



Institute of hygiene and medical ecology,
Faculty of medicine, University of Belgrade, Belgrade,
Serbia

Nikolina Banjanin, MD, PhD, Teaching assistant

Noise sources, harmful effects of noise on
human health and prevention



Noise harms human health and interferes with daily activities of people.

WHO,

<http://www.euro.who.int/en/health-topics/environment>

(Last access 30 April 2019)



In workplaces where work is performed in which daily noise exposure varies considerably from one to the another day the weekly noise exposure must not exceed 85 dB (A). Appropriate preventive measures have to be taken to reduce risk of noise exposure in accordance with the work being done.

Rule book on preventive measures for safe and health work during noise exposure, *Official Gazette of the Republic of Serbia*, No. 96/2011 and 78/2015.



The exposure of people to noise in the process industry is particularly significant because there are many sources of noise in the process industry. Different machines produce different sounds that can interfere with the work process. Noise may have numerous and significant harmful effects on human health. Noise may affect various organ systems and lead to serious disruption of physical and mental health. Many studies of different designs have examined the connection between noise and different diseases.



Exposure to noise may be connected with increasing prevalence of cardiovascular disease.

W.T. Yang et al. Road traffic noise, air pollutants, and the prevalence of cardiovascular disease in Taichung Taiwan, *Int J Environ Res Public Health*, 15 (2018), 8, pii: E1707.

There is a positive relationship between noise and hypertension prevalence.

S. Nserat et al. Blood pressure of Jordanian workers chronically exposed to noise in industrial plants, *Int J Occup Environ Med*, 8 (2017), 4, pp. 217-223.



The connection between noise annoyance and atrial fibrillation was found.

O. Hahad et al. Annoyance to different noise sources is associated with atrial fibrillation in the Gutenberg health study, *Int J Cardiol*, 264 (2018), pp. 79–84.

Noise is positively connected with heart rate in rest.

W. Zijlema et al. Road traffic noise, blood pressure and heart rate: Pooled analysis of harmonized data from 88 336 participants, *Environ Res*, 151 (2016), pp. 804-813.



Noise may be the risk factor for ischemic heart disease.

A. M. Dzhambov and D.D. Dimitrova. Occupational noise and ischemic heart disease: A systematic review, *Noise Health*, 18 (2016), 83, pp. 167-77.

There is a positive relationship between levels of noise and myocardial infarction.

A. Seidler et al. Myocardial infarction risk due to aircraft, road, and rail traffic noise, *Dtsch Arztebl Int*, 113 (2016), 24, pp. 407-14.

Hypertension prevalence is reduced by 1.4% and coronary heart disease by 1.8% by 5-dB noise reduction.

T. K. Swinburn et al. Valuing quiet: an economic assessment of U.S. environmental noise as a cardiovascular health hazard, *Am J Prev Med*, 49 (2015), 3, pp. 345-53.



Exposure to noise is connected with obesity development.

A. Pyko et al. Long-term exposure to transportation noise in relation to development of obesity-a cohort study, *Environ Health Perspect*, 125 (2017), 11:117005.

The prospective cohort study showed positive relationship between noise and incidence of diabetes.

C. Clark et al. Association of long-term exposure to transportation noise and traffic-related air pollution with the incidence of diabetes: A prospective cohort study, *Environ Health Perspect*, 125 (2017), 8:087025.

The relationship between exposure to occupational noise and the risk of prevalent chronic obstructive pulmonary disease was found.

A. M. Dzhambov and D. D. Dimitrova. Self-reported occupational noise may be associated with prevalent chronic obstructive pulmonary disease in the us general population, *Noise Health*, 19 (2017), 88, pp.115-124.



There is a positive relationship between occupational noise and headache/eyestrain.

J. Kim et al. The relationship between occupational noise and vibration exposure and headache/eyestrain, based on the fourth Korean Working Condition Survey (KWCS), *PLoS One*, 12 (2017); 5: e0177846.

