

Indian Academy of Pediatrics (IAP)



GUIDELINES FOR PARENTS

When to Suspect Hearing Impairment and Care of a Child with Hearing Impairment

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10 FAQs on WHEN TO SUSPECT HEARING IMPAIRMENT AND CARE OF A CHILD WITH HEARING IMPAIRMENT

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When to Suspect Hearing Impairment and Care of a Child with Hearing Impairment

Q1

What is hearing loss and how does it affect my child's development?

Hearing is measured in decibels (dB) and is checked at different pitches (frequencies). Normal hearing level is 0–20 dB, and >20 dB is called hearing loss. Depending on the level, hearing loss is described as mild, moderate, severe, or profound (**Fig. 1**). Hearing loss is the most common sensory birth deficit, occurring in 2–4/1,000 babies. It affects not only volume, but also clarity of sounds, hence shouting may only make the speech distorted! **Figure 1** shows sounds missed with different levels of hearing loss.

Hearing loss is sensorineural, conductive or mixed, depending on which area of the ear is affected (**Fig. 2**). Sensorineural loss is usually permanent.

Hearing provides essential stimulation to the brain from birth, causing development of connections which help in understanding speech. In untreated hearing loss, these connections do not develop well. This causes delayed or no speech, affects social

interaction, confidence, behavior, and mental health. It affects the child's education and career. Early diagnosis and management of hearing loss allows the development of brain connections and avoids the impact of hearing loss. If there is delay in management, then these effects cannot be completely reversed, leaving children with permanent difficulties. Even mild hearing loss can limit the child's development.

