Review Article

Hearing Loss and its Impact in the Community

Santosh Kumar Swain

Department of Otorhinolaryngology and Head and Neck Surgery, All India Institute of Medical Sciences, Bhubaneswar, Odisha, India

Abstract

Hearing is considered an important sense of the human being. Hearing impairment cannot be visible and hence its effects are not seen by others, so the deaf suffer in silence. Hearing impairment is not only a communication problem but also a community problem. Hearing loss, which is gradual and permanent, can be brought on by congenital or acquired damage to the auditory nerve and cochlear hair cells. It reduces the working ability and performance of an individual, thus diminishing one's participation. Hearing loss is often associated with loneliness and social isolation which has an impact on cognitive and psychosocial health. Early identification of hearing impairment in a child is vital for effective management. Hearing loss has a detrimental impact on family dynamics and, as a result, the child's development. The widespread prevalence of deafness necessitated a reliable management system and simple clinical implementation. This public health burden can be managed by raising awareness of hearing impairment. There are plenty of clinical assessment and therapy options in hearing impairment research, but lack of knowledge about it implies that public education or awareness should be prioritized more. This review article discusses the epidemiology, etiopathogenesis, clinical features, impact of hearing impairment, and its impact on the community along with current treatment options.

Keywords: Community, deaf-mutism, hearing loss, social isolation

Introduction

Hearing is an essential component of the human being to learn language and speech which help to develop cognitive skills.[1] The common causes of hearing loss include the aging process, noisy environment, nutritional deficiency, systemic and communicable diseases, and gene mutation.[2] The auditory nerve, internal ear or cochlea, middle ear, external auditory canal, loss of sound conduction, and faulty interpretation at the brainstem and cortex of the central auditory processing unit are all factors that lead to hearing loss in patients.[3] Mild hearing loss during the first 2 years of life may affect the natural acquisition process of speech.[3] Broad-ranging effects of hearing loss include a lack of interpersonal communication skills and delayed language acquisition in young children, which can result in social exclusion, loneliness, and dissatisfaction.[4] Hearing loss is a common entity in older persons and impairs communication and may result in social withdrawal. Adolescents with normal hearing and secure social attachment show fewer problems with better performance in school and have more successful relationships with peers in comparison to insecure attachment in infancy due to deafness.[5] Children who have hearing loss are frequently impulsive, distant, and shallow. These young children who participate in early intervention programs have rather typical social development patterns.

Methods of Literature Search

The search for recent research articles on hearing loss and its effects on the community used several methodologies. We began by doing an online search of the Scopus, PubMed, Medline, and Google Scholar databases. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses criteria were used to design a search strategy. While additional research publications were manually found from the citations, our search method recognized the abstracts of published works. The eligibility of randomized controlled trials, observational studies, comparative studies, case series, and case reports was assessed. There were a total number of articles 58 (12 case reports, 14 cases series, and 32 original articles) [Figure 1].

Address for correspondence: Dr. Santosh Kumar Swain, Department of Otorhinolaryngology and Head and Neck Surgery, All India Institute of Medical Sciences, Sijua, Patrapada, Bhubaneswar - 751 019, Odisha, India.
E-mail: santoshvoltaire@yahoo.co.in

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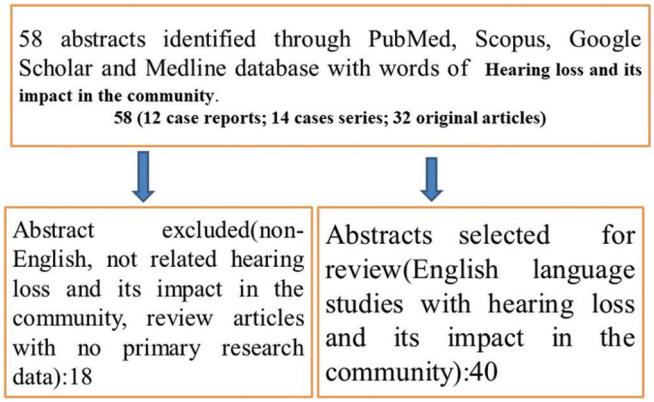

Figure 1: Method of literature search

This paper focuses only on hearing loss and its impact on the community. A better knowledge of hearing loss and its effects on the community is provided by this review analysis. It will also catalyze further study and better awareness about the impact of hearing loss on society or the community.

