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Hearing in India: All aspects

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Abstract:

Hearing loss affects a high percentage of society. It may be due to diseases effecting middle ear or inner ear, may be congenital, age related or due to noise exposure. Various social and economic losses incurred by such individuals, laws and programs to help such persons are made from time to time. They have rights and duties. The national program for prevention and control of deafness, its objectives and recommendations. The various hearing related studies done so far in India and need to be done in future are the highlights of this paper.

Introduction

The ear is a marvelously complex and sensitive organ. Unfortunately, damage to the organ, whether through disease, physical insult, long term exposure to excessive noise, some drugs or simply the effects of aging, can cause the ear to malfunction. The result of malfunction is usually to produce some degree of deafness. Hearing impairment is most frequent sensory deficit in human population, affecting more than 250 million people in the world[1]. Consequences of hearing impairment leads to inability to understand speech sound, decreased capability to communicate, delay in language development, economic and educational backwardness, social isolation and stigmatization.

In India, 63 million people (6.3%) suffer from significant hearing loss[2]. The National Sample Survey (NSS) 58th round (2002) surveyed disability in Indian households and found that hearing disability was 2nd most common cause of disability and top most cause of sensory deficit. In urban areas, loss was 9% of all disability and in rural areas, it was 10%. Depending upon the extent of a person inability to properly, the degree of hearing disability was ascertained it was estimated that the number of person with hearing disability per 100000 persons was 291; it was higher in rural (310) compared with urban regions (236). In the same survey, about 32% of the people had profound (person could not hear at all or could hear only loud sounds) and 39% had severe hearing disability (person could hear only shouted words). The survey results revealed that about 7% of people were born with a hearing disability. About 56% and 62% reported the onset of hearing disability at ≥ 60 years of age in the rural and urban areas, respectively. The incidence of hearing disability during that year was reported to be 7 per 100000 population[3].

The magnitude of milder degrees of hearing loss and unilateral hearing loss would be larger than these estimates for bilateral hearing loss. The major causes of hearing loss and ear diseases in India have been listed by WHO survey[4]. Ear wax (15.9%) was the most common cause of reversible hearing loss. Non-infectious causes such as aging and presbyacusis are the next most common causes of auditory impairment in India (10.3%). Middle ear infections such as CSOM (5.2%) and serous otitis media (3%) are other leading causes of hearing loss. The other causes include dry perforation of tympanic membrane (0.5%) and bilateral genetic and congenital deafness (0.2%). Approximately 50% of all cases of congenital hearing loss are attributable to environmental factors, such as congenital hyperbilirubinemia, ototoxic medication exposure, neonatal hypoxia, viral infections and meningitis. The other 50% of cases are thought to be inherited, i.e. of genetic causes. Of these hereditary cases, approximately 30% are classified as syndromic. About 400 named syndromes are associated with hearing loss, the associated auditory features being quite variable – sensorineural or conductive, unilateral or bilateral, and progressive and stable. This small subset of hearing loss patients (15% of all patients with hearing loss) is the group most readily diagnosed by physicians due

to recognizable features other than hearing loss. The other 70% of hereditary cases are classified as non-syndromic. This group is the otherwise perfectly normal child with the exception of hearing loss.

The inheritance patterns of non-syndromic genetic deafness are autosomal recessive in 75%, autosomal dominant in 22% and X-linked in 3% of cases. The associated "DeaFNess" genes are designated as DFN A (for autosomal dominate gene), DFN B (for autosomal recessive gene) and DFN (for X-linked gene). To date, more than 50 deafness gene has been identified and genetically sequenced, more than half of these identified from syndromic form of hereditary deafness. It is likely that hundred of genes are still awaiting discovery. As a general rule cases with autosomal recessive inheritance are typically born with bilateral, profound deafness to normal hearing parents. Those with autosomal dominant inheritance have a variable pattern of severity and progression and more often have hearing impaired parents. Interestingly, most genetic acquired hearing losses are caused by single gene defects and no trace able family history apparent. The most common cause of non-syndromic deafness is *Connexin – 26* in the World. This *Connexin – 26* protein, a gap junction protein, is present throughout the inner ear and is important in K^+ concentration regulation[5,6,7]. The absence of K^+ circulation is responsible for the hair cells' inability to generate action potential in response to sound.

