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Encyclopedia of Children's Health

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Hearing impairment



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Definition

Hearing impairment is the temporary or permanent loss of some or all hearing in one or both ears.

Description

There are three types of hearing impairment that occur in young children:

- **conductive hearing loss**, a usually temporary interference with the reception of sound from the outer ear to the middle or inner ear
- **[sensorineural hearing impairment](#)**, a permanent abnormality of the cochlear hair cells of the inner ear, the auditory nerve, or the auditory center of the brain

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- mixed hearing impairment, a combination of conductive and sensorineural impairments

Hearing impairments also are classified as prelingual (occurring before a child learns to speak) and post-lingual (occurring after the child has acquired language).

Normal hearing in children is defined as the ability to hear sounds in the range of 0–25 decibels (dB). Hearing impairments are classified in the following degrees:

- Mild, in which a child hears sounds from 26–40 dB. Speech and conversation are usually unaffected but distant sounds may be difficult to hear.
- Moderate, in which a child hears sounds from 41–70 dB. The ability to form sounds and hear normal conversation is affected.
- Severe, in which a child hears sounds from 71–90 dB. The child requires a hearing aid to hear conversations.
- Profound, in which a child can only hear sounds above 90 dB. A hearing aid may help but the child will not be able to articulate words normally.



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Demographics

Temporary and permanent hearing impairments are not uncommon among children.

[Conductive hearing impairment](#) is most often caused by [otitis media](#), an infection of the middle ear. This is very common in children between the ages of six months and four years. About 20 percent of children have an episode of acute [otitis media](#) every year. It affects boys and girls equally. Otitis media is more common among children of Eskimo or Native American descent and among children whose parents smoke. The condition is less common in children over the age of eight. Chronic secretory otitis media, also called otitis media with effusion or suppurative otitis media, is the most common cause of temporary hearing impairment in children under eight. It is more common in boys and rare in children over age eight.

About 12,000 American infants annually are born with some degree of hearing impairment. Although congenital (present at birth) deafness is the rarest form of deafness, it is the most common congenital abnormality in newborns. Three out of every 1,000 children are born with significant hearing impairment. About 65 percent of these children are born deaf and an additional 12 percent become deaf before the age of three. In the United States 14.9 percent of children aged six to 19 have measurable hearing impairment in one or both ears.

Noise-induced hearing impairment is increasing in the United States. It is not uncommon for teenagers to become permanently hearing impaired in the high-frequency range above 4,000 hertz.

Causes and symptoms

Conductive hearing impairment

Children develop otitis media because the eustachian tubes that connect the middle ear with the back of the mouth and equalize air pressure and drain fluid are small and easily obstructed. Acute otitis media can result from a respiratory infection such as a cold that causes an [inflammation](#) that blocks a eustachian tube. The fluid that builds up in the middle ear is susceptible to bacterial and viral infection. If the blockage persists it causes chronic secretory otitis media, the most common cause of conductive hearing impairment in children.

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A painful earache and temporary hearing impairment in one ear are common symptoms of acute otitis media. The symptoms of secretory otitis media develop gradually and fluctuate. They are usually worse in the winter. Symptoms of partial hearing loss from secretory otitis media may go unnoticed for some time and may include the following symptoms:

- immature speech
- behavioral problems resulting from frustration at not being able to hear well
- sitting close to the television or turning up the volume
- poor school performance

Otitis media sometimes runs in families, indicating that there may be a hereditary component. Second-hand smoke also is a risk factor for otitis media. Conductive hearing impairment from middle ear infections may be associated with other medical conditions including the following problems:

- asthma or allergic rhinitis
- **cleft palate** , which impairs drainage of the middle ears through the eustachian tubes (Some 30% of children with cleft palate have conductive hearing loss.)
- other head or facial abnormalities
- **Down syndrome** , which is characterized by narrow ear canals resulting in susceptibility to middle ear infections (About 80% of children with Down syndrome have some hearing impairment.)

Another cause of conductive hearing impairment is an excessive build-up of earwax that prevents sound waves from reaching the eardrum. Although earwax, produced by glands in the outer ear canal, normally works its way out of the ear, sometimes excessive amounts build-up and harden in the outer ear canal, gradually impairing hearing.

