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NOISE INFLUENCE ON HEARING STATUS OF USERS OF HEARING AIDS

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ABSTRACT

The aim of this study was to determine the cause and effect relationship of noise and hearing status users of hearing aids. It was assumed that increased continously and intensity of noise in urban areas has resulted in postponement of the assessment of hearing impairment in relation to age. Also, it was assumed that the inferior status hearing aid users of hearing aids in the city, compared to the auditory user status hearing aids from the suburbs. The sample (N = 60) consisted of the hearing impaired, which is assigned to a hearing aid. The sample was selected randomly and divided into two sub-samples, 30 patients from the city and 30 patients from the suburbs. The survey was administered questionnaire intensity noise levels and users of hearing aids. The processing of the collected data was used descriptive analysis, and testing the difference T - test and Mann Whitney U test, with the selected level of statistical significance 0.05. The results showed a statistically significant difference in the prevalence of users of hearing aids urban and suburban areas, in relation to the age of the respondents. The population of urban settlements are likely accustomed to communicate on a higher level of intensity socio-voice communication, and thus later in life notice hearing loss and later appears at diagnosis. Results hearing loss and hearing loss percentage by Fowler-Sabine-in, in clinical terms, they showed slight differences, with somewhat unfavorable hearing status urban, suburban relative to the population. Not confirmed the statistical significance of these differences, which are only partially can be argued that increasing the intensity of noise in urban areas has resulted in inferior status hearing aid users of hearing aids in this, in relation to the hearing aid user status from the suburbs.

Keywords: *noise, hearing status, hearing aid, communication*

INTRODUCTION

Noise comes from human activities, in particular due to urbanization and the development of transport and industry. Although much more affects the urban population, the victims of this problem become residents of villages along the highways or industrial plants. Noise is becoming more and more present, however, remains unnoticed forms of pollution, even in developed countries (Sing & Daver, 2004).

The noise, especially in recent decades, is one of the main causes of complex health damage, even in industrialized countries. The fight against noise and its harmful effects are part of the efforts made to improve living conditions and to protect the living and working environment (Pravica, 2004).

Today is an important factor in the quality of life in urban areas refers to the noise level. Social and economic development of the population increases its tendency to create noise, but if it is not controlled by a serious health threat. The noise in the cities, especially along the main roads is reaching worrisome levels.

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Homes away from sources of noise and virtually noiseless secondary roads now are very popular, because people want to live in places far away from the noisy urban areas (Oyedepo, 2013).

Noise seriously affects the nervous system, both central as well as vegetative and influence the development of cardiovascular disease; there is a change in blood pressure, pulse rate and respiration, increased serum cholesterol, increased secretion of adrenaline, this creates an increased risk of heart attack infarction. The threshold above which occurs at higher risk for a heart attack is 60 dB.

There is evidence that continuous noise exposure is associated with increased risk of hypertension. During three decades of risk assessment has increased from 0.97 in 1980 to 1.28 in 2010 (Banerjee, 2014).

Noise affects the performance of complex mental activities. Because of the chronic exposure to noise, with students is observed: lack of attention, difficulty concentrating, poor discrimination of sound and speech perception, reduced motivation, poor memory of complex data, weaker ability to read and weaker results at school. The increase in noise from 50 dB to 65 dB, which is increase of 13%, leads to irritability and anger (Istamto, Houthuijs, & Lebret, 2014).

Noise leads to behavioral disorders due to difficulties in communication, increased aggressiveness and cause undesirable changes in behavior. It affects the ability to evaluate and integrate information and create unrealistic estimates. Also, it effect on the sense of sight in terms of poorer color vision, slower adaptation to changing light intensity, as well as identification of details (Klančnik, 2007).

Based on previous research, it was found that the noise is harmful to health and leads to a whole range of diseases. It was believed that the noise impact is limited to the sense of hearing, but today it is proven that the effect is much more complex. The effects of noise are manifested in the form of psychological and functional disorders (Hasanbegović, 2013). The fact is that, depending on the intensity and time of exposure to noise, and constant exposure to excessive sound levels can easily damage or hearing loss.

Hearing impairment due to noise is usually painless and gradual. Often late notice when you are cilia in the ear cannot be repaired. The damage perceptive type and can cause tinnitus. Hearing impairment at high frequencies begins seamlessly, so that a person who is exposed to noise relatively late notice that the hard of hearing, and then the changes are already advanced and become reversible. The ear is still behaving like at healthy person and may not be aware of their problems. If at this stage does not recognize the disorder and the person is still exposed to noise, damage to entering the second phase, the phase of permanent hearing loss which cannot be achieved by a complete recovery of hearing. Due to individual differences of sensitivity to noise, there are persons with hearing loss occurs rapidly, and in others, and after years of exposure to excessive noise hearing is relatively little damage. The effect of noise is more harmful as it strengthens, discontinue and long-term exposure to intense noise, leads to a decrease of hearing sensitivity person, or light hearing loss or even total deafness (Klančnik, 2007).