Noise is the insidious of all industrial pollutants, involving every industry and causing severe hearing loss in every country in the world. Worldwide, 16% of the disabling hearing loss in adults is attributed to occupational noise, ranging from 7 to 21% in the various subregions[8]. The estimated cost of noise to developed countries ranges from 0.2 to 2% of the GDP, where it is the cause of more than one-third of the hearing impairments. The effects of the exposure to occupational noise are higher in the developing regions[9]. There is a lack of epidemiological data on prevalence, risk factors and costs of NIHL in India. Research studies are needed to know the exact prevalence of NIHL among various industries in India[10].

The NSS 58th round also enquired about probably causes of hearing loss in India. In about 25% and 30% cases, for rural and urban India, respectively, the probable cause was old age. Of the other

reasons, ear discharge and other illness were identified as the cause by a comparatively large proportion of persons with hearing disability. Also, in the same survey, nearly 1% of hearing disable persons reported German measles/Rubella as the cause of hearing disability.

It has been noted by WHO[4] that half the causes of deafness are preventable and about 30%, though not preventable, are treatable or can be managed with assistive devices. Thus, about 80% of all deafness can be said to be avoidable. It has also been stated by WHO[6] that there is a shortage of human resources to address the issue of deafness. The estimated number of ENT specialists and otologists in India are 7000 and 2000, respectively. The audiometrist:population ratio was found to be 1:500000 and the ratio of speech therapist to the deaf population were 1:200. There is also a maldistribution of personnel with more people located in urban and rural areas. Human resource analysis revealed that there is a need to enhance the skills and working capacity of practicing doctors and other personnel.

Deafness Definitions

The deaf are those persons lacking the power of hearing for ordinary purposes of life. They do not hear or understand sounds even with amplification.

WHO Definitions

The WHO definition of ‘deafness’ refers to the complete loss of hearing ability in one or two ears[11]. The cases include in this category will be those having hearing loss more than 90dB in better ear (profound impairment) or total loss of hearing in both the ears.

The WHO definition of ‘hearing impairment’ refers to both complete and partial loss of ability to hear[11].

Table No. I

Grade of impairment	Corresponding audiometric ISO value	Performance	Recommendations
0 – No impairment	25dB or better (better ear)	No or very slight hearing problems. Able to hear whispers	
1 – Slight impairment	26 – 40dB (better ear)	Able to hear and repeat words spoken in normal voice at 1 meter.	Counseling. Hearing aids may be needed.
2 – Moderate impairment	41 – 60dB (better ear)	Able to hear and repeat words spoken in raised voice at 1 meter.	Hearing aids usually recommended.
3 – Severe impairment	61 – 80dB (better ear)	Able to hear some words when shouted in better ear.	Hearing aid needed. If no hearing aid available, lip-reading and signing should be taught.
4 – Profound impairment including deafness	81dB or greater (better ear)	Unable to hear and understand even a shouted voice.	Hearing aid may help understanding words. Additional rehabilitation needed. Lip-reading and sometimes signing essential.

Table No I: WHO hearing impairment grades[12].

(Grades 2, 3 and 4 are classified as disabling hearing impairment. The audiometric ISO values are averages of values at 500, 1000, 2000 and 4000Hz)

Deafness in Indian Constitution:

In India, "hearing handicapped" as defined by The Rehabilitation Council of India Act, 1992[13], is – hearing impairment of 70dB and above, in better ear or total loss of hearing in both ears.

This law is applicable to only those persons with severe hearing impairment whose hearing loss is 70dB and above. A persons with hearing levels of 61 to 70dB, (although suffering from severe hearing impairment, as per WHO classification), is automatically excluded from the hearing handicap category.

Section 2(i)(iv) of the persons with Disability Act, 1995[14], (PWD) states that 'hearing impairment' is a disability and a "person with disability" means a person suffering from not less than 40% of any disability as certified by a medical authority. In addition, in Section 2(i) "hearing disability" has been redefined as – "a hearing disable person is one who has the hearing loss of 60dB or more in the better ear for conversational range of frequencies."

This is a step in the right direction, as all person with severe hearing impairment is now included in the hearing handicapped category.

