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Review Article

ENT Health Needs to come to Center stage- India Case Study

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Abstract

The ears, nose, and throat, collectively referred to as ENT are sensory organs that not only facilitate hearing, taste, & breathing but also serve multiple other important functions. In a world filled with complex diseases, vital sensory organs take center stage only when people experience issues affecting their quality of life. The WHO estimates that currently, over 1.5 billion people live with hearing loss globally, 466 million who have disabling hearing loss.

In Inda approximately 63 million people suffer from significant auditory impairment, which is a major area of the focus within the ENT specialty. Sinusitis, allergic Rhinitis, & tonsilitis being the other commonly reported ENT conditions. A recent survey conducted by healthcare provider Pristyn Care, of 56,176 individuals across cities like Delhi, Meerut, Faridabad, Noida, Ghaziabad, Rohtak, Chandigarh, Kanpur, etc.; found that 55% of them reported ENT problems like hearing loss, sore throats, & nasal irritation or congestion, causing significant discomfort, that raise concerns about long-term health impacts. Yet 68% of the affected didn't consult a healthcare professional. Country's 12,000 ENT specialists practice more in cities & district headquarters rather than sub-district levels & rural India. Therefore, improving the quality of patients' lives by early detection & treatment - is an ENT health Challenge.

Materials and Methods: This article explores 6 common ENT symptoms & treatment trends over the last 6 decades to promote prompt early care seeking & effective treatment. The review is based on this author's observations in the evolutions Otorhinolaryngology practices across the world and India's efforts in bridging the gap and catching up with modern technologies used in developed countries in research and management practices in the last 6 decades.

Outcome: Over the past six decades, India has seen a significant evolution in the treatment of Ear, Nose and Throat diseases, shifting from aggressive surgical approaches to more balanced conservative management and promotion of rudimentary devices to advanced technologies. The focus has broadened to include comprehensive rehabilitation programs and increased awareness about prevention and early intervention.

Keywords: specialists; hearing loss; ear infections

Abbreviations:

ENT= ear; nose & throat; **WHO=** World Health Organization; Otolaryngologists= **ENT** specialists; Hearing loss; Ear Infections; **CSOM=** Chronic Suppurative Otitis media

Introduction

The total annual burden of ENT (Ear, Nose, and Throat) diseases is substantial globally and in India, due to conditions ranging from hearing loss to infections and cancers. In India, too, ENT diseases are among the most common reasons for hospital visits, with conditions like impacted ear wax, CSOM, and tonsillitis. Although the global burden of ENT diseases is high, data relating to ENT disease epidemiology & diagnostic error in resource-limited settings remain scarce [1]. ENT diseases, encompassing ear, nose, and throat conditions, are a significant global health concern with a high burden on healthcare systems, particularly in low-resource settings. These conditions are a major cause of morbidity and mortality, with hearing loss being the most common sensory deficit. The WHO has highlighted the need for increased access to ear and hearing care, emphasizing the integration of services at the primary level and empowerment of healthcare providers through training. According to WHO, a major public health issue, with 466 million people currently living with disabling hearing loss, including 34 million children and projects that 900 million will be suffering disabling hearing loss by 2050 [1].

Ear wax, Chronic Suppurative Otitis media (CSOM), acute pharyngotonsillitis, allergic rhinitis, and adenoid hypertrophy are frequently encountered ENT health aberrations. While tonsillitis and acute otitis media are more prevalent in children, quinsy & hearing loss are more common in

adults. Tonsillitis and allergic Rhinitis show seasonal peaks in winter. Approximately 20% of hearing loss sufferers benefit from increased availability of hearing aids, in developing countries.

Magnitude of the Problem: According to the World Health Organization (WHO), over 1 billion people worldwide suffer from hearing loss, with 466 million undergoing rehabilitation services. Additionally, it is estimated that about 1.5 billion people worldwide suffer from chronic nasal conditions such as allergic rhinitis, sinusitis, and nasal polyps [1,2,3]. In India, factors, like pollution, poor sanitation, & limited access to healthcare services in certain regions, cause ENT problems. According to a study by NIH, around 6.3% of Indians suffer from hearing impairment, with the frequency being higher in rural areas. Approximately 8-10% of the Indian population suffers from chronic sinusitis, allergic rhinitis is common in 40% of children & 25% of adults [4].

Pristyn Care, a healthcare provider specializing in minimally invasive surgeries, has seen an increase in ENT-related consultations and surgeries, particularly after Diwali. This rise is attributed to factors like increased awareness of online primary consultation platforms and post-festive season pollution levels. Pristyn Care emphasizes its use of USFDA-approved surgical methods and technologies, along with measures to ensure patient safety and convenience. A recent survey conducted by healthcare provider Pristyn Care, of 56,176 individuals across cities such as Delhi, Meerut, Faridabad, Noida, Ghaziabad, Rohtak, Chandigarh, Kanpur, etc.; found that 55% reported that ENT problems like sore throats, nasal irritation, & ear discomfort & hearing loss, causing significant inconvenience & raise concerns of long-term health impacts. Yet 68% didn't consult any healthcare professional and managed with home remedies [5].

ENT is a medical specialty focused on diagnosing and treating disorders and conditions related to the ear, nose, throat, and areas in the head and neck. ENT specialists / Otolaryngologists are trained to manage and treat various medical and surgical conditions affecting these body areas. Despite having approximately 12,000 ENT specialists in the country, their practice is more in the urban rather than rural areas [4]. Improving the quality of patients' lives through early detection & treatment is an important part of ENT care as these conditions significantly impact daily life

In a world filled with complex diseases, vital sensory organs are often overlooked. However, they take center stage when individuals experience issues affecting their quality of life. The ears, nose, and throat, collectively referred to as ENT disorders, which facilitate taste, hearing, and breathing but also serve multiple important functions.