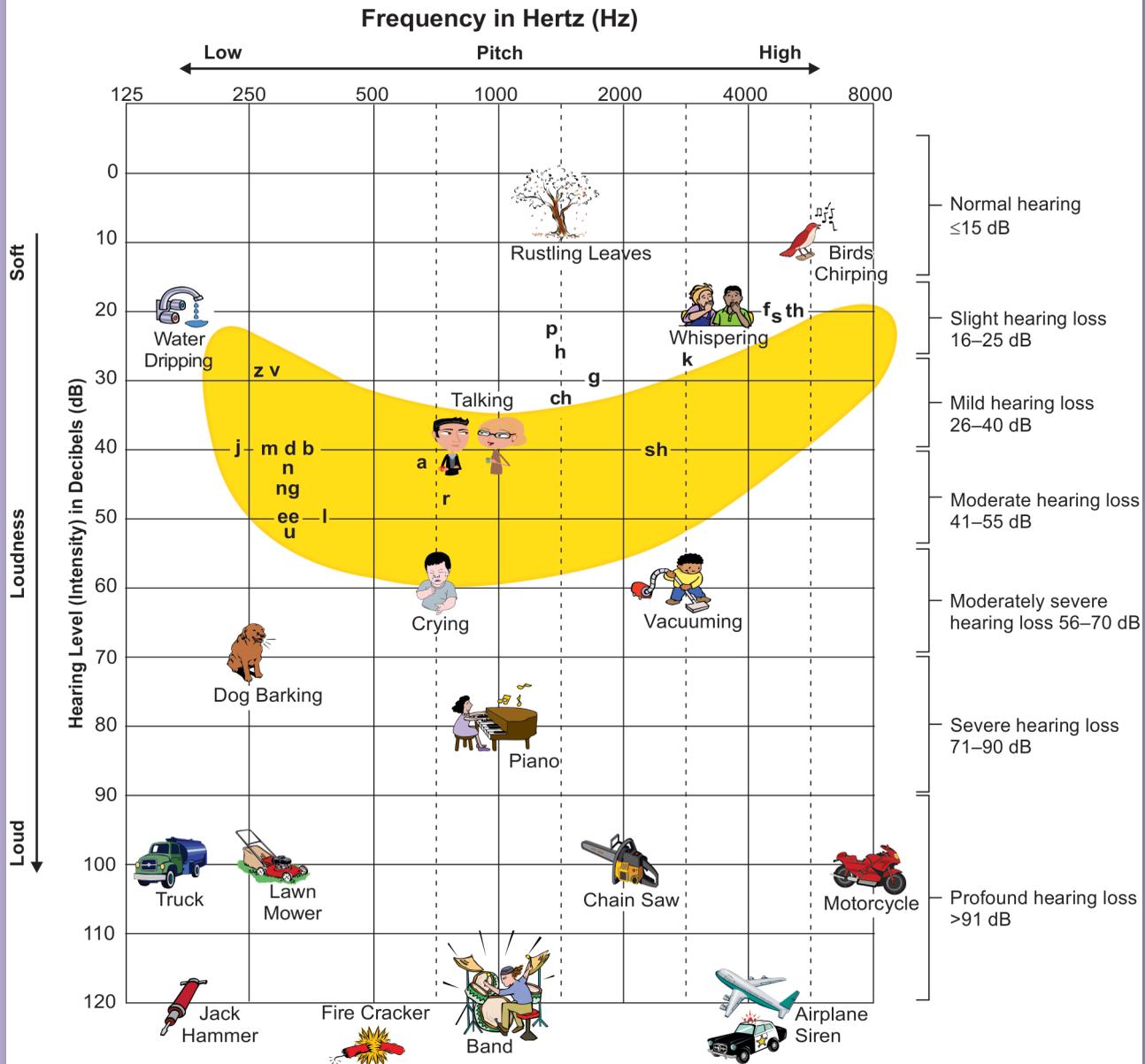


Fig. 1: Level of hearing loss and daily sounds [American Speech and Hearing Association (ASHA)].
Yellow area indicates level of conversational speech.

Source: Adapted from https://www.jtc.org/Audiogram_What_Does_Child_Hear.pdf.

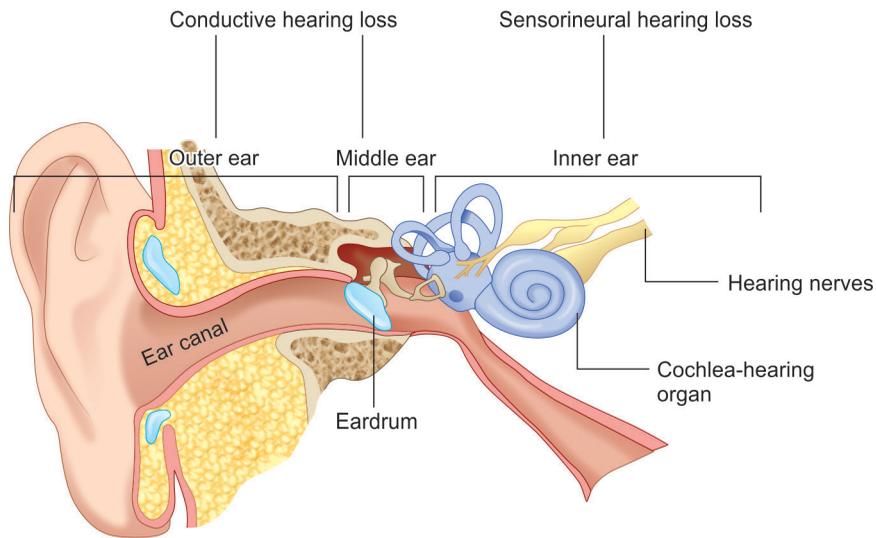


Fig. 2: Types of hearing loss.

Source: Adapted from <https://i.pinimg.com/736x/96/9d/2b/969d2b694e2a94673cf4c60249c7a69c.jpg>.

Q2

What is newborn hearing screening. How is it done and why is this necessary?

Newborn hearing screening is checking a baby’s hearing soon after birth. It is best done before discharge from hospital, and before 1 month of age. It should be done in all newborns, not only those with risk factors.