Calculation of percentage of handicap in deaf person[15]

As stated above, "person with disability" means a person suffering from not less than 40% of any disability as certified by the medical authority.

Percentage of hearing handicap can be calculated by the following formula:-

Degree of handicap:

The average pure tone hearing level in the 3 speech frequencies 500, 1000 and 2000Hz is calculated. If this average is 'X', then 25 is deducted from it e.g. X-25. This value is multiplied by 1.5.

Thus the formula is:
[Average of 3 speech frequencies – 25] × 1.5.
Similarly, the percentage of hearing impairment is calculated for the other ear.
The total hearing handicap of a person is then calculated as follows:
[(Better ear % × 5) + (Worse ear %)] ÷ 6

GOVERNMENT MEASURES:

1. National Programme for Prevention and Control of Deafness[16]

This Programme was launched in 2006. As per NSSO survey, currently there are 291 persons per 100000 populations who are suffering from severe to profound hearing loss (NSSO, 2002). Of these, a large percentage is children between the ages of 0 – 14 years. With such a large number of hearing impaired young Indian, it amounts to a severe loss of productivity, both physical and economic. An even a larger percentage of population suffers from milder degree of hearing loss and unilateral hearing loss.

Objectives of the Programme:

a. To prevent the avoidable hearing loss on account of diseases or injury.

b. Early identification, diagnosis and treatment of ear problems responsible for hearing loss and deafness.
c. To medically rehabilitate persons of all age groups, suffering with deafness.
d. To strengthen the existing inter-sectoral linkages for continuity of the rehabilitation programme, for persons with deafness.
e. To develop institutional capacity for ear care services by providing support for equipment and material and training personnel.

Long term objectives:

To prevent and control major causes of hearing impairment and deafness, so as to reduce the total disease burden by 25% of the existing burden by the end of eleventh five year plan.

Components of the programme:

a. Manpower training and development - for prevention, early identification and management of hearing impaired and deafness cases, training would be provided from medical college level specialists (ENT and Audiology) to grass root level workers.
b. Capacity building - for the district hospital, community health centers and primary health center in respect of ENT/Audiology infrastructure.
c. Service provision including rehabilitation - Screening camps for early detection of hearing impairment and deafness, management of hearing and speech impaired cases and rehabilitation (including provision of hearing aids), at different levels of health care delivery system.
d. Awareness generation through IEC activities - for early identification of hearing impaired, especially children so that timely management of such cases is possible and to remove the stigma attached to deafness.

Strategy:

a. To strengthen the service delivery including rehabilitation.
b. To develop human resource for ear care.
c. To promote outreach activities and public awareness through appropriate and effective IEC strategies with special emphasis on prevention of deafness.
d. To develop institutional capacity of the district hospitals, community health centers and primary health centers, selected under the project.

Programme execution and expansion:

A pilot project was conducted in 25 districts derived from 10 states and 1 union territory. For the remaining four years of the 11th Five year plan, EFC has been approved by the Secretary (Health) for Rs.94.77 crore. It is proposed to expand this programme to include a total of 203 districts covering all the states and Union territories of India by 2012. The expansion will be done in a phased manner, with inclusion of 45 new districts each year.

Expected benefits of the programme:

a. The programme is expected to generate the following benefits in the shorts as well as in the long run. Large scale direct benefit of various services like prevention, early identification, treatment, referral, rehabilitation etc. for hearing impairment and deafness as the primary health center/community health centers/district hospitals largely cater to their need.
b. Decrease in the magnitude of hearing impaired persons.
c. Decrease in the severity/extent of ear morbidity or hearing impairment in large number of cases .

d. Improved service network for the persons with ear morbidity/hearing impairment in the states and districts covered under the project.
e. Awareness creation among the health workers/grassroots level workers through the primary health centre medical officers and district officers which will percolate the. lowest level as the lower level health workers function within the community
f. Larger community participation to prevent hearing loss through panchayatraj institutions, mahila mandals, village bodies and also creation of a collective responsibility framework in the broad spectrum of the society.
g. Leadership building in the primary health centre medical officers to help create better sensitization in the grassroots level which will ultimately ensure better implementation of the programme.
h. Capacity building at the district hospitals to ensure better care.
i. State of the art department of ENT at the medical colleges in the state/union territory under the project.