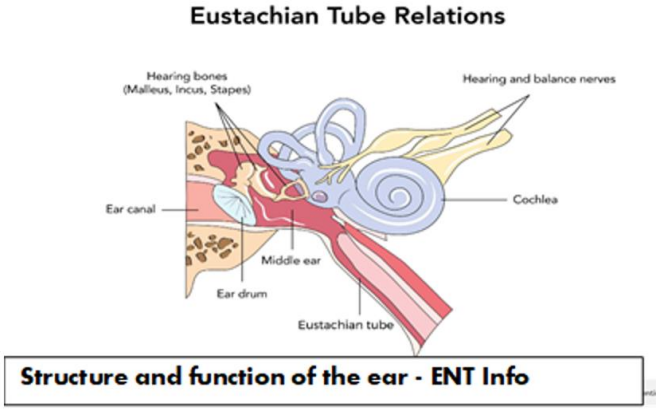
Many low-income countries face challenges in managing ENT diseases due to inadequate resources, infrastructure, and personnel. Early detection & treatment of ENT problems are crucial to preventing complications and irreversible damage. Integrating ear and hearing care into primary healthcare, empowering healthcare providers with the necessary knowledge and skills is the need of time to achieve Universal Health Care (UHC) by 2030 in all countries. Advanced surgical techniques, like Myringotomy, Tympanoplasty, minimally invasive procedures & robotic-assisted surgery are leading interventions in managing ENT conditions globally, which are scarce in Low- & Middle-income countries, limiting access to life-saving surgeries [2,3].

Efforts are needed to improve diagnostic accuracy in ENT, particularly in low-resource settings, to ensure appropriate and timely treatment. Most of these conditions seem minor at first, but if not treated timely, gradually interfere with everyday activities, cause discomfort, and impact the overall quality of life. Persistent ear infections can lead to hearing issues, untreated sinusitis results in frequent headaches & dyspnea. That's why early diagnosis & proper treatment are essential for recovery & long-term relief [2,4,13]

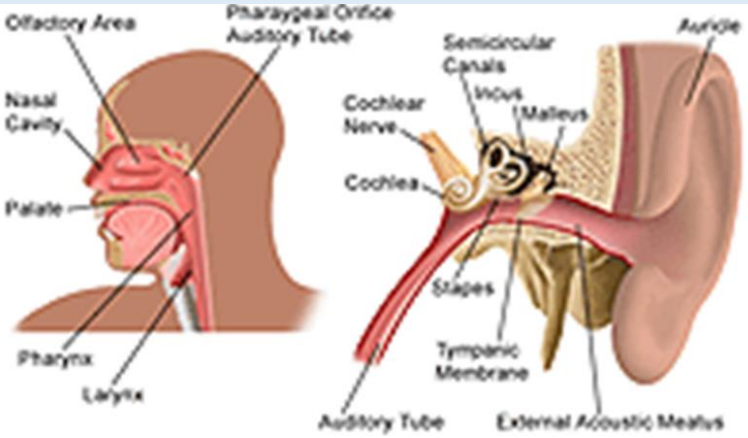
This article explores 6 most common ENT symptoms and treatments trends over the last 6 decades to ensure prompt and effective treatment.

Discussions:

The Ear, Nose, and Throat (ENT), or otolaryngology, region of the body is responsible for several crucial functions including hearing, balance, smell, taste, breathing, swallowing, and speech. These three areas are interconnected & work together to enable these essential processes [6].



Ears: The ears are vital for hearing and maintaining balance. Sound vibrations are processed through the outer, middle, and inner ear, ultimately sending signals to the brain for interpretation as sound. The ear is made up of i) External or outer ear. Which consists of a) Pinna or auricle, the outside part of the ear. b) External auditory canal or tube that connects the outer ear to the inside or middle ear c) Eardrum or tympanic membrane-divides the external ear from the middle ear.ii) Middle ear (tympanic cavity): This is made up of a) Ossicles -3 small bones that are connected and transmit the sound waves to the inner ear b) Eustachian tube, a canal links the middle ear with the back of the nose. It helps to equalize the pressure in the middle ear. Having the same pressure lets sound waves transfer correctly. The eustachian tube is lined with mucus, just like inside of the nose & throat.



iii) Inner ear: This is made up of a) Cochlea which contains the nerves for hearing b) Vestibule that contains receptors for balance c) Semicircular canals which contain receptors for balance. The inner ear plays a key role in spatial awareness & body balance.

Nose: The nose is the organ of smell. It is part of the peripheral nervous system. The nose is made up of i) External nose: A triangle-shaped projection in the center of the face ii) Nostrils: These are 2 chambers divided by the septum. iii) Septum: made up of cartilage and bone. It is covered by mucous membranes. The cartilage gives shape & support to the outer part of the nose iv) Nasal passages, lined with mucous membranes and tiny hairs (cilia) that help to filter the air v) Sinuses: These 4 pairs of air-filled cavities are also lined with mucous membranes. Sinuses make the skull lighter. Their most important role is to make mucus moistens the inside of the nose. The nose filters warm, and humidifies the air we breathe, protecting the respiratory system from irritants &pathogens. It houses the olfactory receptors, enabling the sense of smell, closely linked to the sense of taste. The nose influences speech and resonance.

