Letter to Editor

Evaluation of Occupational Noise Levels in the Ear Canal of Exposed Workers

Dear Editor,

This study was conducted due to the prevalence increase of hearing loss in Iran industries, despite the outspread in hearing protection programs. There was also a report from Canada, Oct 8, 2018 on Hearing Disorders, according to a recent study from Work Safe BC, The National Safety Council's Safety Health Magazine. Researchers looked at hearing test data collected by oil and gas employers from 2012 to 2017. They found that, despite an increase in workers reporting they wear hearing protection (to 98% from 94%), the percentage of workers with noise-induced hearing loss grew to 45 from 33. Of the 294 workers affected, 66% were younger than 35.

This cross-sectional study was done on the 60 participants, 30 (50%) males and 30 (50%) females, in the range between 20 and 30 years. White noise levels of 75, 85, and 95 dB at the frequency range 2–8 kHz were used for the stimulus sound pressure levels (SPLs). The research was done based on the ear canal behavior at three SPLs, which was unique among the literature. However, in this study, responses of the ear canal to the SPLs are concentrated on the men and women separately only for showing the effects of the different acoustical structure of ear canal on received noise, and not for indicating the differences between men and women hearing mechanism. Usually, one SPL was used to study the ear canal even the SPL was much lower than the occupational SPL.[1-3]

It seems that the different morphology of men and women ear like the greater volume of men's ear canal compared with that of women made the amplification ability difference.[4]

Sound pressure amplification ability of men's ear canal for the frequency range between 125 and 1000 Hz was less than for lower and higher frequencies also amplification peak was seen at the frequency equal to the 2000 Hz. This finding is consistent with Liu *et al*. findings.[5] As we know the ear canal volume of women is smaller than men, we expected that the peak of amplification shifted somewhat to higher frequencies in women.[6]

This ability of the ear canal should be considered in the workplace noise evaluations. In such situations because of the resonance ability of ear canal (2 to 8 dB), even under the occupational safe levels, workers may be exposed to unaccepted noise levels in the workplace. The most important note in this study is a higher value of SPL received by hearing system near to eardrum, whereas the sound pressure level measured by a sound level meter (SLM) is near to permitted levels. Since, in some countries, accepted time-weighted average for 8-h exposure with workplaces noises is 85 dB, the resonance ability of ear canal should be considered at occupational hearing protection programs. This is just one of the reasons for the increase in workers' hearing loss, despite the development of hearing protection programs in the industries.

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Conflicts of interest

The authors declare that there is no any conflict of interest.

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References

1. da Silva APR, Blasca WQ, Lauris JRP, de Oliveira JRM. Correlation between the characteristics of resonance and aging of the external ear. Codas 2014;26:112-6.
2. Liu JL, Qin XL, Wang LH, Liang CY, Jiang T. Measurement of sound pressure level at outlet of external auditory canal and eardrum. Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi 2003;21:353-5.
3. Chen S, Deng J, Bian L, Li G. A new method to estimate sound energy entering the middle ear. Conf Proc IEEE Eng Med Biol Soc 2013;2013:29-32.
4. Grewe J, Thiele C, Mojallal H, Raab P, Sankowsky-Rothe T, Lenarz T, *et al*. New HRCT-based measurement of the human outer ear canal as a basis for acoustical methods. Am J Audiol 2013;22:65-73.

5. Manchaiah V, Durisala N, Marimuthu V. Tympanometric profiles for chinese older adults. Audiol Res 2017;7:190.
6. Çalişkan S, Çetin H, Akkaşoğlu S. Morphometry of the external auditory canal: Radiological study. J Surg Med 2020;4:76-9.

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