2. Key Issues of 120 million persons in India (special consideration to deafness)[17]

Under the Persons with Disabilities Act, 1995 there are provisions for appointment of Chief Commissioner of Disabilities at the National level and State Commissioners at the State level to take steps to safeguard the rights and facilities listed in the Act. The commissioners of Disabilities have not been effective, as they have limited power and the offices are poorly resourced. A full-time Chief Commissioner of Disabilities has not appointed for the last two and a half years. The implementation of the existing laws has been dismal. There is National Human Rights Commission and State Human Rights Commissions which too have been redressing grievances.

There are various Courts which can be approached for issues related to violation of rights or discrimination. There are also specific Commissions for women, children, minorities, etc. These have not done much to address issues of persons with disabilities because of various reasons such as lack of awareness on the part of persons with disabilities; lack of knowledge and mindsets of officers in these Commissions who think that the issues of persons with disabilities should be dealt by the Disability Commissioners; lack of accessibility and accommodation of the redress mechanisms.

Data on disability is mostly unavailable or inaccurate in the country and hence, resource allocation and facilities are highly inadequate. People with disabilities continue to be marginalized, discriminated, abused and suffer undue hardships. Systemic abuse and atrocities against people with disabilities continue to be rampant in the society at large.

Acknowledgement of progress:

India signed the United Nations Convention on the Rights of Persons with Disabilities (CRPD) on the very first day, when it was opened for signature i.e. on 30th March 2007 and ratified it on 1st October 2007. One of the major developments, post ratification, has been the decision of the Ministry of Social Justice and Empowerment to draft a new law on disability on the basis of CRPD. This was a direct result of advocacy by the disability sector. Other disability laws, like Mental Health Act, Rehabilitation Council of India Act and National Trust Act are also being reviewed.

The Indian Judiciary has started referring to CRPD to provide favourable judgements to persons with disabilities. For instance, the Supreme Court allowed a woman with intellectual impairment to continue with her pregnancy, taking into

account her wishes, and thus, upheld personal autonomy and freedom of choice (Article 3 and 23 of CRPD)[18]. Similarly, in another case, the Bombay High Court upheld the Government's obligation to provide assistive technologies as reasonable accommodation for employees with disabilities working with the Government (Article 4 and 27 of CRPD)[19].

The Eleventh Five Year Plan (2007 - 12) has made a specific mention of CRPD in the section on Disability. It states that "India being a signatory to CRPD, it is now obligatory upon us to incorporate the essence of the Convention in our planning, implementation, monitoring and review processes." Two of the major initiatives proposed in the plan, i.e. setting up of the Indian Sign Language Research and Training Centre and the Universal Design Institute have been recently announced. These should have a far reaching impact on improving accessibility for persons with disabilities in the years to come. The Department of Information and Technology has formulated guidelines for all official websites to be compliant to international Web Accessibility Standards[20].

Implementation, Monitoring and Reports of CRPD (Article 33 and 35):

India has not designated any Focal Point within the Government for matters relating to the implementation of CRPD. India has also not established any independent mechanisms or formulated a framework to promote, protect and monitor implementation of CRPD. India has not submitted its State Report to the CRPD Committee even though more than two years have elapsed since the entry into force of the Convention.

Neglect, Violence and Abuse:

There are hardly any support services such as affordable and accessible health facilities, rehabilitation, food security, counseling, self help groups, etc. in the community for persons with disabilities.

Most people with disability in the country do not even have the disability certificate that is required for them to get benefits from the Government. Disability is not taken properly into account while counting people Below Poverty Line (BPL). As a result, most people with disabilities are excluded from poverty alleviation measures or schemes.

Recommendations:-

a. Prevent and prohibit institutional violence and torture against people with disabilities.
b. Prevent and prohibit inhuman, degrading and torturous treatments to people with mental impairments, like solitary confinement, direct ECT, ECT without choice, forced institutionalization.
c. De-institutionalize persons with disabilities with regulated phasing out of mental asylums through establishment of model services in the community in compliance with CRPD based on informed consent and choice.
d. Create awareness about disability rights and training and sensitization of service providers, administrative officials and families.
e. Make the disability certification process easier and ensure all people with disabilities have easy access to getting a disability certificate.
f. Create effective Social Security Schemes with adequate support to the people with disabilities, and enhanced support for people with high support needs and families with more than one person with disability.