Throat (Pharynx and Larynx): The throat is a ring-like muscular tube. It acts as the passageway for air, food, and liquid. The throat plays a critical role in the swallowing process and helps in forming speech. The throat is made up of i) Voice box (larynx): This contains the vocal cords. It is key to speech and breathing. The larynx also serves as a passageway to the windpipe (trachea) ii) Epiglottis: This is located above the larynx and works with the larynx and vocal cords to push food into the esophagus and keeps food away from entering the windpipe iii) Tonsils and adenoids: These are made up of lymph tissue, located at the back and sides of the mouth. They protect against infection in childhood. with little purpose thereafter [6].

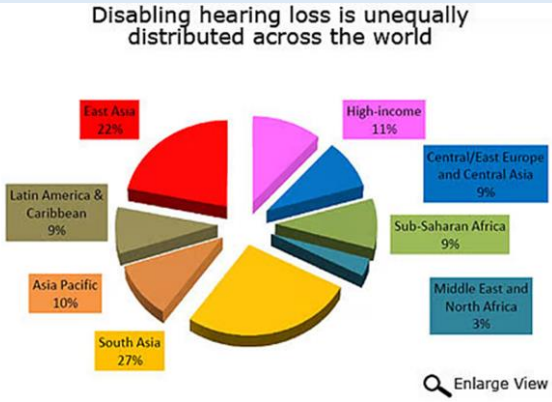
Interconnectedness: The interconnectedness of the ENT system is crucial. Eustachian tubes connect the middle ear to the throat, regulating pressure in the middle ear. Blockage of these tubes can lead to ear pain, muffled hearing, and other issues. Similarly, the sinuses, which are air-filled cavities in the skull connected to the nasal passages, contribute to mucus production and drainage, affecting breathing and sinus health.

Trends in ENT Problems & their Management in India

1.Auditory Impairment (Hearing Loss): The WHO estimates that currently, over 1.5 billion people live with hearing loss globally, and 430 million of them have disabling hearing loss. By 2050, nearly 2.5 billion people will experience some degree of hearing loss, with over 700 million requiring hearing rehabilitation [3]. Global prevalence of 0.5% for adult males and 0.3% for females. Another way of estimating hearing loss is based on the population and proportion of various categories of people estimated to be suffering from hearing loss. In mid-2025, the global population is estimated to be around 8.23 billion, comprising of approximately 4.14 billion males and 4.09 billion females [7]. This estimates about 400 million men and 120 million women are short of hearing.

In India, approximately 6.3% of 1.46 billion in mid-2025 population, or 92 million people, experience significant auditory impairment. Hearing loss is the second most common cause of disability in India. Advanced countries have a lower prevalence of profound and complete hearing impairment. A key difference is the impact of infectious diseases, particularly Chronic Suppurative Otitis Media (CSOM), on hearing loss in India, a factor less prevalent in developed nations. Age-related hearing loss (presbycusis) is a significant contributor to the overall prevalence of hearing loss, in elderly adults in these countries. Exposure to loud noise in occupational and recreational settings is also a key contributor to hearing loss in developed nations. Advanced countries benefit from better access to hearing aids, cochlear implants, and other assistive technologies, which mitigate the impact of hearing loss. The WHO highlights that many impacts of hearing loss can be mitigated through early detection and intervention, including specialized education, assistive technologies, and rehabilitation services Though India has a National Program for the Prevention & Control of Deafness, access to care services and hearing aids to reduce the burden of hearing loss falls short of the demand. In India, infectious diseases and socioeconomic disparities play a major role, especially in remote rural, and tribal populations while age-related and noise-induced hearing loss are more prevalent in advanced countries. Addressing these differences requires tailored public health strategies and interventions.

A review of published peer-reviewed journal articles., reporting the prevalence and degree of HL in India from 1980 to 2020. The Information gathered on the population characteristics, methodology applied and the prevalence of hearing impairment. were analyzed to identify trends and at-risk sections of population in various categories. The results reported using a 3-step screening protocol, hearing impairment (abnormal auditory brainstem response/auditory steady state response) in neonates ranged between 1.59 and 8.8 per 1000 births. Among ‘at risk’ neonates, it ranged from 7 to 49.18 per 1000 births. In children the prevalence of HL was 6.6% to 16.47%. Otitis media was the most common cause of HL in children. Community-based studies (all ages) reported the prevalence of HL between 6% and 26.9% and prevalence of disabling HL between 4.5% and 18.3%. Rural areas & elderly people showed a higher prevalence of hearing impairment [8].



Failure to detect children with congenital or acquired hearing loss results in lifelong deficits in speech and language acquisition, poor academic performance and personal-social and behavior problems. Deficits in speech and language lead to lack of stimulation, which adversely affects the structure of the synaptic junction. Lack of auditory stimulation leads to retrograde degeneration in the cell body and axon. Realizing the fact that initiation of newborn hearing screening programs to identify hearing loss early and facilitate timely intervention. The data on congenital disabilities indicate that congenital hearing loss affects 30 per 10,000 children in India. Screening Critical period for identification and remediation of hearing loss is before the age of 6 months. It has been observed that practice of neonatal screening has dramatically lowered the age of diagnosis of deafness from 1 ½ -3 years to less than 6 months of age. Ideally every baby is to be screened before discharged from hospital [9]. Causes of hearing loss are:

i) Causes in ear canal/Conductive (congenital atresia, wax, foreign body, trauma, external otitis, stenosis)

ii) Causes in middle ear Conductive (acute and chronic otitis media, perforation of tympanic membrane, congenital defects, trauma, malformations either hereditary or familial)

iii) Causes in the cochlea/Cochlear (ototoxic drugs, stay in neonatal intensive care unit due to jaundice or other causes, neonatal infections, head injury, noise).

iv) Causes in auditory nerve/Retro-cochlear (problems in cochlear nerve, auditory pathway or cortex like tumors, trauma, de myelination).

v) Intrauterine infections (tetanus, toxoplasma, rubella, cytomegalovirus &herpes or TORCH group of infections) classified as cochlear or retro-cochlear causes of Sensorineural hearing loss.

