Relationship between hearing thresholds, handicap and the time taken to seek treatment for hearing loss

Relação entre limiares audiométricos, handicap e tempo para procura de tratamento da deficiência auditiva

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ABSTRACT

Purpose: To investigate the relationship between audiometric thresholds, self-perception of handicap, and time taken to seek treatment in patients treated at a public health care service. **Methods:** This retrospective study analyzed the records of 152 elderly and 48 adult patients with hearing impairment. The mean ISO audiometric thresholds (500 Hz to 4 kHz) and the mean high frequencies thresholds (2 to 6 kHz), the speech recognition thresholds, and the total, social and emotional scores from the Hearing Handicap Inventory for the Adults (HHIA) and Elderly (HHIE) were compared with the time elapsed from the onset of hearing complaints and the treatment seeking. **Results:** The mean time for seeking treatment was 7.6 years. No difference was found between adults and elderly for ISO and high frequency mean thresholds, HHIA/E scores, and time for treatment seeking. Weak but significant negative correlations were observed between auditory thresholds and time taken for treatment seeking. No relationship was found between the time taken for treatment seeking and the variables related to educational and socioeconomic levels and perception of handicap. **Conclusion:** Search for treatment seems to be influenced by auditory thresholds. Despite technological advances and changes in the access to information and treatment, the time taken for treatment seeking was similar to that reported 30 years ago.

Keywords: Auditory threshold; Hearing loss; Hearing impaired persons; Questionnaires; Audiology

INTRODUÇÃO

The major adverse consequences of hearing impairment in social, emotional, cognitive, behavioral and economic aspects and the quality of life of an individual are well documented in the literature. Adults with hearing disabilities have reported feelings of inadequacy in the interactions of everyday life or the feeling that they are "different", prematurely older or disabled[1]. Hence, they may present restricted participation or handicap, which indicates difficulty in adapting to the environment, resulting from the hearing and performance problems of functional experiences[2].

In Brazil, it is estimated that 6.8% of the population has a disabling hearing loss[3] and needs some sort of treatment. The service for the hearing impaired was incorporated by the National Health System (SUS) in recent decades. In 2004, the Ministry of Health launched the National Policy of Hearing Health Care, providing comprehensive care with shares in primary care (the gateway system), secondary and tertiary care. These three levels work together in a network of service, reference and counter reference. In recent years, the SUS was responsible for 60% of hearing aid fittings (HA)[4]. This device is the most common rehabilitation alternative for sensorineural hearing loss, providing proven benefit and improved quality of life for affected individuals[5].

In Brazil, hearing screening programs, on a large scale for adults and older people, are still restricted. In addition, hearing loss is one of the health problems not identified in routine medical examinations for this population[6,7]. Thus, in most cases it is necessary that the individuals, by themselves, recognize the existence of the hearing problem and seek treatment.

Despite the existence of successful alternatives for the treatment of sensorineural hearing loss, it is reported that the time between the onset of hearing difficulties and the search for treatment, is on average, eight years[8]. The severity and the time of the onset of hearing loss, the difficulty experienced in everyday situations and the perception of handicap are some factors that influence the decision to seek treatment[6,9-11].

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Considering the consequences of untreated hearing loss and the existence of public hearing healthcare services, the aim of this study was to investigate the relationship between the audiometric thresholds, self-perception of handicap and the time to seek treatment for patients seen at a public hearing health service facility.

METHODS

This is a retrospective study conducted at the Speech-Language Pathology and Audiology Clinic of the Bauru School of Dentistry – Universidade de São Paulo (FOB-USP). The project was approved by the Research Ethics Committee of FOB-USP, under the number 104/2010.

Participants

The medical records of patients enrolled in the Speech-Language Pathology and Audiology Clinic for the period between 2004 and 2009 were analyzed; the first 200 cases that met the following criteria were selected: to be over the age of 18 years; to present bilateral sensorineural hearing loss of any degree, congenital or acquired; to not have received previous treatment at another audiology facility (public or private); and to have the fulfilled Hearing Handicap Inventory for Adults (HHIA) or Elderly (HHIE) before hearing aid fitting. Considered were cases of sensorineural hearing loss: lack of anatomical and functional changes in the external and/or middle ear, according to the otorhinolaryngological assessment and tympanometry results; pure-tone bone-conduction auditory thresholds greater than or equal to 25 dB HL; air/bone gap no greater than 10 dB; speech audiometry results consistent with pure-tone audiometry; and the values of the difference between hearing thresholds and acoustic reflex thresholds not exhibiting decrutement.