<u>Education:</u>

- About 70% of children with disabilities have still not been identified after more than 10 years of implementation of the Education for All programmes, Sarva Siksha Abhiyan (SSA)[21].

- About 28 States have appointed 12,629 resource teachers for 2,694,000 children with disabilities in schools[22]. On an average, 213 children with special needs are under one resource teacher.
- Thereare about 18 million deaf people in India and there are only 550 deaf schools, the majority of which are only till secondary education[23].
- Deaf-blind children are not able to access educational services either in special schools or schemes like SSA. There are currently only three training centres in the country which train 60 teachers every year for an estimated deaf-blind population of 450,000[24].

The total child population of India is about 20 crores (200 million). Therefore, even if we take the conservative estimate of 5% of population as being persons with disability (as per XI Five Year Plan document), the number of disabled children would be about 1 crore (10 million). The number of children with disabilities identified under SSA is only about 30 lakhs (3 million) (SSA website - Table - Progress on Inclusive Education 2009-10).

Recommendations:-

- Legislative changes are needed to make education laws and policies in line with Article 24 of CRPD.
- More resources have to be allocated for inclusive education.
- All children, including those with high support needs, should enjoy their right to attend school on equal basis with others. The proposed plan of the Government to provide them only home-based education should be dropped.

- Educational reforms are needed to ensure proper inclusion of people with disabilities keeping diverse needs in focus.
- Training of all teachers in inclusive education should be planned, budgeted for and conducted on an urgent basis.
- Review and remove all laws, regulations and circulars that bar, restrict or hamper students with disabilities from pursuing their choice of subjects.

Employment:

Employment is a major concern for persons with disabilities. Most people with disabilities are either unemployed or under-employed in the country. Article 16 of the Constitution, which is on equality of opportunity in employment, does not mention disability as a protected group.

Currently, there is identification of only certain jobs in the Government and Public Sector as

suitable for persons with disabilities, which is discriminatory and in violation of Article 3 of CRPD, which emphasizes freedom of choice.

There is rampant discrimination in the Private Sector. Most companies do not employ people with disabilities. There is neither a reservation system nor an antidiscrimination law in the country that prevents discrimination in the private sector.

For enhancing livelihood security for people in the rural areas, the Government enacted the Mahatma Gandhi National Rural Employment Guarantee Act (NREGA) 2005, which guarantees 100 days of waged employment in a financial year to a rural household. The Scheme specifically mentions disability[25]. However, its implementation leaves a lot to be desired. In the year 2011-12, 999,211 persons with disabilities were registered, out of which only 16,436 were given work under the Scheme, creating 121,121 person days 12!

While each person's was supposed to be given work for 100 days in a year, the average person days for persons with disability, as per this data, is only 7 person days in a year. Most people with disabilities who have applied under this programme have not been given work, which is s direct violation of the Act.

Recommendations:-

- Legislative changes to make Employment laws and policies in the with Article 27 of CRPD.
- Strong Anti Discrimination Law in the Country with respect to employment in public and private sectors.
- Amendment of Article 16 of Constitution to include disability. Enforcement of reservation in employment and speedy filling up of the existing backlog in the Government.
- Government support for assisted employment for people with intellectual and other developmental disabilities.

Accessibility:

Deaf people also find it extremely difficult to access public services. There are no Sign Language interpreters, appropriate signages and information in public places. There are no captions in television programmes. Deaf-blind and other people with communication disabilities find it difficult to interact with public officials, say, police officers, judges, bankers, etc. to get any of their rights and entitlements. Sign Language has not been recognized as an official language in the country[27]. There are only about 250 Sign Language interpreters in the entire country for as many as 18 million deaf Indians. There are no posts for Sign Language interpreters.

Disaster Preparedness measures for persons with disabilities are highly inadequate in the country. The Disaster Management Act does not mention needs of persons with disabilities in the event of any disaster. Access to emergency services, such as ambulance, fire engine, police, etc. for persons with disabilities have not be given due priority. Most of these services have to accessed telephonically (by dialing 100, 101, 102, etc.) and there are no alternative methods for persons with speech, hearing and communication disabilities to contact these. These numbers are not known to majority of people and sometimes, these numbers vary from State to State. Even if one wants to access these services in person, there are many barriers – physical, communication and attitudinal.