Conductive hearing loss, a common disorder, occurs in 1 to 2 newborns per 1000 in general population, and 2% to 3% of newborns admitted to neonatal intensive care unit. Vocabulary of a 3-year-old child with hearing impairment if remediated at birth is 300-700 words; if remediated at 6 months is 150-300 words and if remediated at 2 years is 0-50 words, respectively, as compared to vocabulary of a 3-year-old child with normal hearing which is 500-900 words. This is enough reason for early identification and remediation [9].

MASLD & SSNHL Link: A Korean study found that elderly individuals with Metabolic (MASLD) dysfunction-associated steatotic liver disease have a higher risk of sudden sensorineural hearing loss. The findings suggest a potential liver–ear axis linking metabolic health to auditory function.

Using data from the Korean National Health Insurance Service-Senior cohort, researchers analyzed 189,623 individuals aged 65 and above, classified into MASLD and non-liver disease (non-SLD) groups. Over a 9-year follow-up period, 3,803 SSNHL cases were recorded in the MASLD group, with an incidence rate of 2.44 per 1,000 person-years. After adjusting for confounding factors and all-cause mortality, MASLD was found to significantly elevate the risk of SSNHL (adjusted hazard ratio: 1.05; sub distribution hazard ratio: 1.06). Participants with MASLD also exhibited higher levels of metabolic dysfunction, including increased BMI, waist circumference, and blood pressure. The findings support a possible "liver–ear axis," suggesting that metabolic liver conditions may have an adverse effect on auditory health and highlights the importance of early detection and management of MASLD in elderly populations [10].

Trends in Treating Hearing Loss in India: Over the past six decades, India has seen a significant evolution in the treatment of hearing loss, shifting from rudimentary devices to advanced technologies like cochlear implants and digital hearing aids. The focus has also broadened to include comprehensive rehabilitation programs and increased awareness about prevention and early intervention.

Early Decades (1960s-1980s): *When this author entered the health system of the country in 1968, hearing loss t*reatment primarily revolved around basic hearing analog aids and surgical interventions for otosclerosis. Awareness about hearing loss and its impact among people and even primary health care doctors (MBBS qualified) too was limited, leading to delayed diagnosis & intervention. Rehabilitation services were rudimentary, often limited to basic speech therapy.

Mid-Phase (1980s-2000s): By 1978 this author had specialized in Industrial health (DIH) and was working as mid-level public health manager at a sub-district level (designated as Assistant District Health and Family Welfare Officer- AD&FWO) and witnessed introduction of digital hearing aids and development of more sophisticated surgical techniques, including cochlear implants for severe hearing loss mainly in Medical Colleges. There was a growth in specialized clinics and the emergence of audiologists and otorhinolaryngologists (ENT specialists) with expertise in hearing assessment and management mostly at Medical College Hospitals. As this author moved to State headquarters in Bangalore in 1985, it witnessed establishing ENT units in most district hospitals otorhinolaryngologists & audiologists and required equipment. Increased efforts to educate the public about hearing loss, its causes, and available treatments, and including school-based screening under School Health Programs were introduced. Emphasis on hearing conservation programs in industrial & occupational settings to address noise-induced hearing loss had also begun. In September this author moved to Delhi to join UNICEF India Country Office (ICO) and witnessed adoption of cochlear implants for individuals with severe to profound hearing loss. Large numbers of children and adults were benefiting from this technology at All India Institute of Medical Sciences, New Delhi.

Recent Trends (2000s-Present): Widespread adoption of cochlear implants for individuals with severe to profound hearing loss, with increasing numbers of children and adults benefiting from this technology through ENT departments of all Medical Colleges and private hospitals became a norm. Continued advancements are seen in digital hearing aid technology, including features like noise reduction, directional microphones, and wireless connectivity, improving sound quality and user experience. Similarly, Increased use of tele-audiology for remote consultations, hearing aid fitting, and follow-up care, and greater push in the private sector particularly Urban rural and underserved areas has begun. Development of comprehensive rehabilitation programs that integrate hearing aids, speech therapy, auditory-verbal therapy, and other assistive technologies to optimize communication and participation in daily life.

The national capital is estimated to have less than 650 ENT specialists as against a required number of 2000 ear, nose and throat (ENT) specialists to identify and diagnose all patients of 0–15 years of age with common hearing problems indicating a ratio of 0.6. The number of general practitioners available in the city is considerably large and they can share these tasks [14].

The National Program for Prevention and Control of Deafness (NPPCD) launched on a pilot basis in August 2006. It initially covered 25 districts in 10 states and 1 union territory, including Andhra Pradesh, Assam, Gujarat, Karnataka, Manipur, Sikkim, Tamil Nadu, Uttaranchal, Uttar Pradesh, and Chandigarh. The program was later expanded to 192 districts across 17 states and 3 union territories and transitioned into a full-fledged national program in 2008. This author's State Karnataka was one of the states where the program was initially implemented on a pilot basis and later expanded.