There is a positive relationship between noise and sleep disturbances and attention disorders.

M. Skrzypek et al. Impact of road traffic noise on sleep disturbances and attention disorders amongst school children living in Upper Silesian Industrial Zone, Poland, *Int J Occup Med Environ Health*, 30 (2017), 3, pp. 511-520.



Noise annoyance is affected simultaneously by noise exposure level and noise sensitivity. Also, when subjects were exposed to similar noise level different level of noise annoyance was caused by different individual noise sensitivity.

J. H. Sung et al. Influence of transportation noise and noise sensitivity on annoyance: a cross-sectional study in south Korea, *Int J Environ Res Public Health*, 14 (2017), 3, pii: E322.

There is a positive relationship between noise annoyance and prevalence of depression and anxiety.

M. E. Beutel et al. Noise annoyance is associated with depression and anxiety in the general population-the contribution of aircraft noise, *PLoS One*, 11 (2016), 5: e0155357.



Hearing loss induced by noise is significant.

Y. I. Carroll et al. Vital signs: noise-induced hearing loss among adults-United States 2011-2012, *MMWR Morb Mortal Wkly Rep*, 66 (2017), 5, pp.139-144.

Workers in automotive manufacturing industry revealed hearing loss. Their hearing loss was associated with their actual working age of noise exposure.

L. Luo et al. Analysis on characteristics of hearing loss in occupational noise-exposed workers in automotive manufacturing industry, *Zhonghua Lao Dong Wei Sheng Zhi Ye Bing Za Zhi*, 36 (2018), 6, pp. 445-448.



The highest prevalence of workers with any hearing impairment, and with moderate or worse impairment was in the mining sector followed by the construction and manufacturing sectors.

E. A. Masterson et al. Hearing impairment among noise-exposed workers-United States 2003-2012, *MMWR Morb Mortal Wkly Rep*, 65 (2016), 15, pp.389-94.

Workers who had hearing loss had significantly higher rates of tinnitus. For workers exposed to noise hearing conservation programs should include tinnitus management along with other noise control and hearing protection.

O. Hong et al. Double Jeopardy: Hearing loss and tinnitus among noise-exposed workers, *Workplace Health Saf*, 64 (2016), 6, pp. 235-42.



In preventing cochlear damage in noise-induced hearing loss oral magnesium intake may be beneficial.

C. Yildirim et al. The protective effect of oral magnesium supplement on noise-induced hearing loss, *Kulak Burun Bogaz Ihtis Derg*, 16 (2006), 1, pp.29-36.

Magnesium easily crosses the hematocochlear barrier. Magnesium presents neuroprotective and vasodilatory effect. Thus, magnesium may limit the cochlear damage.

I. Sendowski, Magnesium therapy in acoustic trauma, *Magnes Res*, 19 (2006), 4, pp.244-54.



Having in mind the results of the studies, the noise should be understood as a serious problem which can seriously impair the physical and mental health. Special attention should be devoted to people in process industry where exposure to noise can be significant. Sound sources and sound transmission paths should be in the focus of interest in order to adequately plan protection and preventive measures.



Noise exposure may lead to hearing loss which needs preventive and therapeutic strategies. Environmental noise exposure should be reduced ideally at the source, exposure limits should be enforced and educational campaigns would diminish negative health consequences. The results of reduced noise exposure would be lower annoyance, enhanced learning environment, improved sleep and lower prevalence of cardiovascular disease.

M. Basner et al. Auditory and non-auditory effects of noise on health, *Lancet*, 383 (2014), 9925, pp. 1325-32.

To preserve quality of life of workers hearing loss prevention, early detection and intervention to avoid additional hearing loss are critical.

E. A. Masterson et al., Hearing impairment among noise-exposed workers-United states, 2003-2012, *MMWR Morb Mortal Wkly Rep*, 65 (2016), 15, pp. 389-94.