Recommendations:-

- Strict and time bound rules for creating accessible environment in all public spaces (owned by private and public sectors), workplaces, schools, universities, currencies, banking, etc.
- Recognizes Indian Sign Language as one of the official languages.
- Internet and media should be made accessible for people with disabilities.
- Provide accessibility and reasonable accommodation to ensure people with all disabilities are able to access justice (police service, legal service, redress mechanisms, courts, etc.)
- Appropriate measures, including legislative, to support people with disabilities during disasters/emergency situations. The emergency numbers should be made accessible.

Political Participation:

Some persons with disabilities (people with so called "unsoundness of mind") are not allowed to vote, stand for elections or hold public office, as per Article 326 of constitution of India and Representation of people's Act. Some State laws bar people with leprosy and deafness to participate in elections and hold public offices. For instance, Panchyati Raj Act 1994 of Tamil Nadu bars persons with "unsound mind" of "deaf-mute" to contest in the elections.

Recommendations:-

- Review and amend laws to ensure full citizenship and participation of people with disabilities in the democratic process of the country.
- Implement and monitor Court Orders related to making polling booths accessible for people with disabilities.
- Information related to elections should be accessible for people with disabilities.

Driving license:

Earlier, the Motor Vehicles Act and Rules automatically disqualified a deaf person from obtaining a driving license based on the premise that, deaf persons, if permitted to drive, would be a danger to the public.

India is a signatory to United Nation‘s Convention (2007) on persons with disabilities. As a result, a person, though deaf, but holding an international driving license could drive in India, and a deaf person from India going abroad could get an international driving license and would be eligible to drive both abroad and in India. Thus deaf persons from abroad, including Indians, who possessed an international driving license, could legally drive in India while deaf persons from India were prohibited from the same. In a recent landmark judgment (14th February 2011), the Delhi High Court has permitted deaf persons to take a driving test, and if they pass, to get a driving licence[28]. By allowing deaf persons to go through the test and drive if they are found capable, the High Court has, for the first time in this country, permitted deaf persons to legally drive a vehicle.

Employment (Reservation of posts/employment schemes):

The labour laws in India apply equally to the disabled and the non-disabled. Special Employment Exchanges have been established in some State Capitals and Special cells in other employment exchanges. The number of special Employment Exchanges in India is 23 while the number of special cells in ordinary exchanges is 55. They register handicapped persons seeking jobs and also arrange for placement in public and private sector. Special provisions exist such as job quota for the disabled, etc. Section 33 of the Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 provides for a reservation of 3% in the vacancies in identified posts (1% for persons with hearing impairment) in the Government establishments including the Public Sector Undertakings[29]. The service rules of the Government provide that an employee who becomes disabled should be adjusted in a post where his disability will not prevent him from rendering work. Deprivation of work due to disability should be ruled out. Workers who become disabled during the course of employment are entitled to compensation as per the Workmen's compensation Act, 1923[30].

Workmen’s Compensation Act, 1923[30]:

Schedule I of the Workmen’s Compensation Act, 1923 provides the list of injuries leading to Permanent Total disablement. This includes absolute deafness and awards 100 percent of loss of earning capacity.

However, the list of injuries leading to Permanent Partial disablement does not include hearing impairment.

Factories Act[31]:

The Factories Act does not contain any specific provision for noise control. However, under the Third Schedule of the Act, noise induced hearing loss (exposure to high noise levels), is mentioned as a notifiable disease. Recently introduced ISO 14001 also do not mention specific steps for prevention of noise pollution.

Future steps:

Ministry of Social Justice & Empowerment had, constituted a committee, to draft a new legislation for persons with disabilities, replacing the present Persons with Disabilities (Equal Protection of Rights and Full Participation) Act, 1995. The Committee submitted a draft called The Rights of Persons with Disabilities Bill, 2011. (9th February, 2011 version)[33].

Every person with disability has the right to be informed of the various rehabilitation options and make the final decision on the course of rehabilitation. All persons with disabilities have a right to be provided aids and appliances of recognized quality at an affordable cost along with the requisite training to utilize it. There shall be constituted for the purposes of this Act, a Fund to be called the National Fund for Persons with Disabilities.

