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# Pediatric and Geriatric Tinnitus

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**Abstract:** The subject of tinnitus in the population extremes—children and the elderly—is ignored by the literature, probably because children do not complain of tinnitus spontaneously, whereas it is only one challenge among other major health problems in the elderly. A short review of the literature on this subject is presented. Presbytinnitus, defined as tinnitus that accompanies the progressive hearing loss of presbycusis is classified as: type I (normal aging affecting the cochlea), and type II (preexistent sensorineural hearing loss accompanied by multiple systemic complaints, especially of sensory ones). The incidence of tinnitus in presbycusis is 11%. Like in other age groups, there is no significant gender predilection in the prevalence of tinnitus, but a correlation was demonstrated between the severity of tinnitus and exposure to noise. Hypertension was associated with a lower incidence of tinnitus, as compared to normotension and hypotension. Several treatment modalities of geriatric tinnitus are reviewed: the superiority of the band-noise masker in patients with presbycusis, as compared to electrical promontory stimulation; amino-oxyacetic in presbycusis and Meniere's disease; zinc supplementation in marginally zinc-deficient elderly patients in improving sensorineural hearing loss and tinnitus; aeration of the middle ear in presbycusis caused by secretory otitis media. Pediatric tinnitus has an incidence of 13% in children who passed an audiometric screening test, and 23–60% in those with hearing loss, 44% in secretory otitis media, but only 3% complain spontaneously because that the child considers tinnitus to be a normal event. There is no significant difference between children with tinnitus and those without in terms of hearing level, age, gender, or etiology of the deafness. Despite the fact that often children do not mention it, tinnitus may incite behavioral problems.

**Keywords:** Children, elderly, tinnitus, presbytinnitus, presbycusis, sensorineural hearing loss, band-noise masker, electrical promontory stimulation, amino-oxyacetic, zinc, secretory otitis media, Meniere's disease, behavior, hypertension, hypotension.

Complaints of tinnitus in the population extremes—children and the elderly—have much in common, but some different characteristics also are noted. Although this severe problem is not rare, the otolaryngological literature ignores tinnitus in both age groups. We assume that the literature neglects tinnitus in children and the elderly because children, generally, do not complain of tinnitus spontaneously and because among old patients, tinnitus is only one (and frequently a lesser) challenge among other major health problems.

Most legal problems related to tinnitus involve the middle-age population, which is more exposed to hazard-

ous industrial noise. This is an additional reason that the otolaryngological literature focuses on tinnitus not in children and the elderly but in the middle-aged population.

Despite the relative unawareness of geriatric and pediatric tinnitus, this condition is a very disturbing symptom with unwanted sequelae in these two populations.

## PRESBYTINNITUS

C.F. Claussen [22], introduced the concept of *presbytinnitus* tinnitus that accompanies the progressive hearing loss of presbycusis. Presbytinnitus, like presbycusis, is produced by either a peripheral or central pathological process in the auditory pathway. It begins between the ages of 45 and 55 and peaks in one's mid-sixties. Presbytinnitus is described as being of variable intensity

and duration and as fluctuating. The medical-audiological tinnitus patient protocol (MATPP) identifies types of presbycusis: Type I (the minority group) represents the normal aging effects on the cochlea, whereas type II (the majority group) is characterized by preexistent sensorineural hearing loss accompanied by multiple systemic complaints, particularly involving other sensory systems [1].

From the major epidemiological studies of the adult population with tinnitus reported by Coles [2], Singer et al [3], and Chung et al [4], we know that the prevalence of tinnitus increases with age, and there is no gender predilection (10–17% in male persons and 11–18% in female persons). The hearing threshold is considered the most important factor affecting the prevalence of tinnitus.

Rosenhall and Karlsson [5] investigated 74 people aged 70 to 80 who were suffering from tinnitus. As in the previously cited studies, these researchers did not find significant differences between men and women regarding the prevalence of tinnitus. A significant correlation was demonstrated, however, between the severity of tinnitus and exposure to noise.

Nagel and Drexel [6] investigated a group of 270 patients with presbycusis and found that the incidence of tinnitus was 11%. Hypertension was associated with a lower incidence of tinnitus, as compared to normotension and hypotension.

