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Research Paper: Hearing Impairment and Hearing Aid Usage in the Elderly of Northern Iran's Rural Areas: A Field Study

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ABSTRACT

Background: Hearing impairment is the most common otolaryngologic manifestation of aging.

Objectives: Few studies have focused on Hearing Loss (HL) in the Iranian "normal" elderly population. This study aimed to evaluate audiological problems in the normal elderly people of the rural areas of Rasht City in the north of Iran.

Materials & Methods: This cross-sectional study was conducted in 2014. The elderly population was selected using the multistage random cluster sampling technique. The study participants were invited for otolaryngologic examination and recording Pure Tone Audiometry (PTA).

Results: Of 412 elderly subjects over 65 years (52.8% male, 47.2% female, Mean±SD age: 73.5±6.99 years), 137 (33.2%) participants complained of HL, and only 1.2% were hearing aid users. Of the 324 cases that underwent audiological testing, sensorineural HL (SNHL) was detected in 290 (89.5%), conductive HL in 13 (4.01%), mixed HL in one (0.3%), and normal hearing in 20 (6.17%) cases. SNHL was mild in 173 (59.65%), moderate in 90 (31.0%), and severe to profound in 27 (9.31%) subjects. High-frequency SNHL was observed in 247 (76.23%), flat HL in 53 (16.35%), and low-frequency HL in 4 (1.23%) cases. Clinically, almost 23% (audiologically 40%) of the explored elders presented significant HL needing rehabilitation; however, only one in 19 used hearing aids. The SNHL was more frequent in men than women (53.2% vs. 46.8%; P=0.023). Diabetes mellitus did not significantly correlate with SNHL.

Conclusion: This study indicated a high frequency of hearing impairment with minimal ENT consultation and hearing aids among the elderly population in the study area.

Keywords: Hearing loss, Hearing aid, Rural population

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Highlights

● This is the first methodological field study on northern Iran's representative "normal" elderly population. This research found that a noticeable fraction of our population has a hearing impairment, both clinically and audiologically; just a fraction of these cases use hearing aids.

Introduction

Age distribution has dramatically changed during the twentieth century worldwide. According to the World Health Organization (WHO) reports, in 2021, from 2015 to 2050, the proportion of the world's population over 60 years of age will approximately double from 12% to nearly 22%. It is estimated that in 2050, 80% of older people will be living in low- and middle-income countries [1].

In the census in Iran, the remarkable increase in the number of aged people (>60 years old) was found from 7.22% in 2006 to 8.20% in 2011 [2].

Sensory impairments, including visual, somato-sensory, and auditory impairment, cause substantial problems for older people. One out of four Americans is reported to have impaired hearing. In older adults, hearing and vision impairments may be presented by particular challenges to families and caregivers. Approximately 70% of old Americans with Hearing Loss (HL) in at least one ear could potentially benefit from using a hearing aid; however, they do not use one [3].

HL is the most widespread sensory impairment among the aged population. Hearing acuity declines with age. This process physiologically begins by the third decade of life, predominately in the high frequencies. Age-Related Hearing Loss (ARHL) or presbyacusis is a hearing disorder related to the functional loss of sensory and neural elements [4]. Regardless of pathophysiology and types, HL may cause destructive consequences according to the severity of the problem or person's occupational and living conditions. Noticeable impairment is a blockage in the interpersonal communication pathway, which leads to a devastating sequel, such as social isolation, depression, and propensity to accidents. Retaining the elderly as a functional part of society is morally and economically significant. Early diagnosis and reasonable management at the proper time help decrease the burden of the disorder.

Few studies have focused on HL in the Iranian elderly population. Besides, most of the available studies are criticized for being confined to nursing home residents [5, 6]; thus, they fail to represent the general elderly population. Furthermore, the growth rate of the elderly population in Iran is increasing. Regarding the lack of comprehensive studies about the prevalence of hearing disorders in the Iranian elderly, we conducted this field study on the selected area.

Materials and Methods

The data were derived from the population-based cross-sectional study conducted among the elderly in the rural area of Guilan Province, northern district of Iran, in 2014. According to Jalilvand et al. [6], the sample size was estimated to be 185; regarding cluster sampling and design effect, it was multiplied by 2.5; therefore, 465 patients were considered to enter this study.

The study participants were selected by multistage cluster random sampling method. Initially, 35 villages under the supervision of rural health centers were selected by systematic randomization technique. Then, the number of old aged people in every village was divided by the total elderly population of rural areas. Next, we multiplied the result by 462. Finally, the participating elderly were randomly selected by household lists. After obtaining informed consent forms from the study participants, demographic data collection and physical examination were conducted and recorded by general practitioners in healthcare centers. Furthermore, a more precise physical analysis was performed by otolaryngologists, and a pure tone audiometric assessment was conducted by an audiologist using a portable Belton 110 device. In this study, the cases who failed to follow the instructions were excluded.