Included was data from 200 individuals, consisting of 96 men (48%) and 104 women (52%), aged between 24 and 92 years old (mean of 67.23 years of age, SD=15.5). Of these, 48 (24%) were adults aged 24-59 years old (mean of 44.7 years of age, SD=10.6) and 152 (76%) were elderly, aged between 60 and 96 years old (mean of 74.3 years of age, SD=8.5). Considered were only elderly individuals aged 60 years or more.

Participants had bilateral symmetrical (n=166, 83%) or asymmetrical (n=34, 17%) sensorineural hearing loss. The mean pure tone average at 500 Hz to 4 kHz in the better ear ranged from 22.5 to 96.25 dB HL (mean of 50.58 dB HL, SD=12.32). The mean and standard deviation of air conduction hearing thresholds at frequencies of 250 Hz to 8 kHz were obtained for the adult and elderly participants (Figure 1).

The speech reception threshold (SRT) of the better ear ranged from 25 to 95 dB HL (mean 44.7 dB HL, SD=13.45). Two individuals could not perform the speech audiometry tests (with the exception of the speech detection threshold – SDT) due to the severity of their hearing loss.

Procedures

The following data were extracted from patients' records and inserted into an electronic form: patient identification, demographic data (including results of the Instrumental for Socio-Economical Classification[12]), data from interview (patient complaint, discoursed time between the onset of hearing complaints and the time for seeking treatment, presence of tinnitus and its subjective characteristics of pitch, intensity, frequency, laterality and periodicity), audiometry and speech audiometry results obtained at the first consultation as well as HHIA/HHIE scores obtained previously to hearing aid fitting.

The assessment of handicap perception is routinely performed at the Clinic by using the Hearing Handicap Inventory for the Elderly (HHIE)[13] or the Hearing Handicap Inventory for Adults (HHIA)[14], translated into Brazilian Portuguese[15,16].

The HHIE is composed of 25 questions and aimed at evaluating the impact of hearing loss in the emotional and social/situational adjustment of the non-institutionalized elderly individual. The HHIA is a modified version of the HHIE to be applied to deaf adults. As a result, three questions replaced the original HHIE, to include items designed to identify the effects of hearing loss with regards to professional issues[17].

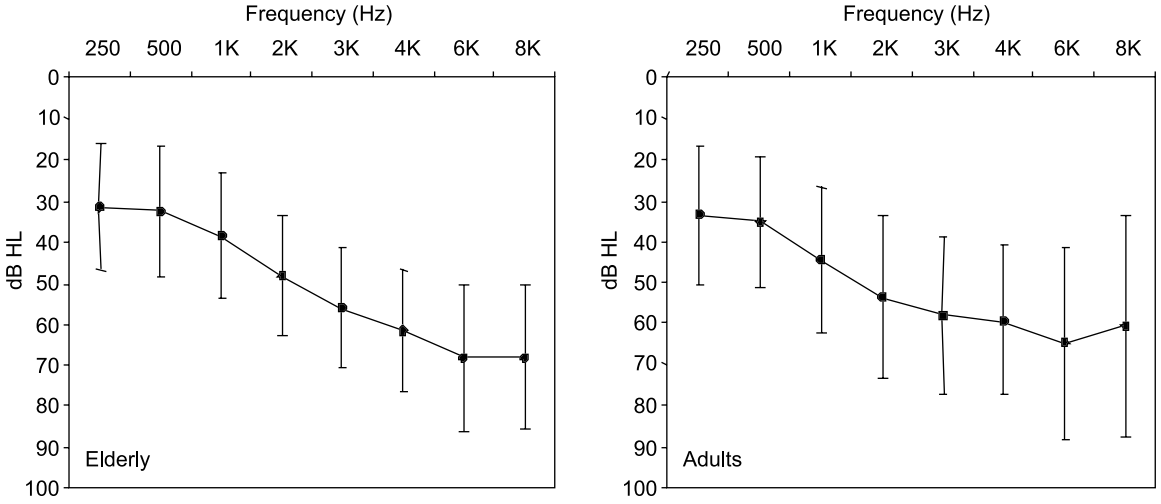

Figure 1. Mean and standard deviation of air conduction audiometric thresholds for the elderly (n=152) and adults (n=48)

The 25 questions are divided into two subscales, which assess the impact of hearing loss for the emotional (E) and social/situational (S) aspects of the individual. Each question is then identified according to the scale to which it belongs to.