Screening is done using the otoacoustic emission (OAE) test. It is used to find out how well the inner ear or cochlea works. There are hair cells in the inner ear that respond to sound by vibrating. The vibrations produce a very quiet sound that echoes back into the middle ear. These quiet echoes are measured as OAE. They are present, if hearing is normal, and generally absent, if there is a mild or greater hearing loss. OAE is done by putting a soft tip microphone (like an earphone) in the ear. It delivers clicks sounds in the baby’s ear and detects echoes from the inner ear (**Fig. 3**). Babies must be quiet, for which feeding before the test is enough. The test is quick and painless, and done by qualified staff in a hospital or clinic. It is reported as “Pass” or “Refer”. If the result is “Refer”, then OAE is repeated at 6 weeks of age, combining it with the immunization visit. Babies who do not pass the second OAE

test, and those admitted in the neonatal intensive care unit (NICU) are advised a hearing test called “brainstem-evoked response audiometry (BERA)” (Question 6). Only few of the babies referred from the screen will have hearing loss.



Fig. 3: Baby having otoacoustic emissions test (OAE) screen.
Courtesy: Dr Col Vishal Vishnu Tewari.

Hearing loss cannot be diagnosed in newborns by examination alone. Screening reduces the age of diagnosis of hearing loss to 6 months from 1.5 to 3 years. This allows early intervention, which avoids the deleterious effects of hearing loss.

Q3

What conditions put my child at increased risk of developing hearing loss?

A child is at higher risk of having hearing loss, if they have the following conditions:

- Family members with childhood sensorineural hearing loss (SNHL).
- *Birth-related risk factors:* These include admission in NICU for >5 days, severe neonatal jaundice requiring exchange transfusion, and severe lack of oxygen at birth. These conditions are more likely to occur in very low birthweight babies.
- Certain infections occurring during mother’s pregnancy, e.g., toxoplasma, syphilis, rubella, herpes, and cytomegalovirus. These may not cause symptoms in the mother, and can be missed, but can still cause hearing loss in the baby.

- Conditions causing unusual facial features and ear malformations, e.g., cleft palate, microtia (**Fig. 4**).
- Medical conditions or “syndromes” associated with hearing loss, e.g., Down syndrome (**Fig. 4**).
- Prolonged use of medications which can be toxic to the ears.
- Bacterial meningitis

Having a risk factor does not mean that your child will always develop a hearing loss, but it means that they must have their hearing checked, and sometimes regularly monitored. Your child’s development should be carefully followed, and a pediatrician should be consulted at the first sign of concern.



Fig. 4: Some conditions with high risk of hearing loss.

Source: Resourced from <https://www.indiamart.com/specialists-hospital/reconstructive-surgery.html>; <https://www.smiletrainindia.org/sites/southasia/files/shivacleftlip.jpg>; and <https://w.ndtvimg.com/elc/2017/10/06151846/102410.jpg>.

Q4

What should make me suspect hearing loss in my child?

Observing the baby’s responses to sounds and vocalization can give a clue to the presence of hearing loss (**Fig. 5**).

In older children, hearing loss can be suspected, if:

- Speech is delayed, child is not talking in sentences of 2–3 words by 30 months of age.
- Speech is unclear compared to other children of same age.
- Does not respond to name, or to an instruction, and notices only after seeing.
- Responds only to loud noises or concentrates on instructions given by gestures.
- Turns up the TV volume very high or sits very close to the TV to hear.
- Has difficulty in understanding, what people are saying.

	Birth–4 months		4–9 months
	<ul style="list-style-type: none"> • Does not startle to sounds at 1 month • As weeks pass, does not respond to parents voice by smiling, cooing, or calming 		<ul style="list-style-type: none"> • Does not smile when spoken to • Does not notice noisy toys • Does not turn head to familiar sound • Not making babbling sounds
	9–15 months		15–24 months
	<ul style="list-style-type: none"> • Not babbling much • Not attempting to repeat simple sounds • Not using voice to get attention • Does not respond to name 		<ul style="list-style-type: none"> • Not saying single words such as 'mama', 'baba' • Not listening with interest to song, rhymes • Cannot name common objects • Does not point to body parts • Does not follow basic commands

Fig. 5: When to suspect hearing loss in babies?
Source: Adapted from <https://www.healthyhearing.com/help/hearing-loss/children>.