Sensorineural hearing impairment

Sensorineural hearing impairments result from abnormal development or disorders of the cochlea, the spiral cavity of the inner ear, disorders of the auditory nerve that transmits electrical impulses from the inner ear to the brain, or abnormalities of the auditory center of the brain. Such conditions have a variety of causes. For example, more than 70 known inherited

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disorders account for about one-half of all severe sensorineural hearing impairments; however, 90 percent of children with congenital hearing impairment are born to parents with normal hearing. In addition, the following problems are associated with sensorineural hearing impairment:

- craniofacial anomalies
- Down syndrome, in many of which cases the child has some immune deficiency that leads to frequent ear infections resulting in hearing loss
- problems during or shortly after birth that may damage the inner ear or auditory nerve
- low birth weigh, below 3.5 lb (1.6 kg)
- incubator noise affecting premature infants
- neonatal exposure to aminoglycoside **antibiotics**
- bacterial infections such as **meningitis** during infancy
- cytomegalovirus (CMV) infection during childhood
- accidents involving head injuries

High-frequency hearing impairment in teenagers most often results from exposure to loud noise such as amplified music.

While about 50 percent of congenital hearing impairments have no known cause, prenatal risk factors for congenital hearing impairment include:

- **rubella** (German **measles**) (More than 50% of children born to mothers who contracted rubella during the first ten weeks of pregnancy suffer from congenital malformations.)
- CMV, the most common viral infection in fetuses, a leading cause of **congenital deafness** (CMV affects 1% or 40,000 newborns annually; about 8,000 of these newborns have birth defects.)
- other infections, including **toxoplasmosis**, herpes, syphilis, or flu
- drug or alcohol consumption
- drugs that are **ototoxins**

Symptoms of congenital deafness in newborns include:

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- lack of response to loud noises
- lack of response to voices or noise when sleeping in a quiet room
- failure to calm down at the sound of the mother's voice
- failure to make normal baby sounds including cooing by six weeks of age
- failure to look for the source of a noise by three to six months of age
- failure to **play** with noisy **toys**, such as a rattle, by four to eight months
- failure to babble by about six months of age

Symptoms that a baby or young child may have a hearing impairment include:

- lack of reaction to loud noises
- failure to imitate sounds
- lack of response to the child's name during the first year of life
- failure to vocalize (to imitate simple words, enjoy games that involve speech, or talk in two-word sentences during the second year)
- failure to understand simple directions during the third year

When to call the doctor

A physician should be consulted immediately if a parent suspects that a child has a hearing impairment.

Diagnosis

Parents are usually the first to suspect a hearing impairment in their child. Early detection of and intervention for hearing impairments are crucial for preventing or minimizing developmental and educational delays. Hearing-impaired children who are identified and receive early intervention before six months of age develop significantly better language skills than children identified after six months of age. However, in the United States, the average age of diagnosis is at two years of age, and significant hearing impairments have gone undiagnosed in children as old as six.

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Newborn hearing tests often are administered only if an infant is considered at risk for congenital deafness. However, routine screening of sleeping newborns is on the increase. If a problem is detected, additional tests are used to determine the type and severity of the impairment. Tests used are as follows:

- An evoked otoacoustic emissions (OAE) test that detects an echo emitted by the inner ear in response to sound; the echo is produced only if the inner ear is healthy and functioning normally.
- An automated [auditory brainstem response](#) (ABR) test, or brainstem auditory-[evoked response](#) (BAER) test, in which brainstem responses to sounds are monitored through small electrodes taped to the child's head.

Pediatricians may examine a child's ears with a viewing instrument called an [otoscope](#). Age-appropriate hearing tests may be performed routinely throughout childhood. Test administrators who suspect a hearing impairment may cover their mouths to prevent the child from lip reading, also called speech reading. Types of hearing tests include:

- behavioral tests that measure the quietest sound that the child can hear and the ability to understand words
- speech discrimination tests for children with simple vocabularies
- the McCormick toy discrimination test for three-year-olds, in which the child is asked to identify words that sound similar, such as tree and key
- a simple form of [audiometry](#) that assesses frequency perception through earphones
- tympanometry, in which a probe inserted into the ear measures sound waves bouncing off the eardrum
- acoustical impedance tests to identify middle ear problems including otitis media

Treatment

Conductive hearing impairment

Acute otitis media may be treated with antibiotics. Secretory otitis media usually disappears without treatment. However, a procedure called **myringotomy** or tympanostomy may be used for recurrent acute otitis media or secretory otitis media that persists for several months. A small plastic tube is inserted through the eardrum to drain fluid and equalize the air pressure between the middle ear and the ear canal. The tube usually falls out within six to 12 months and the hole in the eardrum

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closes. Myringotomy is an outpatient procedure performed under general anesthesia.