The questionnaires are administered in an interview format, at the first consultation at the hearing aid sector. A professional, along with the patient, reads the 25 questions in the questionnaire, who then is instructed to mark the answer as it deemed most appropriate. Three alternatives are available for each question: "Yes" (equivalent to four points), "Sometimes" (equivalent to two points) and "No" otorhynolaryngological (equivalent to zero points).

The questionnaire's scores are calculated manually. The total score is the sum of the points for the 25 questions. The emotional (13 questions) and social (12 questions) subscales are totaled separately. The total score may range from 0 to 100. Values closer to 100 indicate a greater perceived handicap. The score indicates if the individual does not present a perception of handicap (0-16%) or present a mild/moderate perception (18-42%) or a severe perception of the handicap (above 42%).

Analyses were performed for the total group of participants and also separately for the adults and the elderly. This was due to the differences in social, emotional and communicative demands for each age group.

The Pearson Correlation Coefficient was utilized to verify the relationships between the mean audiometric thresholds (ISO and high frequency) and the total score and subscales scores of the questionnaires (HHIA/HHIE) with the time between the onset of hearing complaints and the time taken for seeking treatment. The Spearman Correlation was utilized to verify the relationship between the socioeconomic status, the educational level and the time taken for seeking treatment. The median hearing thresholds (ISO, medium and high frequency), speech recognition thresholds, total and subscales scores of the handicap questionnaires and the time for seeking treatment were compared between the adults and the elderly by means of the Mann Whitney test, since the tests of normality did not allow the Student's t test application. In all cases a significance level of 5% was adopted.

RESULTS

The mean and median auditory thresholds for the better ear at ISO and high frequencies, as well as the mean and median speech recognition thresholds are shown in Table 1.

There was no difference between adult and elderly patients in relation to the median of the auditory thresholds for the ISO (p=0.37) frequencies and the high frequencies (p=0.37). There was also no recorded differences in the speech recognition threshold (p=0.09). The complaint of tinnitus was reported in 142 of the records analyzed (71%) for 33 adults and 109 elderly.

With regard to the socioeconomic status, the participants were divided into the following groups: lower class (n=33; 16.5%) upper lower class (n=110; 55%) lower middle class (n=32; 16%) and middle class (n=6; 3%). In 19 of the records (9.5%), the socioeconomic classification was not specified. The degree of education of the participants were divided into the following groups: illiterate (n=23; 11.55%), incomplete elementary school (n=60; 30%) and complete (n=50; 25%), incomplete high school education (n=7; 3.5%) and complete (n=35; 17.5%) and superior education (n=17; 8.5%). In eight cases (4%) education information was not included in the participant's chart.

The classification for handicap degree among participants was made (Table 2).

The data referent to averages of the results of the HHIA, HHIE questionnaires and the time between the onset of hearing complaints and seeking any treatment were obtained (Table 3).

The Mann-Whitney test revealed no differences between the adults and the elderly with regards to the total median score

Table 1. Mean, median and 25 and 75% percentiles for hearing thresholds and speech reception threshold for participants' better ear

	ISO hearing threshold dB HL (Mean 500 Hz, 1, 2 and 4 kHz)				High frequency threshold dB HL (Mean 2, 3, 4 and 6 kHz)				Speech reception threshold (dB HL)			
	X	Med	25%	75%	X	Med	25%	75%	X	Med	25%	75%
Adults (n=48)	46.7	46.2	37.5	51.8	57.8	56.5	47.4	65	47.2	50	38	55
Elderly (n=152)	45.2	43.7	37.5	51.6	59.2	60.2	50	66.6	43.8	42.5	35	50
Total (n=200)	50.5	45	37.5	51.5	58.9	60	50	65.3	44.7	45	35	55

Note: X = mean; Med = median; 25% = 25th percentile; 75% = 75th percentile

Table 2. Classification of self-perception of handicap according to the results of the HHIA and HHIE questionnaires

	Perception of handicap						Total	
	Absent		Mild to moderate		Severe			
	n	%	n	%	n	%	n	%
Adults	10	20.83	16	33.33	22	45.83	48	100
Elderly	43	28.29	47	30.92	62	40.79	152	100
Total	54	27	63	31.5	83	41.5	200	100

Note: HHIA = hearing handicap inventory for the adult; HHIE = hearing handicap inventory for the elderly

(p=0.17) or emotional (p=0.08) and social (p=0.41) subscales of the handicap questionnaires. It also revealed no differences between the median time for seeking treatment for the adults and the elderly (p=0.14).