2.Ear Infections: Ear infections, medically called "Otitis media", are among the most common ENT disorders, because of pathogenic germs entry & get stuck and grow inside the middle ear or ear canal causing pain and drainage from the ear. If not treated early, it will lead to hearing loss and speech delay in children. These are more common in children than adults, in India. Conditions like cerumen impaction, OME, and CSOM are common ear morbidities in children due to less developed Eustachian tubes and immune systems. Prevalence differences have been observed among residential and Scio-economic status, with higher rates in urban slums, followed by rural or tribal children and urban elite population. Most children are brough with complaints of i) Ear pain or discomfort ii) Fluid drainage from the ear iii) Fever and chills iv) Irritability in infants and young children. In delayed care seeking cases present with Hearing loss, Balancing problems, Nausea & vomiting, Pain while swallowing, disturbed Sleeping issues.

Otitis media could be either Acute suppurative otitis media (ASOM) with less than 1% prevalence, or Chronic suppurative otitis media (CSOM) is the most common type with a prevalence rate of about 4% of children and Otitis media with effusion (OME) with a reported rate of about 3% of children. ASOM and CSOM are more prevalent during winter. While ASOM is less frequent in adults, CSOM does occur, but otitis externa is more common in adults. Smoking is a recognized risk factor for ear infections in adults [9].

Majority of the cases seek treatment a general practitioner in rural India and urban literate population may seek care with an ENT specialist. The common treatment practices include i) Antibiotics (in case of bacterial infection) ii) Pain relievers iii) Ear drops

Trends in Treating Ear Infections in India: The approach to treating ear infections in India has shifted in the last 6 decades from primarily relying on antibiotics to a more nuanced approach incorporating conservative management, addressing antibiotic resistance, and exploring alternative therapies. In the past, in the 1960's & 70's antibiotics were frequently prescribed for ear infections, particularly acute otitis media (AOM). Over time, widespread & sometimes inappropriate antibiotic use led to the emergence of multidrug-resistant bacteria, to common antibiotics, making treatment more challenging. National guidelines by 1980's recommended waiting for mild cases of AOM in children, and reserving antibiotics for more severe or persistent infections. This shift is accompanied a focus on preventative measures like vaccination (PCV for pneumococcal infections) and promoting hygiene practices are being emphasized to reduce the incidence of ear infections. There is increasing exploration of alternative and complementary therapies, including probiotics and herbal remedies, for managing ear infections and supporting the immune system. Surgical procedures like tympanostomy tube insertion (grommets) are considered for recurrent AOM, especially when associated with persistent middle ear effusion. Tympanostomy tube insertion, while a relatively modern surgical procedure was reintroduced in the mid-20th century has been practiced in India for several decades, its use becoming more widespread in recent times. The procedure is used to treat conditions like chronic ear infections and persistent fluid buildup in the middle ear. With advancements in medical technology and a greater understanding of ear diseases, the use of tympanostomy tubes has become more prevalent in India, mirroring global trends in the last decade. Efforts are being made to improve public awareness about ear infections, their causes, and appropriate management strategies, particularly in vulnerable populations. There's a growing recognition of the importance of understanding local antibiotic susceptibility patterns to guide treatment decisions for chronic suppurative otitis media (CSOM) in the last decade. Nanoparticle-based drug delivery systems are being investigated as a potential method to improve drug efficacy and reduce side effects in ear infection treatment [9].

3. Sinusitis: Sinusitis is a condition that occurs when the hollow cavities in the skull (surrounding the eyes and nose), called sinuses, become infected by bacteria or viruses or get inflamed due to allergies and other conditions. About 134 million Indians suffer from chronic sinusitis each year. Common symptoms include i) Nasal congestion and cough ii) Facial pain or pressure around the eyes or cheeks iii) Postnasal drip iv) Thick nasal discharge v) Pain when swallowing, vi) Fever vii) Severe headaches, viii) Difficulty breathing ix) foul breath x) Dizziness xi) Toothache. Persistence of any of these symptoms for more than 12 weeks indicate chronic sinusitis.

Sinusitis, particularly chronic rhinosinusitis (CRS), is a common condition in India, affecting a significant portion of the population. Estimates suggest that 1 in 8 Indians suffer from CRS, so it is more prevalent than chronic conditions like diabetes, asthma, or coronary heart disease. This prevalence translates to roughly 134 million people affected by chronic sinusitis in India. In a study of ENT patients attending OPD, Chronic rhinosinusitis (46.1%) was the most common type of rhinosinusitis, followed by Acute type (29.7%) [11]

Types of Sinus Surgery in India: Surgical treatment for sinusitis in India primarily involves Functional Endoscopic Sinus Surgery (FESS), balloon sinuplasty and Caldwell-Luc surgery being less common.

i) Antral wash: It was a minor surgical procedure even this author had undergone in 1965 involving a cannula insertion into the sinus through the nasal passage to drain and cleanse the area. Also known as antral lavage or irrigation, was a procedure to treat maxillary sinusitis by flushing out the maxillary sinus with a saline solution. Antral washouts were a common treatment in the 1960's & 70's. Procedure includes making a small puncture in the sinus wall, typically through the inferior meatus, to allow insertion of a cannula. Saline solution is then pumped into the sinus, dislodging & washing out mucus, pus, debris, and the infectious material, is drained out. It was

ii) aimed to relieve symptoms of sinusitis by clearing out the infection and promoting better drainage in Subacute and Chronic Maxillary Sinusitis cases. Antral washouts are an option for persistent sinusitis that doesn't respond to initial treatments of antibiotics and nasal steroids. It is also used to obtain samples for bacterial culture and antibiotic sensitivity testing, helping to identify the specific infection. Modern approaches like Functional Endoscopic Sinus Surgery (FESS) & balloon sinuplasty are favored for chronic sinusitis now a days [12].