Excessive earwax usually can be removed at home, following a doctor's instructions. Special drops are used to soften the wax, and the ears are flushed with water. If necessary a doctor may remove earwax using suction or a metal probe.

Sensorineural hearing impairment

Sensorineural hearing impairment and congenital deafness are incurable. However, any residual hearing can be maximized with a hearing aid. Many types of hearing aids are available for children as young as three months. A postauricular hearing aid fits behind the ear and is connected to a plastic mold that is custom-fitted for the child's ear. These must be replaced as the child grows.

An older child with sufficient residual hearing can use an in-the-ear or in-the-canal hearing aid, in which the entire apparatus fits inside the ear. Hearing aids may be programmed to match a child's particular type of hearing loss. A transposer can change high-pitched sounds that are inaudible to many hearing-impaired children into lower-pitched sounds.

Cochlear implants may be used in children who are profoundly deaf and thus are not candidates for hearing aids.

Electrodes are surgically implanted into the cochlea through a hole drilled in the mastoid bone. Cochlear implants rely on three external components: a microphone to pick up sound, a speech processor to select and arrange the sounds, and a transmitter and receiver/stimulator that converts the signals from the processor into electrical impulses. The electrodes in the cochlea collect the impulses from the stimulator and send them to the brain. Although they do not restore normal hearing, cochlear implants can provide substantial improvement in speech recognition and production, as well as the ability to hear and identify common sounds such as doorbells. Most children receive implants between the ages of two and six. As of 2002 about 10,000 American children had cochlear implants. Children with cochlear implants have been found to be at an increased risk for bacterial meningitis.

Various educational approaches are employed for children with hearing impairments:

- lip reading and sign language, particularly for children with severe hearing impairment
- a bilingual-bicultural (bi-bi) approach that considers the deaf community as a separate culture with its own language

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(American Sign Language [ASL])

- the auditory-oral approach, which relies on powerful hearing aids or cochlear implants, supplemented with lip reading, and uses spoken rather than sign language
- the auditory-verbal (A-V) approach, which relies on enhanced residual hearing and one-on-one teaching to develop auditory skills without lip reading or sign language
- cued speech, a simple visual phonetic-based system of eight handshapes, each representing several consonant sounds, and four positions around the mouth, each representing several vowel sounds
- the total communication approach, which uses multiple methods of communication, including hearing amplification, gestures, lip reading, finger spelling, and one of several English-based sign languages known collectively as [Manually Coded English](#) (MCE)

Prognosis

Symptoms of acute otitis media usually disappear within a few days, although a ruptured eardrum may take several weeks to heal. Sometimes hearing is affected for three months or more until all of the fluid has drained from the ear. Following a myringotomy hearing in the affected ear usually returns to normal, often within a few days. As a child grows the eustachian tubes widen and stiffen, allowing air to enter and fluid to drain from the middle ear more efficiently. However, recurrent or chronic otitis media can result in ongoing moderate hearing impairment, often at a stage in which hearing is essential for [language development](#).

Children who receive early intervention for hearing impairments can develop at nearly the same rate as other children. However, even a minor hearing impairment can significantly affect a baby's ability to understand and communicate and to acquire speech and language. The effects of hearing impairment on learning depend on the following:

- the severity of the impairment
- the affected frequency range
- the age at which the impairment occurred
- how early the impairment was detected

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- how early treatment was initiated

Prevention

Couples with **family** histories of congenital deafness may seek genetic counseling to assess the risks for their children. If they have not already had rubella, women should be vaccinated before becoming pregnant. During pregnancy women should take only drugs that are known to be safe for the fetus.

It is very important for the hearing-impaired to protect residual hearing from loud noise. Teenagers should be encouraged to avoid very loud music. Those at risk for hearing impairment from other loud noises should be encouraged to wear earplugs.

Parental concerns

Hearing is very important for the development of emotional relationships between a child and the family. Families of hearing-impaired children must find additional means of connecting emotionally. Support groups often are very helpful for hearing-impaired children and their families.