It was collected information from the participants' interview regarding hearing complaints, the location where they first sought treatment and the indicated conduct at this location (Table 4).

Correlations between the results of the questionnaires HHIA, HHIE, hearing thresholds, speech reception threshold (dB HL) and the time for seeking treatment among the participants were also analyzed. Very weak and not significant correlations were found between the time for seeking treatment and schooling variables (r=0.03, p=0.12) and the socioeconomic level (r=0.01, p=0.2) (Table 5).

Correlation analyses were also performed between the time for seeking treatment and the scores of the HHIA/E questionnaires, for just the 99 cases in which the first search for treatment was the Speech-Language Pathology and Audiology Clinic. Correlations were very low and not significant

Table 3. Results of total, emotional and social subscales scores of the handicap questionnaires and time taken for treatment seeking (n=200)

	Hearing handicap inventory for adults and for the elderly												Time for treatment seeking (years)				
	Total				Emotional				Social								
	X	Med	25%	75%	X	Med	25%	75%	X	Med	25%	75%	X	DP	Med	25%	75%
Adults (n=48)	44.8	42	23	67	22.5	9	37	22.5	22.2	23	19	29	9.1	9.9	5	2	14
Elderly (n=152)	40.0	33	14	61	19.0	4	34	19.0	21.1	20	9	30	7.1	10.4	4	1	9
Total (n=200)	41.1	38	16	64	19.8	4	34	19.8	21.4	20	10	30	7.6	10.3	4	1	9

Note: X = mean; Med = median; 25% = 25 percentile; 75% = 75 percentile; SD = standard deviation

Table 4. Ownership of the hearing problem, location sought and action taken at the time of first treatment seeking

	Adults		Elderly		Total	
	n	%	n	%	n	%
Hearing difficulty complaint						
Participant	42	88	129	84.9	171	85.5
Family and/or close friends	6	12	23	15.1	29	14.5
Total	48	100	152	100	200	100
Location						
Place of work (company)	2	4	0	0	2	1
Private facility (ENT and/or audiologist)	21	44	51	34	72	36
Public general hospital	3	6	3	2	6	3
Hearing healthcare service – secondary or tertiary level	22	46	83	54	105	52
Basic health unity	0	0	8	5.5	8	4.5
Foundation/Municipal Rehabilitation Center	0	0	7	4.5	7	3.5
Total	48	100	152	100	200	100
Action taken						
Audiological tests	20	42	58	38	78	39
Audiological tests and referral	5	10	11	7	16	9
Audiological tests and hearing aid referral	23	48	83	55	106	52
Total	48	100	152	100	200	100

Note: ENT = Ear, nose and throat physician

Table 5. Correlations between mean thresholds (ISO and high frequency), speech recognition threshold in the better ear and total and subscales scores of the social and emotional handicap questionnaire and the time for seeking treatment (n=200)

	SRT		Mean ISO		Mean high frequency		Total handicap		Emotional handicap		Social handicap	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Time for seeking treatment	-0.18	0.00*	-0.24	0.00*	-0.26	0.00*	0.03	0.59	0.06	0.35	-0.003	0.95

* Significant values (p<0.05) – Pearson Correlation

Note: SRT = Speech reception threshold

between the time for seeking treatment and the HHIA/E's total (r=0.04, p=0.23), emotional (r=0.04, p=0.13) and social (r=0.01, p=0.19) scores.

DISCUSSION

The median auditory thresholds at high frequencies for the elderly group were slightly higher than those of the adults. However, there was no significant difference between the groups. This may have occurred because the majority of the participants had hearing losses with a sloping audiometric configuration. It should be noted, however, that there was a greater variation of auditory thresholds for older adults (Figure 1).

For 54 of the participants, there was no perception of handicap measured by the HHIA/E. The analysis of the audiometric data showed that of these, 31 (57%) had an ISO average greater than or equal to 40 dB HL, reinforcing the results of previous studies that showed no direct relationship between the threshold and the perception of handicap[18,19].