Epidemiology

About 200 million population worldwide were reported to have varying degrees of hearing impairment.[6] A profound degree of hearing loss was documented to affect 5 million people all over the world.[6] Worldwide genetic hearing loss was found to be about 0.9/1000 live births.[7] As per the Indian Council of Medical Research report, about 10%–16% of school-going children in India are having varying degrees of hearing loss, and two deaf babies born per hour, so adding 18,000 deaf babies to the Indian population per year.[8] The global prevalence of sensorineural hearing loss was first documented by the World Health Organization (WHO) in 1985.[9] At that time, 42 million people (around 1% of the world's population) were estimated to have moderate to profound hearing loss. By the year 2011, the estimate had increased to 360 million, of whom 32 million were children younger than 15 years.[10] The most recent WHO report shows that approximately 466 million people (6.1% of the world's population) were living with disabling hearing impairment in 2018.[11] The prevalence of age-related hearing loss increases steeply with age, from 3% among adults of 20–29 years to 45% of adults with age 60–69 years, to above 80% of people over the age of 80 years.[12] As per the WHO, nearly 2.5 billion individuals are projected to present a point of hearing loss and a minimum of 700 million will require rehabilitation.[13]

Etiology of Hearing Loss

The etiology of hearing loss is classified into syndromic and nonsyndromic causes. The syndromic causes include Usher syndrome, Pendred syndrome, Wolfram syndrome, and Stickler syndrome.[1] The nonsyndromic causes are due to mutations in the genes related to hearing loss. Hearing loss can occur by a multitude of genetic or environmental factors. Environmental causes of hearing impairment include prenatal, perinatal, and postnatal factors. Approximately 60% of severely deaf cases are attributed to genetic causes.[14] The environment causes of hearing loss include injury that happened to the infant during birth which account more for the causation of congenital impairment attributing a high percentage of perinatal factors. In the case of premature deliveries, events happening during the perinatal period are of greater significance for the later development of neurodevelopmental disabilities and are associated with organ dysfunction in the newborn. The incidence of deafness is high in children born preterm with birth asphyxia in comparison to the term baby.[15] Approximately 1 in 4 preterm babies with very low birth weight develop retrocochlear damage resulting in permanent bilateral hearing loss.[16] One significant underlying cause of deafness is hereditary factors. Several genetic causes of deafness have been identified and characterized, such as the CX26 mutation-related deafness, Pendred syndrome(PDS)-related deafness, mitochondrial DNA-related deafness, Usher syndrome, Waardenburg syndrome, and Jervell-Lange-Nielsen syndrome.[17] Perinatal hypoxia or anoxia due to premature separation of the placenta, cord compression, fetal heart rate abnormalities, or rupture of the uterus may result in temporal, neural dysfunction of the brainstem leading to temporary hearing loss in the newborn. A significant correlation between low birth weight and serum bilirubin levels is observed in comparison to term babies. Premature babies show peak bilirubin levels compared to those born at term suggesting the possible role of feeding and hydration in the genesis of the jaundice. If ototoxic drugs are taken during pregnancy, these are usually transferred to fetuses or infants through the placenta or breast milk and cause side effects in the newborn. Drugs like gentamycin which is used for the treatment of infectious diseases in neonates potentially ototoxicity by damaging the cochlear and vestibular system. Children with adverse perinatal conditions and taking aminoglycoside therapy are at major risk for permanent hearing loss due to ototoxicity.