Because hearing impairments may delay speech and language acquisition, interfere with **cognitive development**, and disrupt progress in school, the educational decisions that parents make for their child are of special significance. About 50 percent of all children with congenital deafness attend regular schools; the other 50 percent receive some type of specialized schooling.

KEY TERMS

Audiometry —The measurement of hearing ability, usually with the an audiometer.

Auditory brainstem response (ABR) —Brainstem auditory evoked response (BAER), brainstem evoked response (BSER), auditory evoked response (AER); a hearing test that records electrical activity in the brain in response to sound via electrodes on the scalp; used for newborns, infants, and young children.

Cochlea —The hearing part of the inner ear. This snail-shaped structure contains fluid and thousands of microscopic hair

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cells tuned to various frequencies, in addition to the organ of Corti (the receptor for hearing).

Cochlear implantation —A surgical procedure in which a small electronic device is placed under the skin behind the ear and is attached to a wire that stimulates the inner ear, allowing people who have hearing loss to hear useful sounds.

Conductive hearing impairment —Hearing impairment associated with the outer or middle ear, often caused by infection.

Cytomegalovirus (CMV) —A common human virus causing mild or no symptoms in healthy people, but permanent damage or death to an infected fetus, a transplant patient, or a person with HIV.

Decibel —A unit of the intensity of sound or a measure of loudness. Normal speech is typically spoken in the range of about 20-50 decibels.

Eustachian tube —A thin tube between the middle ear and the pharynx. Its purpose is to equalize pressure on either side of the ear drum.

Myringotomy —A surgical procedure in which an incision is made in the ear drum to allow fluid or pus to escape from the middle ear.

Otitis media —Inflammation or infection of the middle ear space behind the eardrum. It commonly occurs in early childhood and is characterized by ear pain, fever, and hearing problems.

Otoacoustic emission (OAE) —Sounds or echoes created by vibrations of hair cells in the cochlea in response to sound; used to screen for hearing impairment in newborns.

Otoscope —A hand-held instrument with a tiny light and a funnel-shaped attachment called an ear speculum, which is used to examine the ear canal and eardrum.

Sensorineural hearing loss —Hearing loss caused by damage to the nerves or parts of the inner ear governing the sense of hearing. Sound is conducted normally through the external and middle ear.

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Tympanometry —A test where air pressure in the ear canal is varied to test the condition and movement of the ear drum. This test is useful in detecting disorders of the middle ear.

See also [Cochlear implants](#).

Resources

BOOKS

Kurtzer-White, Ellen, and David Luterman, eds. *Early Childhood Deafness*. Washington, DC: AG Bell, 2001.

Niparko, John, et al. *Cochlear Implants: Principles and Practices*. Washington, DC: AG Bell, 2000.

Olsen, Wayne, ed. *Mayo Clinic on Hearing*. Rochester, MN: Mayo Clinic Health Information, 2003.

Roush, Jackson. *Screening for Hearing Loss and Otitis Media in Children*. Washington, DC: AG Bell, 2001.

ORGANIZATIONS

Alexander Graham Bell Association for the Deaf and Hard of Hearing (AG Bell). 3417 Volta Place, NW, Washington, DC 20007. Web site: <http://www.agbell.org>.

American Speech-Language-Hearing Association. 10801 Rockville Pike, Rockville, MD 20852. Web site: <http://asha.org>.

Deafness Research Foundation. 1050 17th St., NW, Suite 701, Washington, DC 20036. Web site: <http://www.drf.org>.

WEB SITES

"FDA Public Health Web Notification: Risk of Bacterial Meningitis in Children with Cochlear Implants." *U.S. Food and Drug Administration*, September 25, 2003. Available online at <http://www.fda.gov/cdrh/safety/cochlear.html> (accessed December 28, 2004).

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Gordon-Langbein, Amie. "Facts About Hearing Loss in Children." *Alexander Graham Bell*. Available online at http://www.agbell.org/information/brochures_faq.cfm (accessed December 28, 2004).

"So Your Child has a Hearing Loss: Next Steps for Parents."

Alexander Graham Bell. Available online at http://www.agbell.org/information/brochures_parent_so.cfm (accessed December 28, 2004).

Margaret Alic, PhD



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