The Noise Pollution (Regulation and Control) Rules, 2000 Modified upto 2010[32]:

This act has given provision for control of noise pollution due to the increasing ambient noise levels in public places from various sources, inter-alia, industrial activity, construction activity, fire crackers, sound producing instruments, generator sets, loud speakers, public address systems, music systems, vehicular horns and other mechanical devices have deleterious effects on human health and the psychological well being of the people; it is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise. It has given definitions and provision of Ambient air quality standards in respect of noise for different areas/zones, Responsibility as to enforcement of noise pollution control measures, Restrictions on the use of loud speakers / public address system and sound producing instruments, Restrictions on the use of horns, sound emitting construction

equipments and bursting of fire crackers, Consequences of any violation in silence zone / area, Complainant authority and Power to prohibit**.**

Table No - II

Ambient Air Quality Standards in respect of Noise

Area code	Category of Area/Zone	Limits in dB(A) Leq*	
		Day Time	Night Time
A	Industrial area	75	70
B	Commercial area	65	55
C	Residential area	55	45
D	Silence Zone	50	40

Note: - 1. Day time shall mean from 6.00 a.m. to 10.00 p.m.

2. Night time shall mean from 10.00 p.m. to 6.00 a.m.
3. Silence zone is an area comprising not less than 100 metres around hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority
4. Mixed categories of areas may be declared as one of the four above mentioned categories by the competent authority.

***** dB(A) Leq denotes the time weighted average of the level of sound in decibels on scale A which is relatable to human hearing.

A "decibel" is a unit in which noise is measured.

"A", in dB (A) Leq, denotes the frequency weighting in the measurement of noise and corresponds to frequency response characteristics of the human ear.

Leq: It is energy mean of the noise level over a specified period.

RESEARCH WORKS SO FAR IN INDIA:

As per Ramanuj Bansal et al 1992; most of the patients belong to age group of 0 -10 years. C.S.O.M. was the most common etiological factor resulting in hearing loss and presbyacusis was the second commonest cause[34].

In 1994 a study conducted by C. Das et al in tribal villages of Manipur shows the percentage of children's population in the villages was 35.77% and there was 6.62% prevalence of deafness among the children. The age incidence was found to be highest in the children group of 6-10 years of age[35].

As per Prof. V.N. Chaturvedi et al; 2 deal" babies are born/hour i.e. 1/2000 to 1/0000 live births (Kumar & Chaturvedi 1996), 18000 deaf babies are added to our population every year, 5% of India population have speech and hearing problem, Prevalence of hearing loss is 10.7% in rural area and 6.8% in Urban area (ICMR 1983), Prevalence of middle ear disease in school going children is 4.6%,. In urban area varies from 5.4% to 14.9% and among rural areas is 03.9% (Mishra 1961). Puyarn 1998) and Presbyacusis and congenital sensorineural hearing (SNHL) with delayed development of speech and language (DOSL) are common cause for hearing loss. The incidence of the later is 0.9/1000 in ENT OPD cases (Chaturvedi & Kumar 1993)[36].

A study in traffic police personnel's was done by V. K. Singh et al in 1995; which showed significant hearing losses in them Those personnel who had less than 2 years service in the traffic branch had slightly less (60.3%) incidence of hearing loss as compared to others who had a higher incidence of approximately 85%[37].

Sharing his 10 years experience of deaf mute children Dr. Mangal Singh et al has mentioned non genetic causes as 33% of his total patients as the etiological agents, genetic causes responsible for 15.8% and remaining as idiopathic[38].

Etiological factors for deafness

- Non-genetic causes 33.3%

1. Embryopathies

(a) Infection

(b) Toxaemia of pregnancy

(c) First trimester bleeding

(d) Ototoxic drugs

(e) Jaundice

(f) Rh incompatibility

2. Perinatal causes (10.8%)

(a) Low Apgar score

(b) Low birth weight (<2.5 kg)\prematurity

(c) Breech presentation

(d) Post-term

3. Post-natal causes (12. 5%)

(a) Eruptive fever

(b) Meningitis

(c) Hyperbilirubinemia

(d) Traumatic

(e) Cerebral palsy

(f) Delayed mi1estones

- Genetic causes (15.8%)

1. Family history (10.8%)

(a) Paternal

(b) Maternal

(c) Siblings

2. Congenital syndromes (5.4%)

- Idiopathic (50.6%)

In 2005 a neonatal hearing screening of high risk babies was performed by M. John et al which recommends use of otoacoustic emissions followed by BERA for initial neonatal screening for hearing and also mentions the difficulties which would be commonly faced in such situation[39].