Hearing Loss and Its Manifestations

Clinical manifestations of deafness are well known. In children of 1–2 years of age, no response to sound stimulation and delayed development of speech are the important features. If a child does not develop fluent speech by 3 years of age, deafness should be suspected. Those who have acquired speech defect, auditory inattention, and low performance in the school and have the main features of hearing loss. Hearing loss in the initial months of life can lead to serious consequences for the later development of individual working ability and adjustment in social life.[18] The diagnosis of hearing impairment causes a world to alter for the families of newly diagnosed hearing-impaired children. More than only hearing loss is present in this household setting. Parents who have normal hearing are unfamiliar with deafness and have doubts about their deaf child.[19] They might not be aware of their deaf children's long-term objectives and expectations. They frequently ponder their part in providing their deaf youngster with excellent parenting as well. They could feel remorseful, perplexed, or powerless, all of which are frequently understandable reactions.[20]

Hearing Loss in the Elderly Person

In human existence, aging is an unavoidable phenomenon. One sensory deficiency in older persons is progressive hearing loss.[21] Presbycusis, a quiet, progressive sensory deficiency that causes hearing impairment and ultimately severe deafness, is the term used to describe age-related hearing loss.[22] The quality of life is negatively impacted in older people with age-related hearing loss due to psychological depression, self-esteem issues, and social isolation. In the older age group, social isolation and loneliness are significant factors that show psychological well-being.[23] Older persons with hearing loss may experience depression and other mental health issues due to loneliness and social isolation.[24] A person's capacity to grasp auditory information is impaired by age-related hearing loss, making it harder to follow conversations and reducing peripheral auditory processing by the cochlea.[25] Reduced cochlear auditory processing may lead to higher cognitive load and decreased cognitive reserves for social and interactional activities.[26]

Impact of Hearing Loss on Social and Emotional Development

Prevention of social or personal problems as well as the encouragement of healthy growth and development is necessary for effective social and emotional development. A fundamental cornerstone of success in life is normal, balanced social-emotional development. Realizing their academic and professional potential also benefits from having the skills that are typically associated with good social and emotional development.[27] Unfortunately, a lot of deaf kids exhibit less competency in several areas, putting them at risk for many problems.[28] Low academic success, low employment, and a higher likelihood of social maladaptation (such as violence, drug, and alcohol misuse) are these effects. However, the quality of the home environment, parental adjustment to hearing loss, family coping, and kind of education can have an impact on how deafness affects a child's development.[29]

Management

The goal of the management is the prevention of mutism by early detection of hearing impairment, treatment, and subsequent rehabilitation of severely untreatable deafness by putting hearing aids or cochlear implants and imparting speech therapy.

Early identification of hearing loss

Early identification of hearing loss can be done by either universal mass screening or a high-risk registry. Universal mass screening of all cases can be helpful for the identification of hearing impairment, but it is a costly affair and needs a planned infrastructure for its implementation. The high-risk registry is a cheaper method where we focus mainly on the high-risk group population as deafness is 5–20 times more common in the high-risk group.[30] The high-risk group includes a positive family history of sensorineural hearing loss, and a history of toxoplasma, rubella, cytomegalovirus, herpes, and syphilis infections. Other high-risk groups include APGAR scores 0–4 at immune, 0–6 at 5 min, low birth weight (<2500 g), and craniofacial anomalies. The high risk conditions for congenital hearing loss include congenital syndromal abnormalities, bacterial meningitis, hyperbilirubinemia requiring exchange transfusions, intermittent positive pressure ventilation for more than 5 days, and ototoxic drug treatment in children for more than 5 days.[31] The disadvantage of a high-risk registry includes leaving a large number of the deaf where no previous history or clinical findings is seen. One of the diagnostic tools for early identification of deafness in children is behavioral observation audiometry (BOA) which detects the child's response to the sound stimulus by trained audiologists. The acoustic reflex test is an objective test that determines the change in compliance of the middle ear due to the contraction of the stapedius muscle by an impedance audiometer in response to a sound stimulus. Two important tests such as otoacoustic emissions (OAEs) and auditory brainstem response (ABR) are helpful for hearing screening in neonates, infants, and older children. In evoked OAEs (EOAEs), cochlear echoes are generated in the inner ear in response to sound stimulus and are recorded by a microphone placed in the external auditory canal. If there is doubt of hearing impairment, it is confirmed and quantified by brainstem evoked response audiometry (BERA), which can be performed even in newborns and to persons of any age with a high degree of accuracy. The sensitivity and specificity of BOA are less and the antiretroviral therapy has high false negativity. EOAE is a good tool for screening but is not possible to establish the threshold of hearing. BERA has high sensitivity, specificity, and diagnostic accuracy and can be performed even in newborns, and there is no requirement for sedation and anesthesia. The threshold of hearing is well established by BERA. In a country like India, the National Program for the Prevention and Control of Deafness aims to improve early identification of hearing impairment and control deafness.[8]