iii) Functional Endoscopic Sinus Surgery (FESS): is a minimally invasive procedure performed to widen the sinus passages and improve drainage, often used for chronic sinusitis and sometimes for severe acute cases.

iv) Balloon Sinuplasty: This procedure uses a balloon catheter to dilate the sinus openings, improving drainage. It is less invasive than FESS but not suitable for all.

v) Caldwell-Luc Surgery: A more traditional approach involves accessing the maxillary sinus through an incision in the upper gum. It is less frequently used than FESS.

vi) Image-Guided Surgery: This technique utilizes advanced imaging to provide real-time guidance during surgery, potentially enhancing precision and safety.

vii) Turbinate Reduction Surgery: This procedure addresses enlarged turbinate's, which can contribute to nasal obstruction and sinusitis.

viii) Septoplasty: Correcting a deviated septum is sometimes performed in conjunction with sinus surgery to improve airflow and drainage

Trends in Treating Sinusitis in India: While in the initial stages general practitioners give i) Antibiotics (if suspected bacterial infection), Antihistamines and Pain relievers. Specilaists opt for Nasal decongestants or sprays, Topical nasal corticosteroids and Surgical antrum wash/ irrigation as a last option. Over the past six decades, the treatment of sinusitis in India has evolved from primarily relying on medical management with antibiotics and decongestants to incorporating advanced surgical techniques like Functional Endoscopic Sinus Surgery (FESS) and newer therapies such as biological treatments.

While medical management remains foundational, particularly for acute sinusitis, the understanding of chronic sinusitis has led to more targeted and minimally invasive surgical and pharmacological approaches. Here's a more detailed look at the trends:

Early Decades (60s-80s): Medical Management Dominated with the treatment primarily focused on symptom relief with broad-spectrum antibiotics (often), decongestants (oral and topical), and saline nasal rinses. Surgical options were more invasive and often reserved for severe cases or complications, such as orbital cellulitis.

Mid-Late 80s and 90s: CT imaging became more available, leading to better understanding of sinus anatomy & disease extent. Functional Endoscopic Sinus Surgery (FESS) emerged as a minimally invasive surgical technique, offering improved access to & visualization of the sinuses.

2000s and Beyond: More targeted topical medications, including corticosteroids and other anti-inflammatory agents, were developed and incorporated into treatment protocols. FESS techniques were further refined, with a greater emphasis on preserving healthy tissue and improving surgical outcomes. There was a growing understanding of the role of inflammation and mucociliary dysfunction in CRS, leading to the development of therapies targeting these pathways in the last decade. Biologic therapies, like targeting IL-5 for nasal polyps, are now available, offering new options for patients with severe or recalcitrant CRS. Balloon sinuplasty, a minimally invasive procedure that widens sinus openings with a balloon catheter, gained popularity as an alternative to traditional sinus surgery in the last decade. Management of complex cases, such as fungal sinusitis or orbital complications, increasingly involved a multidisciplinary approach, including otolaryngologists, ophthalmologists, and other specialists. Of late there's a move towards personalized treatment plans, considering individual patient factors, disease severity, & response to treatment. Increased awareness of sinusitis prevalence & impact on quality of life has led to greater patient engagement in treatment decisions.

Current Trend is emphasis on early diagnosis and treatment of both acute and chronic sinusitis to prevent complications and improve outcomes through appropriate antibiotic use reserved for bacterial sinusitis and their use is guided by culture and sensitivity results. Biologics and other advanced therapies are being integrated into treatment protocols for specific patient populations. National research continues to explore new diagnostic and therapeutic approaches for sinusitis, including targeted therapies and novel drug delivery methods.

4. Tonsillitis: Tonsilitis is an infection of the tonsils that causes severe throat pain. In Indian society, tonsillitis, is primarily caused by viral or bacterial infections. Viruses are the more common culprit include adenoviruses, influenza viruses, and Epstein-Barr virus (EBV). Streptococcus pyogenes (group A streptococcus) is a key bacterial cause, often leading to strep throat. Children are brought to a general practitioner or an ENT specialist with complaints of i) Sore throat ii) Difficulty swallowing iii) Swollen or enlarged tonsils iv) White or yellow patches on the tonsils v) Enlarged neck lymph glands vi) Fever and chills vii) Bad breath viii) Swelling of the face. Diagnosis is usually based on clinical presentation.

The epidemiology of Tonsillitis among the reported age groups, maximum tonsillitis cases are observed in the preteen age group (6-12 years) with 69% followed by teenage groups (13-18 years) 18%, children (4-5 years) 17%. The distribution of tonsillitis is more in males (58%) compared to female children. There's a notable increase in tonsillitis cases, especially in adults, linked to rising allergy rates and environmental pollution.