A study on noise induced hearing loss (NIHL) was performed by Ruikar M.M. et al in 1994, which showed the following results NIHL was significantly higher (76.6%) in employees exposed to >85 dB(A) than to 70-85 dB(A) (35.2%) and to <70 dB(A) (10.7%). Hearing handicap in employees with NIHL increased in severity as the noise level increased. Average hearing handicap was significantly higher (12.5%) in >85 dB(A) exposure group than 70-85 dB(A) (7.9%) and <70 dB(A) (4.9%)

exposure groups. The risk of having hearing handicap >10% was 5.2 times higher in > 85 dB(A) exposure group than in <85 dB(A) exposure group and concluded One third of textile mill employees had hearing handicap. Noise levels >85 dB(A) are associated with high proportion as well as greater severity of hearing handicap[40].

M. V. V. Reddy et al 2004, conducted Interview based prospective study in children below 14 years of age with hearing loss which showed the results on the type of the hearing impairment are presented in their study; Out of 743 children with hearing loss18.57% were found with syndromic hearing impairment and 81.73% constituted for only isolated (non-syndromic) deafness. The results on etiology of hearing loss in children with deafness shows that in 15.22% of children, deafness was inherited, in 13.77% it was acquired and in 71.01% the etiology was unknown[41].

Rajiv Dhawan et al, 2006 conducted comparative study to evaluate Transient Evoked Oto-acoustic Emission (TEOAE) as screening modality for hearing impairment in neonates. Brainstem Evoked Response Audiometry (BERA) was used as gold standard diagnostic tool in this study. The factors affecting the specificity of TEOAE were also studied. They concluded that TEOAE is a simple and rapid test with relatively higher acceptability. But, the low sensitivity and specificity are the main shortcomings that take away from TEOAE, the status of independent screening modality for hearing impairment in neonates. TEOAE cannot completely replace BERA as screening modality for hearing impairment in neonates, however can complement it[42].

DISCUSSION

Though the hearing being one of the most important senses and presence of various law and active measures are being taken by the government, the need of the time is to have devoted action and constitution of one centre fully devoted for all hearing activities in the country. The various studies so far in India give various recommendations which need to be followed. Research activities devoted to hearing and noise pollution must be promoted. So far the studies recommend these various measures to be taken which are

1. To consult a doctor within 24-48 hours, if a child is found to have cold which can be manifested by nasal obstruction, nasal discharge or running nose, sneezing bouts, bleeding from nose, pain in the throat and cough, fever and headache[35].

2. Once there is discharge in the ear, to avoid entry of water and/or moisture in the ear. To avoid swimming and driving absolutely until and unless the doctor says alright[35].

3. If there is history discharge in the ear, to follow up consultations with the doctor, until and unless the doctors says it is done with[35].

4. In view of the high incidence of acoustic damage in professions where there is high exposure to noise shifting between high and low noise intensity areas, withdrawal of individuals with significant hearing loss and use of personal ear protectors like ear fenders or ear muffs and creation of awareness among exposed individuals about the hazards of noise pollution and stressing the importance of hearing conservation by constant education and regular monitoring of susceptible individuals[37].

5. An effective and comprehensive conservation of hearing is probably the only means available whereby any industry can be certain of protecting the health of employees exposed to noise and at the same time of obviating payment of compensation for unjust claims for occupational deafness[40].

6. All babies with a history of birth asphyxia, high risk deliveries should be subjected to audiological assessment by 6 months of age and rehabilitation should be started at the earliest to avoid subsequent handicaps[34].

7. All syndromic and non-syndromic hearing loss children should be look for their etiology and thus established the most common cause of genetic hearing loss in India and thus the gene therapy if required.

8. To make national deaf registry system, for all deaf people by whatever cause and whatever age, so that best rehabilitation can be done.

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