An increasing number of phenomena of hearing loss due to noise are in the world. The occurrence of hearing loss due to noise depends on the frequency, intensity and duration of the noise. Hearing loss caused by noise is a slow and progressive disease. Changes typically occur in both ears and include the frequency range 3000-6000 Hz, while the lower frequencies are going to be included in long-standing disease (Sayapathi, Ting & Koch, 2014).

The aim of this study was to determine the cause and effect relationship of noise and hearing status users of hearing aids, with the assumption that increased continuously and intensity of noise in urban areas has resulted in dumping assessment of hearing impairment in relation to age, and worse hearing aid user status hearing aids in this, in relation to the hearing aid user status hearing aids from the suburbs.

METHODS

The sample of examinee

The sample (N=60) consisted of the hearing impaired, which is assigned to a hearing aid. The sample was selected randomly, based on the analysis of documents limited population of 557 persons with impaired hearing, in the period from 2012 to 31.5.2016. For the study, the sample was divided into two subgroups, of which the first sub sample consisted of 30 subjects in the field of higher intensity noise (urban areas), and the other 30 subjects in the field of low intensity noise (suburbs).

Measuring instrument and sample variables

For data collection was used questionnaire to collect data on levels of intensity of the noise and the users of hearing aids, respectively, for the purposes of this research from it are applied the following variables:

1. The area of high/ low intensity noise (city and suburb),
2. Age,
3. Degree of hearing impairment users of hearing aids,
4. The percentage of hearing impairment users of hearing aids.

Methods of data processing

The data are processed in a computer software package SPSS 17.0. We performed a descriptive analysis, i.e., determined the distribution of frequencies and percentages, and calculation of basic statistical parameters. To test the difference of age is calculated by T - test differences in arithmetic means, and to test the difference level of damage and the percentage of hearing loss Mann Whitney U test, the level of statistical significance 0.05. The results are presented in tables and graphs.

RESULTS AND DISCUSSION

Results of the research aged users of hearing aids

Table 1 shows the frequencies and percentages of representation of users of hearing aids in relation to age. It is observed that the greatest incidence of both subsamples of respondents aged 70-80 years (36.6% urban and 46.6% of the suburban environment). Also, it is evident that there are differences in representation at all age levels. The biggest differences are present in the aged 80-90 (33.1% urban and suburban 6.6%), and then aged up to 60 years (23.1% urban and suburban 9.9%). Representation of respondents aged 60-70 and 70-80 years was with some minor differences.

Table 1. Representation of respondents by age

Age	Urban areas		Suburbs	
	f	%	f	%
< 60	3	**9,9**	7	**23,2**
60 – 70	6	19,8	7	23,2
70 – 80	11	36,6	14	46,6
80 – 90	10	**33,1**	2	**6,6**

Table 2 shows the basic statistical parameters and the result of T-test difference representation of respondents in relation to age. They can be observed significant differences in the basic parameters between subsamples of respondents (urban Mean = 74.23, a suburban Mean = 68.77), based on the results of T-test (t = 2.367), with 58 degrees of freedom, it was confirmed that these differences are statistically significant at the level of statistical significance of p = 0.02.

Table 2. The basic statistical parameters and T test difference results for the variable Age

Areas	Min	Max	Mean	SD	Sum	S_k	K_u
Urbans	53	90	74,23	9,81	2063,00	-0,500	-0,383
suburban	52	82	68,77	7,91	2227,00	-0,539	-0,633
t= 2,376; df=58; p=0,02							

Since the socio-voice communication in terms of noise, from its complete mastering, it is necessary to keep the highest level, even often superior to the standard values (40-60 dB), most likely in this case appears mechanism called adaptability.

That is, the population of urban settlements, with continuous exposure to noise of high intensity, get used to communicate on a higher level of intensity socio-voice communication, and thus noticeable hearing loss later in life, and therefore, for various reasons, later (average 5-6 years compared to suburban) and appears on the diagnosis, which was recorded during the study.

Li et al. (2008) found that people who have lived a long time in noisy environments are less sensitive to noise and disturbance.

The research results of the hearing status of participants

Table 3 shows the frequencies and percentages of representation of users of hearing aids compared to the level of hearing loss. It is observed that the same, the highest percentage (59.9%) of respondents of both subsamples has a moderate hearing loss (40-60 dB). Other subjects are arranged differently on the standard levels of hearing (<20 dB) and mild (20-40 dB) and severe hearing loss (60-90 dB). In subjects from urban settlements is somewhat more present goods (26.7%) and in suburban severe (19.8%) of hearing loss.