Although the results have not demonstrated significant differences amongst the groups, the literature[17,20] discusses the differences in the scores of the adults and seniors in handicap questionnaires. This can be explained by the fact that adults have life styles that make them interact in diverse acoustic environments with a larger number of contacts, which increases the demand for communication and therefore, the awareness of difficulties and handicap[6,21]. The results may have been related to the insufficient number of adult participants or because there were no randomization techniques employed to compose samples.

The time to search for the first treatment service ranged from two months to 61 years. Twelve participants (6%) reported an onset of hearing impairment before 15 years of age and in one case there was a report of congenital hearing loss, however, the search for treatment occurred only in adulthood. One study[8] reported a mean time lapse of eight years between the onset of hearing complaints and the seeking of treatment. It was reported that due to the insidious appearance of the majority of the sensorineural hearing losses, this time may be greater, perhaps double the time than that reported by the individual subjects.

Although not significant, the adults spent more time between the onset of complaints and the time of seeking treatment, when compared to the elderly. Another survey conducted in the same place where the present study was conducted, indicated that from 106 adults only 2.6% sought care in the first year after the onset of hearing loss and about 50% waited ten years or more before seeking treatment[18].

For approximately 15% of the cases the hearing related complaint was reported by friends or relatives and not by the participant. In these cases, the demand for treatment may have been motivated by the frustrations expressed by others, rather than the perceived need by the patient himself. This situation is fairly reported in the literature[21,22] and may have implications for clinical practice where the "medical model" (based on the disease and giving the professional more authority and power for treatment decision making) is predominant. Individuals who do not own the problem, can attend consultations and go through hearing aid selection and fitting process recommended by the professionals without, however, accepting the diagnosis and agreeing with the treatment[23]. This is one of the reasons that lead to the reflection for the need to shift over to a service model centered on the client that, among other things, emphasizes the importance of including the patient's perspective in the consultation and treatment.

With regards to the type of service sought, 59.5% of the participants were seen at the National Health System. Of these, only 4.5% sought the basic health unit, which would be the first point of contact and entry into the SUS. This may be due to the fact that the data collection covered the years 2004 and 2005, when the system of reference and counter reference for hearing health, according to the National Policy on Hearing Health, was still being organized in the region covered by this study. At the time, there were more common auto references for the services for medium and high complexity levels. In 1% of the cases, seeking treatment occurred in the hearing conservation program of the company where the individual was employed. For 36% of the participants, the first attempt to seek treatment occurred in the private sector, where the process of audiological diagnosis was carried out. Only six of these individuals have been through the process of hearing aid selection in the private sector without, however, being fitted with such devices. The cost of the devices was the factor that led to the non-fitting of the hearing aids for these six individuals.

Based on the analysis of the copy of the audiometric test performed in the private sector and on purely audiometric criteria (ISO average of the better ear greater than or equal to 40 dB HL), 69 (91%) of 78 subjects who only underwent the diagnostic process (audiological test), were considered candidates for the use of hearing aids. Participants reported that the health professional that conducted the first hearing test and found a hearing loss did not referred them to hearing aid selection and fitting. Although the reliability of such reports may be questioned, this is a finding that deserves further investigation, since the literature suggests that family physicians, audiologists and otolaryngologists may have negative perceptions with regards to the effectiveness and benefits of the use of hearing aids and because of this, do not recommend the use of such devices for potential candidates[8,32,24].

The negative correlations between the audiometric data and the time for seeking treatment were very weak, although significant (Table 5). So, this finding should be interpreted with caution. Much of the sensorineural hearing loss primarily affects high frequencies, which have less impact on the individual's ability to recognize speech in quiet environments, making the perception of hearing difficult[1]. The self-reported hearing impairment significantly decreases when only the high frequencies or only one ear is affected[25]. When the severity of hearing loss increases, it affects other frequencies, thereby worsening the performance of speech recognition and presenting more obvious communication limitations. This can facilitate a recognition of the existence of a problem and therefore, encourage the search for treatment[6,9,11].

There was no significant correlation between self-perception of handicap and the time for seeking treatment (Table 4). In principle, this could have occurred because of the limitations

of the methodology of the study, since data from the HHIA/E questionnaires were only obtained when the individual was treated at the Speech Therapy Clinic (this not necessarily being the first time for seeking treatment). Thus, the analyzes of correlation were repeated between the time for seeking treatment and the processing of the scores from the questionnaires for only 99 cases in which the first treatment was carried out in the clinic. The results again showed no significant correlations between the time to seek treatment and the total score and the emotional and social subscales of the HHIA/E.