- Hears better in one ear than the other.
- Watches others in order to imitate their actions, at home or in school.
- Responds to vibrating phone rather than ringtones.
- Has problems academically, especially if they were not present before.
- Complains of ear pain, earaches, and noises in ears.
- Has conditions linked with hearing loss: Slow in sitting or walking unsupported, constant mouth-breathing or snoring.

Hearing loss is a “silent” disability and can be missed by observation, particularly true of mild-to-moderate hearing loss. It is important to, hence, do newborn screening and check hearing when there is concern.

Q5

My child has been suspected of having a hearing loss. Which doctor should I consult and how soon?

As soon as you suspect hearing loss in your child, you should consult a pediatrician, who will listen to your concerns and examine your child. Do not delay getting advice when hearing loss is suspected, because untreated hearing loss can impact on your child’s development.

The pediatrician can refer you to a “pediatric audiologist” to have your child’s hearing tested. If your child has wax build-up, ear infection, or another problem causing conductive hearing loss, he/she may be referred to an otolaryngologist [ear, nose, and throat (ENT) doctor] to have this treated.

Audiologists can perform in-depth behavioral hearing assessment for even very young children (as young as 6 months). They can also do hearing tests for babies from birth to 6 months of age. After the assessment and tests, the audiologist will spend time talking with you about your child's hearing ability and recommend an appropriate treatment plan.

After diagnosis of hearing loss, your child may need further tests to find the cause of hearing loss (e.g., MRI scan, genetic tests). Children with hearing loss can sometimes have other difficulties (e.g., vision, balance) and may need to see other specialists. Your pediatrician and audiologist will advise you in this regard.

Q6

What tests are done for diagnosing hearing loss in children?

Hearing can be assessed at any age, even in a newborn. Hearing tests are painless. The choice of test depends on the child's age and development.

- *Otoacoustic emission test*: Described in Question 2. OAE can also be done in older children.
- *Brainstem-evoked response audiometry*: Soft earphones play sounds into the baby's ears and responses from the hearing nerve are seen as waves on a linked computer. The baby needs to be asleep for this test, and older babies may require sedation. It is done in babies referred from the newborn hearing screen and in older children who do not do behavioral audiometry reliably. BERA gives information about hearing levels.
- *Behavioral audiometry (Fig. 6)*: This test can be done from 6 months onward. Response of the child is observed to sounds presented through a speaker or headphones. Depending on age, various methods are used to encourage the child to respond to sounds, e.g., lighted toys (in visual reinforcement audiometry), play tasks, e.g., building a tower of blocks (in play audiometry), or pressing a button. These tests depend on cooperation of the child and give information about hearing levels.
- *Tympanometry*: This test checks for any middle ear abnormality.



Visual Reinforcement Audiometry

Play Audiometry

BERA

Fig. 6: Common hearing tests done to diagnose hearing loss.

Source: Resourced from https://www.nhstaysidecdn.scot.nhs.uk/NHSTaysideWeb/groups/corporate/documents/documents/prod_212279.jpg; <https://www.hearingaiddoctors.com/media/Pediatric/original/children-conditioned-play-audiometry.jpg>; and <https://www.maroongroge.com/aep/ics-chartr-ep-200/>.

Q7

Why does my child have a hearing loss, and will it get better?

Conductive hearing loss is commonly caused by ear infections or fluid behind the eardrum. Infections are treated with ear drops and antibiotics. Fluid behind the eardrum may resolve on its own, or is treated with a small operation called grommets done by ENT doctors. Treatment of these conditions will improve hearing.