Treatment of hearing loss

Once a deaf child is identified, and some residual hearing is present after seeing his or her threshold, a suitable hearing aid can be prescribed and speech therapy can be given to prevent mutism. The major treatment for mild-to-moderate hearing loss is the provision of hearing aids.[32] The hearing aids are different types such as behind the ear, in the ear, and in the canal models. In behind-the-ear type, the microphone, amplifier, receiver, and battery are all in one unit that is worn behind the pinna. In the ear type, the entire hearing aid is kept in an earmold which can be worn in the ear. In the canal (ITC) model, the hearing aid is so small that the entire aid can be worn inside the external auditory canal. If a child does not show improvement in speech after 6 months of intensive training, the child should be sent for consideration of suitability regarding a cochlear implant and subsequent auditory verbal therapy.[33] The cochlear implant has two parts such as external parts (consisting a microphone, a speech processor, and a transmitter) and internal parts (surgically

implanted) parts that contain a receiver/stimulator and an electrode array. Cochlear implant bypasses the damaged cochlea and directly stimulates the auditory nerve.[33] To maximize language development, infants with any level of hearing loss should be identified and enrolled in an intervention program by 6 months of age. Early diagnosis and care of the condition are essential to reducing the handicap in these kids. The deaf-mutism and its hazards can be prevented by early estimation of hearing threshold by BERA and rehabilitation with hearing aids or cochlear implants along with speech therapy.[34] Because the spiral ganglion and central pathways are still mostly intact, cochlear implant intervention, particularly early intervention, in people with congenital deafness can result in noticeable hearing and speech rehabilitation. Regenerative therapies are new hopes for restoring sensorineural hearing loss. The next stage of research will likely focus on regenerative therapy for sensorineural hearing loss, where various biotechnological tools such as gene transfer systems, exogenous stem cell supplements, and activation of endogenous stem cells can help to restore hair cell loss and *in situ* cochlear function.[35] In the future, replacing cochlear hair cells may include transferring exogenous stem cells or stimulating indigenous stem cells. In addition, being tested is the use of gene transfer therapy to regenerate hair cells.[36]

Prevention of Hearing Loss

Prevention measures usually delay the onset or slow down the further deterioration in age-related hearing loss. The preventive measure includes minimizing loud noise exposure, limiting ototoxic drugs with improved diets, and changing lifestyle habits. Sensitive hair cells are damaged by sound pressure levels > 80 decibels.[37] As far as possible, elderly people should avoid extended exposure to certain sound sources.[37] By using noise-protective tools such as earplugs, noise-canceling headphones, and noise-reducing earphones, short-term noise exposure can be prevented.[37] It has been demonstrated that a diet rich in omega-3 fatty acids, antioxidants, zinc, folic acid, and Vitamin C can halt or postpone the onset of age-related hearing loss.[38] Systemic diseases such as hypertension, diabetes, and obesity should be controlled for preventing age-related hearing loss. Tobacco chewing habits and smoking should be stopped and recommended to delay the onset of age-related hearing loss.[39] Occupational hearing loss is usually preventable by appropriate measures with personal protective equipment.[40] Noise-induced hearing loss is the most common occupational condition that occurs in a wide spectrum of industries. Early detection of noise-induced hearing loss is done by periodic audiometric tests which may help in the prevention of further loss by the use of hearing protective devices.[40]

Conclusion

Deaf-mutism is a quite prevalent problem worldwide and contributes to a major portion of disability. Early diagnosis of hearing impairment is helpful to prevent it through proper rehabilitation. Early identification of hearing loss can be done by BERA, acoustic reflex threshold test, and EOAE studies. Early diagnosis of hearing impairment among risk children provides an opportunity to get a remedial measure in a large number of cases at an early language-developing age, to prevent deaf-mutism. Neonatal screening hearings should be implemented in all levels of hospitals before the discharge of the baby to detect any hearing impairment. Proper counseling has to be given to the mother about dos and don'ts during pregnancy time.

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Conflicts of interest

There are no conflicts of interest.

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