HL was classified as sensory neural, conductive, and mixed-type, based on audiometric features of air and bone conduction.

The degree of HL was classified based on hearing thresholds, as normal: 0-25 dB, mild: 25-40 dB, moderate and moderately severe: 40-70 dB, severe: 70-90 dB, and profound: >90 dB. In assessing the pattern of HL, high-frequency loss reflects the loss in frequencies 3-8 kHz [7].

In this study, we classified the sample as follows: 60-69, 70-79, 80-89, and ≥90 years old age groups. The obtained data were analyzed in SPSS using t-test and Chi-squared test, mean and standard deviation (for descriptive data) at the significance level of P<0.05.

Results

Of 239346 habitants in 338 villages of rural areas related to the Rasht metropolitan City (the capital of Guilan Province in the north of Iran), 31704(13.2%) subjects were more than 65 years old. After sampling, 413 elderly subjects were randomly enrolled in the study (Mean+SD age: 73.43+7.04 years). Furthermore, 218(52.8%) cases were male, and 195(47.2%) were female. The prevalence of associated diseases was as follows: 71(17.2) patients had diabetes, 203(49.2%) were hypertensive, 92(22.3%) subjects reported a history of cardiovascular diseases, and 93(22.5%) participants reported dyslipidemia.

Pure tone audiometry was performed in 324 participants. Of these, 304(93.8%) cases presented hearing impairments in their audiometric tests, most commonly sensorineural HL (Table 1).

Most of the sensorineural cases had "bilateral," "high frequency" SNHL, with "mild" severity (i.e., averaged frequency thresholds between 25-40 dB). Indeed, among 290 elder adults with Sensorineural Hearing Loss (SNHL) in pure tone audiometry, 173(59.65%) cases had mild hearing loss, 90(31.0%) subjects had moderate hearing loss, and 27(9.31%) subjects had severe to profound hearing loss. In other words, more than 40% of the subjects had "moderate to severe" and "severe" intensities of HL in their audiometry evaluation, indicating some rehabilitative interventions. The most common pattern of SNHL was a high-frequency loss, i.e., observed in 247(76.23%) cases (Table 2).

Of all cases with HL in pure tone audiometry, 53.2% were male, and 46.8% were female. There was a significant gender-wise difference in the frequency of SNHL. There was a male predilection for hearing impairment (P=0.023). However, the difference in the prevalence of HL was not significant among age groups (P>0.05). Additionally, the majority of HL in diabetic patients was 56 of 71. Compared to the prevalence of HL in the elderly without a history of diabetes, data analysis re-

Table 1. The type of hearing loss in the examined elderly

The Type of Hearing Loss	No. (%)
Sensorineural hearing loss	290(89.5)
Conductive hearing loss	13(4)
Mixed HL	1(0.3)
Normal	20(6.2)
Total	324(100)

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Table 2. The patterns of hearing loss in the explored elderly

The Pattern of Hearing Loss	No. (%)
High-frequency loss	247(76.23)
Flat	53(16.35)
Low-frequency loss	4(1.23)
Total	304(100)

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vealed no significant relationship between diabetes and HL (P>0.05).

Self-Reported HL was detected in 137(33.2%) cases, i.e., mild in 10.2% of cases and bilateral in 80.3%; however, only 1.2% of the study participants used hearing aids. Indeed, almost 23% of the elderly population declared significant HL; however, only one in 19 used hearing aids. Twenty-five percent of the research participants complained of chronic non-pulsatile tinnitus, i.e., bilateral and unilateral, in 58(14%) and 47(11.4%) cases, respectively. Our study subjects had no significant differences between tinnitus and gender or age groups.

Moreover, 15(12.1%) subjects had a history of significant otalgia in the past 6 months, and one had a history of radical mastoidectomy. In physical examinations, 5(1.2%) subjects had active otorrhea, and 10(2.4%) presented tympanic membrane perforation. Cerumen impaction was detected in 110(26.6%) subjects.

Discussion

The current study investigated the frequency of HL in the old-aged population of rural areas of northern Iran. This field study was the first to be performed on a "normal" elderly general population of Iran; all study participants were randomly selected via a correct methodological sampling.

According to the present research results, more than 40% of the study subjects had "moderate to severe" and "severe" intensities of HL in their audiometry, requiring some rehabilitative and assistive intervention. Additionally, "clinically," almost 23% of the elderly population had significant HL; however, only one in 19 used hearing aids. In a systematic review in Europe, roughly 30% of men and 20% of women were found to have a hearing loss of 30 dB HL or more by the age of 70 years, and 55% of men and 45% of women by the age of 80 years [4, 8]. Similar studies in the UK and the USA had reported HL of almost 23%, 56.9%, and 63.1% in the old population [9-11]. The differences in the prevalence of hearing loss among different studies seem to be due to the heterogeneity of measures and cut-off points for the severity of hearing impairment, the definition of old age groups, accessibility to the health system, and socioeconomic characteristics. Furthermore, occupational exposures, such as noise-induced hearing loss without preventive measures, the general population's low auditory hygienic information, and predisposing genetic factors, i.e., variably distributed among different population groups, should be considered.

