have problems. Speech development could be delayed and difficulties to concentrate in school are common. More children with unilateral hearing loss have to repeat classes than their peers. Taking part in social activities could be a problem. Early aiding is therefore of utmost importance.

Screening

It is advisable that children should have their hearing tested several times throughout their schooling:

- When they enter school
- At ages 6, 8, and 10,
- At least once during middle school
- At least once during high school

There is not enough evidence to determine the utility of screening in adults over 50 years old who do not have any symptoms.

Prevention

It is estimated that half of cases of hearing impairment and deafness are preventable. A number of preventative strategies are effective including: immunization against rubella to reduce congenital infections, immunization against *H. influenza* and *S. pneumonia* to reduce cases of otitis media, and avoiding or protecting against excessive noise exposure. Education on the perils of hazardous of noise exposure increases the use of hearing protectors.

Cochlear Implant

Illustration of a cochlear implant

There are a number of devices that can improve hearing in those who are hearing impaired or deaf or allow people with these conditions to better manage in society. Hearing aids, which amplify the incoming sound, will improve hearing ability, but nothing can restore normal hearing. Cochlear implants artificially stimulate the cochlear nerve by providing an electric impulse substitution for the firing of hair cells. Cochlear implants are not only expensive, but require sophisticated programming in conjunction with training for effectiveness. Cochlear implant recipients may be at higher risk for meningitis. People who have hearing impairments, especially those who develop a hearing problem in childhood or old age, may need the support and technical adaptations as part of the rehabilitation process. Recent research shows variations in efficacy but some studies show that if implanted at a very young age, some profoundly impaired children can acquire effective hearing and speech, particularly if supported by appropriate rehabilitation.

Assistive devices

Many hearing impaired individuals use assistive devices in their daily lives:

- Individuals can communicate by telephone using telecommunications device for the deaf (TDD). These devices look like typewriters or word processors and transmit typed text over regular telephone lines. Other names in common use are textphone and minicom.
- There are several new telecommunications relay service technologies including IP Relay and captioned telephone technologies. A hearing-impaired person can communicate over the phone with a hearing person via a human translator. Wireless, Internet and mobile phone/SMS text messaging are beginning to take over the role of the TDD.
- Real-time text technologies, involving streaming text that is continuously transmitted as it is typed or otherwise composed. This allows conversational use of text. Software programs are now available that automatically generate a closed-captioning of conversations. Examples include discussions in conference rooms, classroom lectures, and/or religious services. One such example of an available product is Auditory Sciences' Interact-AS product suite.
- Instant messaging software. In addition, AOL Instant Messenger provides a real-time text feature called Real-Time IM.
- Videophones and similar video technologies can be used for distance communication using sign language. Video conferencing technologies permit signed conversations as well as permitting a sign language-English interpreter to voice and sign conversations between a hearing impaired person and that person's hearing party, negating the use of a TTY device or computer keyboard.
- Video relay service and video remote interpreting (VRI) services also use a third-party telecommunication service to allow a deaf or hard-of-hearing person to communicate quickly and conveniently with a hearing person, through a sign language interpreter.
- Phone captioning is a service in which a hearing person's speech is captioned by a third party, enabling a hearing impaired person to conduct a conversation with a hearing person over the phone.
- For mobile phones, software apps are available to provide TDD/textphone functionality on some carriers/models to provide 2-way communications.
- Hearing dogs are a specific type of assistance dog specifically selected and trained to assist the deaf and hearing impaired by alerting their handler to important sounds, such as doorbells, smoke alarms, ringing telephones, or alarm clocks.
- Other assistive devices include those that use flashing lights to signal events such as a ringing telephone, a doorbell, or a fire alarm.
- The advent of the Internet's World Wide Web and closed captioning has given the hearing impaired unprecedented access to information. Electronic mail and online chat have reduced the need for deaf and hard-of-hearing people to use a third-party Telecommunications Relay Service in order to communicate with the hearing and other hearing impaired people.

Resources and interventions

Many different assistive technologies, such as hearing aids, are available to those who are hearing impaired. People with cochlear implants, hearing aids, or neither of these devices can also use additional communication devices to reduce the interference of background sounds, or to mediate the problems of distance from sound and poor sound quality caused by reverberation and poor acoustic materials of walls, floors and hard furniture.

Three types of wireless devices exist along with hard-wired devices. A wireless device used by people who use their residual hearing has two main components. One component sends the sound out to the listener, but is not directly connected to the listener with the hearing loss. The second component of the wireless system, the receiver, detects the sound and sends the sound to the ear of the person with the hearing loss. The three types of wireless devices are the FM system, the audio induction loop and the infra-red system. Each system has advantages and benefits for particular uses.

The FM system can easily operate in many environments with battery power. It is thus mobile and does not usually require a sound expert for it to work properly. The listener with the hearing loss carries a receiver and an earpiece. Another wireless system is the audio induction loop which permits the listener with hearing loss to be free of wearing a receiver provided that the listener has a hearing aid or cochlear implant processor with an accessory called a "telecoil". If the listener does not have a telecoil, then he or she must carry a receiver with an earpiece.