Sensorineural hearing loss (SNHL) is due to genetic causes in 50% of children. These are due to faults in the genes, which can occur either spontaneously or are inherited through parents and ancestors. They are more common when marriages occur between close relatives. They can also occur if no one in the family has a hearing loss. Blood tests can sometimes identify the cause of genetic hearing loss (*Connexin 26*, *Pendred*, associated with kidney disease). In the remaining 50%, SNHL is caused by conditions mentioned in Question 3, severe head injury and inner ear malformations. Some of these can be seen on MRI scan. Sometimes, even after doing tests, the cause of hearing loss may not be found.

Most babies with SNHL will *not* improve with time. Delayed management will result in poorer developmental and speech outcomes. Hence, parents should not delay management while hoping for the problem to get better.

Q8

What management can be offered to my child who has a confirmed hearing loss? Should I wait for some more time before starting?

Treatment for conductive hearing loss is described in Question 7. Medicines are not useful in congenital SNHL. Management is with hearing aids (**Fig. 7**), fitted by “pediatric audiologists”. They work like a precise volume control, making sounds louder and clearer. They cost Rs. 5,000–3.5 lakh. Hearing aid accessories are available to use with phones and television.



Fig. 7: Different types of hearing aids. Choice depends on the type and degree of hearing loss.

Source: Resourced from <https://www.cochlear.com>; <https://lerablog.org/health/services/4-different-types-of-hearing-aids/>; and <https://boingboing.net/images/hearingaid.jpg>.

Children with profound hearing loss get limited benefit from hearing aids and are offered cochlear implant surgery (**Fig. 8**), done by ENT doctors. This costs Rs. 7.5–15 lakhs. After cochlear implants, progress can only occur if the child participates in a regular rehabilitation program. Help may be available through organizations with the cost of cochlear implants and hearing aids.

Your child will benefit from sitting in the front in class, seeing face of speaker, and being in surroundings with less noise. They may need speech therapy, help with schoolwork, and rarely, special schools, and sign language. Devices such as strobe light connected to alarm clock, doorknobs are available. Supporting the child at home and school is important as hearing aids can be a “stigma”.

Management of hearing loss should be started as soon as possible after diagnosis, without waiting, because delay can cause permanent effect on development.