Surprisingly, only 5.2% of our necessitous elders used hearing aids, i.e., very low. Notably, many of elders with "significant" HL declared no complaint because they have a fair hearing in two-person dialogues; however, they are unaware that they have real difficulties with hearing in "crowding parties" and "noisy" environments. In a previous study in the UK, more than half of the individuals with hearing problems owned no hearing aid, and only 60% of those who applied a hearing aid used it regularly [9]. Due to another study, hearing aids were used in 40.0% of adults with moderate hearing loss but only 3.4% of those with mild hearing loss [5]. It was predicted that approximately 70% of older Americans with HL in at least one ear could potentially benefit from using a hearing aid; however, they did not use one [3]. A study in Iran revealed that 21.2% of the elderly required hearing aids; however, t only a few patients wore one [6]. Cost, difficulty in usage, and cultural beliefs may be barriers to such a meager rate of hearing aid usage and poor compliance in the examined older subjects.

Our study found no differences between hearing loss among the elderly age sub-groups, i.e., in contrast with some other studies [3, 10, 11]. Generally, the prevalence of HL is expected to increase with aging; however, exposure to risk factors is significantly effective.

In this study, gender disparity was detected in HL, i.e., in concordance with other studies which suggested that men were more likely than women to have a hearing impairment; it may be due to protective effects of estrogen hormone in women [12, 13]. Furthermore, compared with the prevalence of HL in the elderly without a history of diabetes, data analysis revealed no significant relationship between diabetes and HL in our subjects (P>0.05). This is, to some extent, congruent with some studies [14, 15]; however, in contrast with other investigations [16].

In pure-tone audiometry, 76.23% of the study participants had high-frequency hearing loss (down-sloping pattern), 16.35% flat, and 1.23% had low-frequency hearing loss, similar to the results of Barozzi, who reported the majority of the HL of the participants as down-sloping and flat [17].

To our knowledge, aging has significant impacts on hearing and vestibular function of the ear, involving a substantial fraction of the elderly population with diseases and problems such as BPPV and other types of vertigo and dizziness, falling, tinnitus, and related adverse drug reactions [18-21]. With rising proportion of elderly population in countries, including Iran, more precisely man-

aging these problems is of utmost importance, especially hearing deficits that is very common and meanwhile reducing the quality of life of this noticeable fraction of population ,which pushes them toward sequestered life; however, "underestimation" both from the perspective of elders and health care system would have huge effects on quality of life this part of society. Therefore, with the increasing growth of the elderly population, the integration of HL screening programs in this age group at primary healthcare levels seems reasonable.

Conclusion

The prevalence of HL in the elderly population of northern Iran is noticeable; however, using assistive and rehabilitative devices (i.e., hearing aids) is very low and much lower than in other parts of the world. Increasing the awareness of our elderly population about their hearing difficulties and using hearing aids, and increasing insurance coverage for this population group is highly recommended. More investigation on HL and the associated effects on quality of life is recommended for future studies.

Ethical Considerations

Compliance with ethical guidelines

All study procedures complied with the Declaration of Helsinki 2013's ethical guidelines. The Research Committee of Guilan University of Medical Sciences approved it by the register number of 676.

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Authors contributions

Conceptualization: Shadman Nemati, Alia Saberi, Mirmohammad Jalali, Hooshang Gerami, Zahra Karimi, Ehsan Kazemnezhad Leyli; Supervision [Shadman Nemati, Mirmohammad Jalali, Hooshang Gerami; Methodology: Shadman Nemati, Alia Saberi, Mirmohammad Jalali, Hooshang Gerami, Zahra Karimi, Ehsan Kazemnezhad Leyli; Investigation: Shadman Nemati, Alia Saberi, Mirmohammad Jalali, Zahra Karimi, Arsalan Dadashi; Writing – Original Draft: Shadman Nemati, Zahra Karimi, Sevil Nasirmohtaram, Zahra Mohtasham-Amiri; Writing – Review & Editing: Shadman Nemati, Alia Saberi, Zahra Karimi, Sevil Nasirmohtaram, Zahra Mohtasham- Amiri,; Funding Acquisition: Shadman Nemati, Zahra Karimi, Arsalan Dadashi; Resources: Shadman Nemati, Zahra Karimi, Arsalan Dadashi.

Conflict of interest

The authors reported no conflicts of interest.

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