Research indicates that self-perceived handicap is one of the biggest factors that determine demand and adherence to treatment[6,9-11]. Overall, these studies compared groups of individuals who purchased or used hearing aids with those who did not, or groups of individuals who sought consultation with a hearing professional versus those who did not. All participants of this study, either by choice or driven by external factors, searched for some kind of diagnosis and treatment. It was not part of this proposal to consider whether there was adherence to it. The comparison of the present study with the literature[6,9-11], may suggest that although the individual's ability to participate in daily life situations is one of the factors that lead to seeking treatment, it does not influence the time spent for the implementation of such an action.

Physiological, psychological and social determinants interact in the dynamic process of seeking treatment and the use of health services and the exact contribution of each one of these factors is still unknown. An example of a psychological determinant to delay the seeking of treatment is denial[22]. Denial is a natural response, often unconscious, which allows individuals to minimize the impact of stressful situations, such as the perception of hearing impairment or a diagnosis of hearing loss. The ownership of the problem in communication is addressed to another person (i.e., the speaker) or thing (i.e., environmental acoustics). Denial may result from the stigma associated with hearing loss and hearing aids[1]. Many extrinsic agents to the hearing loss (i.e., "the environment") may influence an individual to seek help. This includes family members and friends, social roles[9] and the communication needs of the hearing impaired person, the level of hearing accessibility within society and the system for providing hearing health services[26]. The search for treatment is also influenced by the knowledge about treatment for hearing impairment, access to places to carry out audiological diagnosis and rehabilitation process[6,24], perceived value and effectiveness of hearing aids and health conditions (including manual and visual skills and financial situation)[24].

Finally, there are factors that facilitate or delay seeking treatment and some of them can play both roles at different times for different individuals. One said factor may, at the same time, contribute to an individual to be motivated to seek treatment and move another one away from taking that decision[27]. For example, knowing an effective user of hearing aids can stimulate an individual to seek treatment, realizing that the hearing aid device provides for improved communication. Another individual, despite acknowledging the positive results from the use of hearing aids in communication, can focus solely on the aesthetics and stigma of the device and postpone seeking treatment.

CONCLUSION

The time between the onset of hearing complaints and seeking treatment was on average 7.6 years. There are weak or non-existent correlations between the audiometric and demographic data, perception of handicap and the time to seek treatment.

Despite the advances in technology, the miniaturization of hearing aids and a greater availability and access to proper information concerning hearing loss and rehabilitation procedures, the time between the onset of hearing complaints and seeking treatment is similar to that already reported three decades ago. The results of the correlations reinforce the concept that the demand for treatment is "multifactorial".

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RESUMO

Objetivo: Verificar a relação entre limiares audiométricos, autopercepção do *handicap* e tempo para procura de tratamento em indivíduos atendidos em um serviço público de saúde auditiva. **Métodos:** Trata-se de estudo retrospectivo, com análise de prontuários de 152 idosos e 48 adultos deficientes auditivos. As médias de limiares audiométricos ISO (500 Hz a 4 kHz) e de altas frequências (2 a 6 kHz), os limiares de reconhecimento de fala e a pontuação total e das subescalas social e emocional dos Questionários de *Handicap* Auditivo para Adultos (HHIA) e Idosos (HHIE) foram comparados com o tempo compreendido entre o início da queixa auditiva e o momento da procura por tratamento. **Resultados:** O tempo médio para procura do tratamento foi de 7,6 anos. Não houve diferença entre adultos e idosos para as médias dos limiares ISO e de alta frequência, pontuação total e das subescalas do HHIA/E, e tempo para procura do tratamento. Correlações negativas fracas, porém significativas, foram observadas entre os limiares audiométricos e o tempo para procura de tratamento. Não foram encontradas relações entre o tempo para procura de tratamento e as variáveis referentes à escolaridade, nível sócio econômico e percepção do *handicap*. **Conclusão:** Os limiares audiométricos parecem influenciar a procura pelo tratamento. A despeito dos avanços tecnológicos e mudanças no acesso à informação e ao tratamento, o tempo de procura pelo tratamento é similar ao encontrado há 30 anos.

Descritores: Limiar auditivo; Perda auditiva; Pessoas com deficiência auditiva; Questionários; Audiologia

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