Table 3. Share of respondents in relation to the degree of hearing impairment

Hearing loss (dB)	Urban areas		Suburbs	
	f	%	f	%
< 20	0	0,0	1	3,3
20 – 40	8	26,7	5	16,7
40 – 60	18	**59,9**	18	**59,7**
60 – 90	4	13,2	6	19,8

Table 4 shows the frequencies and percentages of representation of users of hearing aids compared to the percentage loss of hearing according to Fowler-Sabine-in. It is observed that the greatest incidence of both subsamples of respondents with hearing loss percentage less than 50% (39.7% urban and 42.9% of the suburban environment), while other respondents, with minor differences, differently arranged in both subsamples, on the other levels of hearing loss percentage of 10%.

Table 4. Presence of respondents in relation to the percentage loss of hearing according to Fowler-Sabine-in

Percentage loss of hearing (FS)	Urban areas		Suburbs	
	f	%	f	%
< 50	12	**39.7**	13	**42.9**
50– 60	7	23.1	6	19.8
60 – 70	5	16.5	3	9.9
70 – 80	3	9.9	4	13.2
80 – 90	1	3.3	3	9.9
> 90	2	6.6	1	3.3

Table 5 presents the basic statistical parameters for variable degree of hearing impairment and hearing loss percentage. It can be observed a slight difference in these parameters between the subsamples of respondents with somewhat less favorable results for urban, suburban relative to the population. Jawed, et al. (2010) found a direct correlation with perceptive hearing loss and noise exposure, 0.42 dB from 500 Hz to 2000 Hz per year.

Table 5. Basic statistical parameters of variable degree of hearing impairment and hearing loss percentage according to Fowler-Sabine

Variables	Areas	Min	Max	Mean	SD	S_k	K_u
Degree of hearing impairment	City	30,00	85,00	**49,63**	13,00	0,96	1,44
	Suburban	10,00	88,30	**49,42**	14,07	0,17	2,37
Percentage loss of hearing FS	City	41,60	93,70	**58,75**	14,82	0,93	0,03
	Suburban	26,80	99,30	**57,68**	17,47	0,71	-0,31

In order to check the statistical significance of differences in variables which evaluated hearing status of the respondents used the Mann-Whitney U test. It was found that there was no statistically significant difference in the level of statistical significance $p < 0.05$, but the results mean values of ranks also show that both variables on average higher in the urban population. Despite the lack of statistical significance of differences, slightly worse hearing status of the city, in relation to the suburban population, in the clinical sense, can be seen as a consequence caused by the influence of the higher intensity of noise in the urban areas (Table 6).

The results of this study, we define the research Basner et al (2014). Specifically, studying references from relevant articles publicatied in the past five years found that observational and experimental studies of human exposure to noise leads to his harassment, disturbing his sleep and causes daytime sleepiness, affect the operating efficiency, influence the outcome of the disease in patients and work staff in hospitals, increases the occurrence of hypertension and cardiovascular disease, impairs cognitive performance of students, leading to irritability and even aggression. For all these reasons we cannot ignore nonauditiv effects of noise on people (Kim et al., 2012; Hasanbegović, 2013).

Table 6. Mann-Whitney U test for differences variable percentage loss of hearing according to Fowler-Sabine and degree of hearing impairment

Variables	Areas	Mean Rank	Sum of Ranks	Medijana	Mann-Whitney U	Z	p
Degree of hearing impairment	City	30,53	916,00	53,65	449,00	0,015	0,99
	Suburban	30,47	914,00	48,30			
Percentage loss of hearing FS	City	31,67	950,00	51,15	415,00	0,517	0,61
	Suburban	29,33	880,00	45,80			

CONCLUSION

The research results of causal relationship of noise and hearing status users of hearing aids in different settlements, showed a statistically significant difference in the prevalence of users of hearing aids urban and suburban areas, in relation to the age of the respondents. The population of urban settlements, continuously exposed to high-intensity noise, probably accustomed to communicate on a higher level of intensity socio-voice communication, and thus later in life notice hearing loss and later appears at diagnosis. Results hearing loss and hearing loss percentage by Fowler-Sabine-in the two subjects in populated areas, in clinical terms, they showed slight differences, with somewhat unfavorable hearing status urban, suburban relative to the population. Mann-Whitney U test was not confirmed by the statistical significance of these differences, which can only partially be argued that the increased intensity of noise in urban areas has resulted in inferior status hearing aid users of hearing aids in this, in relation to the hearing aid user status from the suburbs.

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