Auditory hallucinations are an interesting form of tinnitus described in the elderly. Sometimes, these are ascribed to psychiatric illness, but this phenomenon has also been observed in the mentally healthy. Klostermann et al [7] gathered 26 cases from the literature, supplemented by 6 new cases from their own observations, including the first description of 2 cases in a single family. All these patients were hard of hearing or deaf.

Berrios [8] described musical hallucinations in 46 patients and found that these are more common in women and that their onset often is related to ear pathology, particularly deafness. Psychosis and personality traits play a minimal role in the development of musical hallucinations.

Tinnitus seldom is recorded in the clinical database of the elderly, despite the fact that next to hearing loss, tinnitus is the most commonly reported ear problem by the elderly population. Many times, the elderly person worries that the tinnitus is a sign of an impending crisis such as stroke, brain tumor, or insanity. This severe, unreasonable fear must be reduced by discussion and explanation.

## TREATMENT OF GERIATRIC TINNITUS

In a recent study, Ohkawara and Watanabe [9] investigated two treatment modalities: electrical promontory

stimulation and the band-noise masker. The masker was more effective in the patients with presbycusis.

In a study of the working population aged 50–65 years, Stephens et al [10] reported that tinnitus in a patient with hearing loss increased that individual's acceptance of a hearing aid. This might be attributable to the masking effect of the hearing aid.

Guth et al [11] reported that amino-oxyacetic acid given to 66 patients with cochlear tinnitus was most effective in reducing the severity of tinnitus in patients with presbycusis and Meniere's disease. However, this treatment cannot be used clinically because of its severe side effects, such as nausea and disequilibrium.

Zinc deficiency is known to be a contributing factor in cochlear damage. A study conducted by Shambaugh [12] found that tinnitus diminished and the sensorineural hearing loss improved on zinc supplementation in nearly one-third of marginally zinc-deficient elderly patients. It is believed that zinc deficiency is one cause of presbycusis [12]. However, no beneficial effect of zinc supplementation on tinnitus was proven in tinnitus patients with euzincemia [13].

Zikk et al [14] described the precipitation of a clinical picture of sudden hearing loss, tinnitus, and vertigo in elderly subjects with presbycusis by superimposed serous otitis media. Therefore, much attention must be paid to the state of the Eustachian tubes and aeration of the middle ear in these patients. This type of pathological process is much easier to treat than tinnitus at other etiologies [14].

## TINNITUS IN CHILDREN

Nodar [15] found in his 11-year review a 13% incidence of tinnitus in children who passed an audiometric screening test and a 59% incidence among those who suffered from hearing loss. Only 3% complained spontaneously of tinnitus. The survey included 2,000 children [15]. This discrepancy between the high incidence of tinnitus and the low rate of spontaneous complaint in children may be accounted for by the fact that the child considers tinnitus to be a normal event, as it usually has been present for a long time before it is discovered. Another explanation lies in the child's inability to distinguish the psychological impact of the tinnitus from its medical significance [16].

Graham [17] reported that 64% of children with moderately severe hearing loss were found to have tinnitus. Thirty percent had a very disturbing tinnitus.

Mills and Cherry [18] reported that 43.9% of children they studied complained of tinnitus in a group of 66 children with secretory otitis media, whereas among 44 children with sensorineural hearing loss, the incidence of tinnitus was 29.9%.

Viani [19] claimed that the scant literature relating to tinnitus in children may be due in part to the inability of the child to differentiate normal from abnormal hearing. There is also miscommunication between the adults and children regarding the description of the child's symptoms. Of 102 children with severe to profound hearing loss 23% reported tinnitus. No significant difference was found between those with tinnitus and those without in terms of hearing level, age, gender, or etiology of the deafness.

Ben-David et al [20] described the interesting case of a child with severe tinnitus after head trauma. The child did not complain spontaneously; nevertheless, the complaint of tinnitus was detected unintentionally via an investigation of the child's strange behavior. The authors emphasized the importance of head trauma as an etiological factor in tinnitus in children [20].

Graham and Butler [21] stressed that despite the fact that often children do not mention this bothersome buzzing or ringing, tinnitus may cause difficulties in concentration and incite behavioral problems.

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