Treatment approaches include Rest and fluids, Pain relievers, Antibiotics (if bacterial infection suspected). Tonsillectomy in severe or recurrent cases. While it was once a very common procedure, particularly for recurrent throat infections in children, the number of tonsillectomies performed has declined. This shift is attributed to a better understanding of the tonsils' role in immunity and the development of more conservative treatment approaches for conditions like recurrent tonsillitis. However, tonsillectomy remains a relevant procedure for severe obstructive sleep apnea, peritonsillar abscess, & cases of recurrent infections when other treatments fail.

Trends in managing Tonsillitis in India: Over the last six decades, managing tonsillitis in India has seen a shift from primarily surgical interventions like tonsillectomy to a greater emphasis on medical management, through antibiotic therapy, with a focus on reducing surgeries. Better understanding of the antibiotic resistance & tailoring treatment to the cause specific tonsillitis, including potential involvement of the beta-lactamase-producing bacteria.

Early Decades (1960s-1980s): Tonsillectomy was common for recurrent tonsillitis, in children, either to avoid recurrent infections or obstructive symptoms. Limited knowledge of microbial flora and for want of their drug sensitivity tests in Tonsillitis, treatment decisions were less targeted and led to antibiotic resistance. *Ayurvedic practices, like Pratisarana and Kavala, were part of the treatment landscape for chronic tonsillitis.*

1990s - 2010s: Advancements in antibiotic therapy, complimented by the documented risks of Tonsillectomy led to a shift towards medical management as a primary approach. In the late 1990's the role of Group A Beta-Hemolytic Streptococcus (GABHS) & the emergence of penicillin resistance, due to beta-lactamase-producing bacteria (Staphylococcus aureus & Hemophilus influenza), shifted the focus to culture the specific pathogens causing tonsillitis & guide appropriate antibiotic selection. Tonsillectomy was reserved for cases where medical management failed or for severe obstructive symptoms even though Tonsillitis cases increased, laying emphasis on conservative management even by the general practitioners.

Recent Trends (2010s - Present): The rise in allergies and tonsillitis among adults, possibly linked to pollution & construction work, led to a growing recognition of the root causes of tonsillitis, including industrial, traffic & environmental pollution, in urban areas. Current approaches are in favor of a combination of antibiotics, pain relievers, supportive care, and a focus on preventing complications, recurrence and optimizing the use of both medical and surgical interventions.

The use of Ayurvedic medications Kanchnara Guggulu &Tankana-Madhu, for chronic tonsillitis, are being used with mixed outcomes.

5. Allergic Rhinitis: Allergic rhinitis, also called hay fever, is an allergic reaction caused by allergens- tiny particles in the air such as dust, pollen, mold, insects, or pet dander. Approximately a quarter of adolescents in India suffer from allergic rhinitis. It involves inflammation of the inside of the nose. Cases reports with symptoms of Sneezing, Runny or stuffy nose, Itchy or watery eyes, Tiredness, Sore throat, Sinus pressure and headaches, Nasal congestion, Fatigue, Coughing or trouble breathing. These cases are generally managed by i) Allergy medications (antihistamines, decongestants), ii) Nasal sprays (corticosteroids) iii) Leukotriene inhibitors iv) Immunotherapy (allergy shots)

Trends in Allergic Rhinitis (AR) treatment in India: Managing allergic rhinitis (AR) in India has also seen a shift from symptomatic treatment to a more comprehensive approach including allergen avoidance, pharmacotherapy, and immunotherapy. In the late160's when this author entered the profession, AR was often considered a minor ailment, just like cold with most people making a statement of *"Treated cold lasts one week and untreated cold lasts for 7 days."*

Early Decades (60s-80s): Allergic rhinitis was often not recognized as a significant health issue, considered as common cold linked to cold wind or getting wet in rains or being in water for long, patients often self-treated or did not seek professional help. Management primarily focused on relieving symptoms, in each attack due to limited access to allergy testing.

Mid Decades (90s - early 2000s): International Study of Asthma and Allergies in Childhood (ISAAC) brought attention to the increasing prevalence of allergic diseases, including AR, among children and adolescents. Use of first-generation antihistamines - diphenhydramine & chlorpheniramine became common, despite their sedative effects. Emergence of Second-Generation Antihistamines patented & introduced in 1983 but became widely available in India by the early 1990s. loratadine, & fexofenadine became available in India around the same time. Intranasal Corticosteroids, a more prominent treatment option for nasal congestion, sneezing, and rhinorrhea entered Indian markets in late 1990's.

Recent Trends (2010s - Present): *P*revalence of AR in India, increased due to environmental and lifestyle changes and the focus directed towards Allergen Avoidance, especially respiratory allergens like Parthenium, dust mites, pollen, and mold.

Current management includes the use of modern antihistamines, intranasal corticosteroids, and leukotriene receptor antagonists (LTRAs) and Allergen-specific immunotherapy as a disease-modifying treatment option for patients who don't respond adequately to medications. Despite advancements, challenges remain in diagnosis, particularly in rural areas, and in ensuring access to allergen testing and disease modification strategies like immunotherapy to alter the underlying immune response to allergens.

6. Sleep Apnea: This is a serious sleep disorder in which the cessation of breathing happens while a person is asleep. These breaks last a few seconds to a few minutes and may occur multiple times, during a night. Sleep apnea disrupts normal sleep patterns and can lead to various health complications if left untreated. This condition affects both adults & children [15].

Cases approach general practitioners with complaints of i) Gasping or choking sensations during sleep ii) Loud and persistent snoring complaints by spouse or others sleeping in the same room, iii) Excessive daytime sleepiness iv) Morning headaches v) Difficulty concentrating or memory

vi) Irritability or mood swings vii) Feeling exhausted in the morning viii) Dry mouth or sore throat upon waking ix) Pauses in breathing while asleep witnessed and informed by others x) Insomnia or difficulty staying asleep due to awakening abruptly with shortness of breath.