A third kind of wireless device for people with hearing loss is the infra-red (IR) system, which also requires a receiver to be worn by the listener. Usually the emitter for the IR device, that is, the component that sends out the signal, uses an AC adaptor. The advantage of the IR wireless system is that people in adjoining rooms cannot listen in on conversations, making it useful for situations where privacy and confidentiality are required. Another way to achieve confidentiality is to use a hardwired amplifier which sends out no signal beyond the earpiece that is plugged directly into the amplifier. That amplifier of the hardwired device also has a microphone inside of it or plugged into it.

Inside the classroom, children with hearing impairments may also benefit from interventions. These include providing favourable seating for the child. This can be achieved by having the student sit as close to the teacher as possible so that they will be able to hear the teacher, or read their lips more easily. When lecturing, teachers should try to look at the student as much as possible and limit unnecessary noise in the classroom. If a student has a hearing aid, they are likely to hear a lot of unwanted noises.

Pairing hearing impaired students with hearing students is a common technique, allowing the non-hearing student to ask the hearing student questions about concepts that they have not understood. When teaching students with hearing impairments, overheads are commonly used, allowing the teacher to write, as well as maintain visual focus on the hearing impaired student. For those students who are completely deaf, one of the most common interventions is having the child communicate with others through an interpreter using sign language.

Epidemiology

Disability-adjusted life year for hearing loss (adult onset) per 100,000 inhabitants in 2004.

no data	475-520
<250	520-565
250-295	565-610
295-340	610-655
340-385	655-700
385-430	>700
430-475	

Globally hearing loss affects about 10% of the population to some degree. It caused moderate to severe disability in 124.2 million people as of 2004 (107.9 million of whom are in low and middle income countries). Of these 65 million acquired the condition during childhood. At birth ~3 per 1000 in developed countries and more than 6 per 1000 in developing countries have hearing problems.

Society and culture

Deaf culture

Main article: Deaf culture

Jack Gannon, a professor at Gallaudet University, said this about deaf culture. "Deaf culture is a set of learned behaviours and perceptions that shape the values and norms of deaf people based on their shared or common experiences." Some doctors believe that being deaf makes a person more social. Dr. Bill Vicar, from ASL University, shared his experiences as a deaf person, "[deaf people] tend to congregate around the kitchen table rather than the living room sofa… our good-byes take nearly forever, and our hellos often consist of serious hugs. When two of us meet for the first time we tend to exchange detailed biographies." Deaf culture is not about contemplating what deaf people cannot do and how to fix their problems. That is called a "pathological view of the deaf". Instead deaf people celebrate what they can do. There is a strong sense of unity between deaf people as they share their experiences of suffering through a similar struggle. This celebration creates a unity between even deaf strangers. Dr. Bill Vicars expresses the power of this bond when stating, "if given the chance to become hearing most [deaf people] would choose to remain deaf." There is more to deaf culture than meets the eye and has to be "experienced" to full comprehend it.

Views of treatments

There has been considerable controversy within the culturally deaf community over cochlear implants. For the most part, there is little objection to those who lost their hearing later in life or culturally Deaf adults (voluntarily) choosing to be fitted with a cochlear implant.

Many in the Deaf community strongly object to a deaf child being fitted with a cochlear implant (often on the advice of an audiologist; new parents may not have sufficient information on raising deaf children and placed in an oral-only program that emphasizes the ability to speak and listen over other forms of communication such as sign language or total communication. Other concerns include loss of deaf culture and limitations on hearing restoration.

Most parents and doctors tell children not to play sports or get involved in activities that can result in injuries to the head. Soccer, Hockey, and Basketball can be some examples. A child with a hearing loss may prefer to stay away from noisy places, such as rock concerts, Football games, airports, etc., as this can cause noise overflow (noise overflow is a type of headache that occurs in many children and adults when they are near loud noises.)

Sign Language

Main article: Sign Language

Sign Languages convey meaning by manual communication and body language instead of acoustically conveyed sound patterns. This can involve simultaneously combining hand shapes, orientation and movement of the hands, arms or body, and facial expressions to fluidly express a speaker's thoughts.

There is no single "sign language". Wherever communities of deaf people exist, sign languages develop. While they utilize space for grammar in a way that oral languages do not, sign languages exhibit the same linguistic properties and use the same language faculty as do oral languages. Hundreds of sign languages are in use around the world and are at the cores of local deaf cultures. Some sign languages have obtained some form of legal recognition in many part of the world. In South Africa, sign language is receiving recognition in some part, it is not yet an official language. Various mechanisms are progressing to ensure that sign language is official recognised. Deaf sign languages are not based on the spoken languages of their region, and often have very different syntax, partly but not entirely owing to their ability to use spatial relationships to express aspects of meaning.