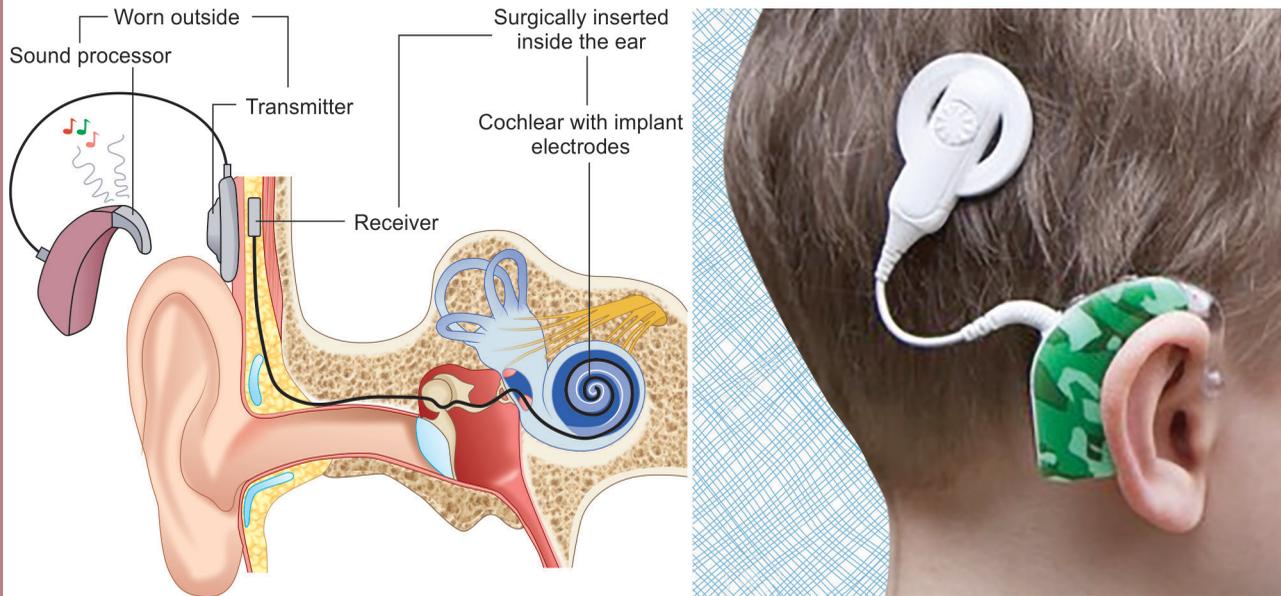


Fig. 8: Cochlear implants.

Source: Adapted from <https://healthjade.com/wp-content/uploads/2018/09/cochlear-implant.jpg> and <https://www.nhs.uk/conditions/hearing-loss/treatment/>.

Q9

What is future outcome of my child with hearing loss with early management?

- The outcome of your child will depend on what age management started and what input was received (use of hearing aids, speech therapy, and parent support). For congenital hearing loss, outcome is best if hearing aids are fitted before 6 months age. If cochlear implants are needed, they should be fitted before the age of 2 years for best outcome.
- With early management, your child can have a good quality of life, age-appropriate language, and educational achievement. Communication is vital for socialization and integration in society. Your child will be able to build friendships and have a professional career.
- If your child needs hearing aids, they will need to continue using them (like glasses, hearing aids do not improve underlying problems, or “cure” hearing loss). Your child may need support with lip reading. They may prefer to have subtitles on television. They may need provision in schools to be able to hear overhead announcements.
- Parental awareness, education, and access to specialized help are keys to successful outcome of the child.
- Some children with hearing loss may have additional needs, e.g., vision loss, learning difficulty. These factors cause additional challenge and the child’s progress may be slower than expected.

Q10

What measures can be taken to prevent hearing loss?

World Health Organization estimates that about 60% of hearing loss is due to preventable causes (Fig. 9):

- Hearing loss caused by infections can be prevented by immunization [measles, mumps, and rubella (MMR), *Haemophilus influenzae*, *Pneumococcus*, flu, maternal rubella] and good hygiene. Toxoplasmosis is preventable with health education (pregnant mother avoiding exposure to cat feces and uncooked meats). Treatment of toxoplasmosis in the pregnant mother and neonate reduces the risk of SNHL. Cytomegalovirus infection is also preventable (Fig. 10).

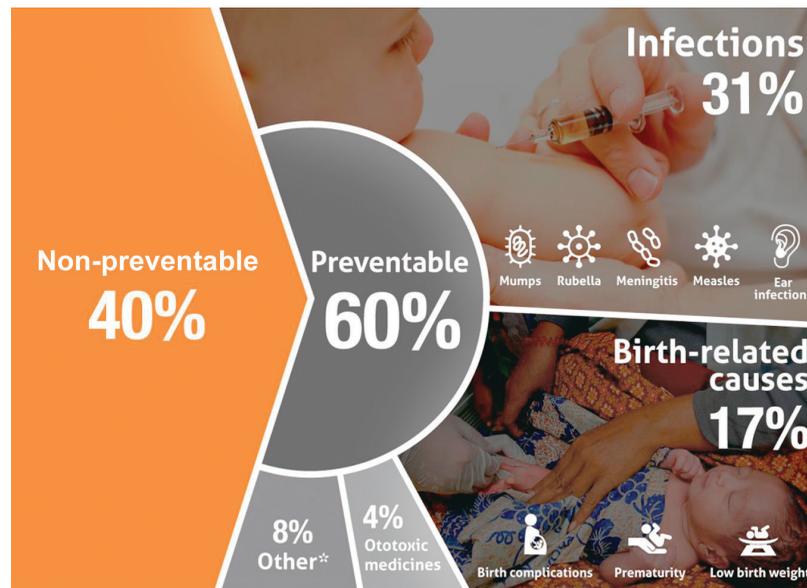


Fig. 9: Overview of the causes of preventable hearing loss.