Treatment involves Lifestyle modifications, Oral Appliances, Mandibular Advancement Devices (MADs), Continuous Positive Airway Pressure (CPAP) Therapy and Surgery. Inspirational Therapy, Cognitive Behavioral Therapy (CBT)

Trends in treatment of Sleep Apnea in India: Sleep apnea and its management was not in the syllabus or hospital exposure sessions in this authors Medical College days. Beginning with Nathaniel Kleitman's seminal research in the 20th century and Eugene Aserinsky's discovery of rapid eye movement (REM) sleep, the discipline has progressed through significant milestones. Henri Gastaut's identification of obstructive sleep apnea (OSA) and the development of polysomnography (PSG) progressed to modern advancements of innovative diagnostic tools such as home sleep apnea testing (HSAT) and peripheral arterial tonometry (PAT) as well as groundbreaking therapeutic options like positive airway pressure (PAP) devices, oral appliances, and pharmacological treatments. Beyond OSA, the field has expanded to address diverse sleep disorders, including insomnia, parasomnias, restless legs syndrome (RLS), narcolepsy, and rare conditions such as Kleine–Levin syndrome (KLS). Emerging technologies, such as artificial intelligence (AI), telemedicine, and genomic research promise a future of precision & accessibility. Identification of it as clinical domain & treatment practices with basic interventions started in early 1990's in AIIMS New Delhi and select Government medical colleges in cities Mumbai, Bengaluru, Chennai, Hyderabad, Kolkata etc., thereafter. Initially, treatment options were limited, but with increased research and understanding of the condition, therapies like CPAP, oral appliances, and even surgical interventions are now available [15].

Early Stages (1960s-1980s): Sleep apnea was not widely recognized or diagnosed in India. Tracheotomy was one of the early interventions, for severe cases. There were no specialized sleep clinics or diagnostic facilities.

(1990s-2010s) Era of Increasing Awareness and Diagnosis: Research and publications began to shed light on the prevalence and impact of sleep apnea, while Polysomnography (sleep studies) became accessible, allowing for more accurate diagnosis of sleep apnea severity. Continuous Positive Airway Pressure (CPAP) machines emerged as a primary treatment for obstructive sleep apnea (OSA). Still the focus was on sleep apnea among obesity and aged high-risk individuals.

2010s-Present: Innovations in CPAP and BiPAP devices enhanced patient comfort and compliance. Oral appliances, such as mandibular repositioning devices, became an alternative for patients with mild-moderate OSA or those intolerant to CPAP. Surgical options, like upper airway stimulation and hypoglossal nerve stimulation, gained traction for specific cases. Weight loss through lifestyle changes or bariatric surgery was recognized as an important factor in managing OSA. Studies indicated a rise in the prevalence of OSA, possibly due to increased awareness, aging population, and obesity. Indian Council of Medical Research (ICMR) & AIIMS New Delhi conducted studies and published guidelines based on research and prevalence in India since early 2010's. Sleep apnea's recognition as a public health problem in India, alongside the initiation of interventions, is a relatively recent development, with formal guidelines emerging in 2014. While awareness of the condition is still growing, there have been efforts to address it, particularly in the context of related health issues like obesity, hypertension, and daytime sleepiness. Studies indicate that a large percentage of the Indian population is affected by OSA, and insomnia rates range from 13.8% to 33.0%. The COVID-19 pandemic impacted sleep medicine practices, with a shift towards telemedicine and home sleep apnea testing. In 2023, a mask-free surgical implant that stimulates the upper airway was approved and in India sleep apnea devices market is also expected to grow significantly in the coming years.

There are ongoing efforts to address sleep apnea in India. A study published in Sleep Medicine Reviews highlights the large number of Indians potentially affected by OSA, emphasizing the need for more comprehensive healthcare. A recent study also suggests that a significant portion of police officers in Kerala may have OSA

Modern advancements include innovative diagnostic tools such as home sleep apnea testing (HSAT) and peripheral arterial tonometry (PAT) as well as groundbreaking therapeutic options like positive airway pressure (PAP) devices, oral appliances, and pharmacological treatments. Beyond OSA, the field has expanded to address diverse sleep disorders, including insomnia, parasomnias, restless legs syndrome (RLS), narcolepsy, and rare conditions such as Kleine–Levin syndrome (KLS). Emerging technologies, such as artificial intelligence (AI), telemedicine, and genomic research promise a future of precision and accessibility. This review highlights the indispensable role of interdisciplinary collaboration and innovation in shaping the ongoing evolution of sleep medicine.

Conclusion:

Despite India's improving health indices, hearing disability remains persistently high. It is a major contributor to the loss of personal potential & a financial strain on individuals & country.

Limited efforts of assessing ear functions in neonatal period are another factor needing national attention and persistent ear infections are leading to hearing loss burden. A large-scale multicentric study to identify the degree and type of HL, widespread neonatal screening, strengthening treatment facilities, well-funded rehabilitation programs & social awareness campaigns to counter the rising prevalence of hearing impairment is the need of the time.

Allergic Rhinitis and sinusitis too need due attention at PHC level with referral link.

Sleep apnea's recognition as a public health problem in India, in 2014, with initiation of interventions, through formal guidelines needs to expand fast to reach rural area.

Overall early diagnosis & proper treatment are essential for recovery & long-term relief

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