School

School for the Deaf

There are many schools of deaf children in South Africa and many parents who happen to have deaf child are encouraged to visit these schools around the country according to their satisfaction. It is advisable that parents of deaf children must consider the academic level of deaf school they send their children to, as deaf school's academic level varies as far as teaching is concerned. In most deaf schools, teachers of deaf students are generally hearing teachers which mean those teachers are themselves learning about sign language while at the same time teaching deaf students. This is viewed as unfair advantage as child's teaching can take a backward progress due to difficult sign language communication. Deaf teacher are generally the best tool a deaf student can have as they will very likely to understand deaf students more easily and express in similar language. Parents of deaf children must also gather more information about deaf schools before weigh up the options, it is not a case of because there are deaf school, the child must go there no matter what. In order for a deaf child to qualify for special school, the child's has to be send for audiology testing with the results serving as supporting documents.

Inclusion vs. pull-out

There are mixed opinions on the subject between those who live in deaf communities, and those who have deaf family members who do not live in deaf communities. Deaf communities are those communities where only sign languages are typically used.

Many parents who have a child with a hearing impairment prefer their child to be in the least restrictive environment of their school. This may be because most children with hearing loss are born to hearing parents. This can also be because of the recent push for inclusion in the public schools.

It is commonly misunderstood that least restrictive environment means mainstreaming or inclusion. Sometimes the resources available at the public schools do not match up to the resources at a school for the deaf. Some hearing parents choose to have their deaf child educated in the general education classroom as much as possible because they are told that mainstreaming is the least restrictive environment, which is not always the case. However, there are some parents who live in Deaf communities that feel the general education classroom is not the least restrictive environment for their child. These parents feel that placing their child in a special school where all children are deaf may be more appropriate for their child because the staff tend to be more aware of the needs and struggles of deaf children. Another reason that these parents feel a special school may be more appropriate is because in a general education classroom, the student will not be able to communicate with their classmates due to the language barrier.

In a special school where all the children use the same language (whether it be a school using SL, Total Communication or Oralism), students will be able to interact normally with other students, without having to worry about being criticised. An argument supporting inclusion, on the other hand, exposes the student to people who aren't just like them, preparing them for adult life. Through interacting, children with hearing disabilities can expose themselves to other cultures which in the future may be beneficial for them when it comes to finding jobs and living on their own in a society where their disability may put them in the minority. These are some reasons why a person may or may not want to put their child in an inclusion classroom.

Myths

There are many myths regarding people with hearing losses including, but not limited to:
1. Everyone who is deaf or hard of hearing uses sign language.
There are a variety of different sign systems used by hearing-impaired individuals.

Individuals who experience hearing loss later in life usually do not know sign language.
People who are educated in the method of oralism or mainstream do not always know sign language.
2. People who cannot hear are not allowed to drive.
Deaf people may use special devices to alert them to sirens or other noises, or panoramic mirrors to enable improved visibility.
Many countries allow deaf people to drive, although at least 26 countries do not allow deaf citizens to hold a driver's license.
3. All forms of hearing loss can be solved by hearing aids or cochlear implants.
While many hearing-impaired individuals do use hearing aids, others may not benefit from the use of a hearing aid. One reason can be that they don't have any external ear canals to place the moulds; another that the hearing aids are not powerful enough.
For some hearing-impaired individuals who experience distortion of incoming sounds, a cochlear implant may actually worsen the distortion. A bone conduction hearing solution (BAHA) however, will never affect the hearing in a negative way since it reroutes the sound through the skull.
4. All deaf/hard of hearing people are experts in Deaf Culture.
Deaf people may have a variety of different beliefs, experiences, and methods of communication.
This may be influenced by the age at which hearing was lost and the individual's personal background.
5. All deaf people want to be hearing.
While some individuals with hearing loss want to become hearing, this is not the case for everyone. Some take pride in their deafness or view themselves as a minority rather than a disability group.
6. People who can't hear can't use a phone.
Teletypewriters, Video phones and cell phone text messages are used by deaf people to communicate. A hearing person may use an ordinary telephone, a sms and a Telecommunications Relay Service to communicate with a deaf person.
7. Everyone who cannot hear can lip read.
Only about 30% of spoken English is visible on the lips.
Lip reading requires not only good lighting, but also a good understanding of the oral language in question and may also depend on contextual knowledge about what is being said.
8. Most deaf people have deaf parents.
Less than 4% of deaf children in South Africa have a deaf parent.

Research

A 2005 study achieved successful regrowth of cochlea cells in guinea pigs. It is important to note, however, that the regrowth of cochlear hair cells does not imply the restoration of hearing sensitivity as the sensory cells may or may not make connections with neurons that carry the signals from hair cells to the brain. A 2008 study has shown that gene therapy targeting Atoh1 can cause hair cell growth and attract neuronal processes in embryonic mice. Some hope that a similar treatment will one day ameliorate hearing loss in humans.

For further information visit/contact:

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