Source: Resourced from World Health Organization. Childhood Hearing Loss: Strategies for Prevention and Care, 1st edition. Geneva, Switzerland: World Health Organization; 2016. pp. 1-28.



Fig. 10: Prevention of cytomegalovirus infection in pregnant mother.

- Ear infections can be prevented with ear hygiene and avoiding use of cotton buds.
- Birth-related risk factors can be prevented by improving maternal and child health practices.
- Ototoxic medicines could potentially be avoided.
- Prevention of consanguineous marriages and genetic counseling help in reducing genetic hearing loss.
- Impact of noise on hearing can be avoided by talking with your child/adolescents about using lower volume with headphones and wearing earplugs at loud events. Sounds <75–80 dB (level associated with 60% volume on most personal listening devices) are generally safe (**Fig. 11**).
- A “Pass” on newborn hearing screening does not guarantee that the child will not have hearing loss at a later age. If there are concerns about your child’s hearing, then seek pediatrician advice at the earliest.

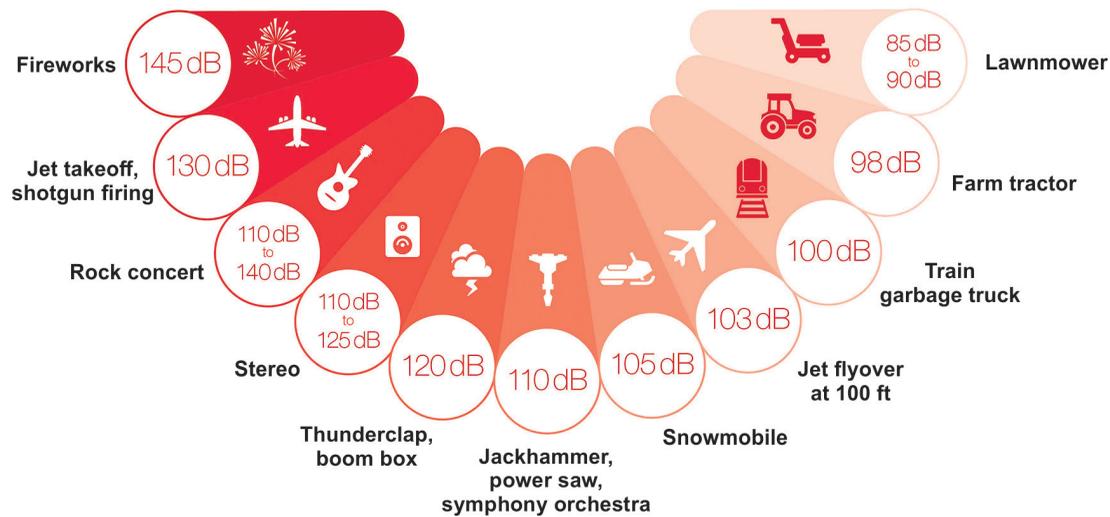


Fig. 11: Safe limit of loud noises depends on loudness and duration of exposure (maximum of 8 hours for 85 dB and 15 minutes for 100 dB).

Source: Adapted from <https://www.eaqr.com/hearing-health/articles/guide-to-noise-induced-hearing-loss>.

POINTS TO REMEMBER

- Hearing loss is common and can cause irreversible impact on development, if left untreated.
- It can be reliably detected by newborn hearing screen which should be done in all babies.
- The best outcome for the child is achieved with the 1-3-6 rule. Hearing screen by 1 month age, diagnose hearing loss by 3 months and fit hearing aids by 6 months of age.
- With early management a child with hearing loss can have excellent outcome.
- Many causes of hearing loss can be prevented.

RESOURCES

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