

Correlation between urban noise and non-infectious diseases in the population

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The widespread introduction into industry of heavy duty machines and equipment is accompanied by an increase in the noise background in industry and also a rise in its intensity in everyday life and in the streets of a large city.

Long term noise, by weakening the functional state of the central nervous system, reduces the resistance of the body and promotes the development of serious disease processes - neurotic states, hypertension or hypotension disease, stomach and duodenal ulcers, gastritis, colitis, occupational loss of hearing and deafness [1, 4, 5, 8].

A large scale study of the population living in a noisy part of a city with a noise level of 70-90 phon, 81-85 dB, has shown that neuroses are 3 times more frequent, hypertonic and hypotonic diseases 1.4 times, inflammatory diseases of the organ of hearing 18.3 times [3, 5], and hypertonic disease, and cardiovascular neuroses 2.3 times than in people living in a quiet part of the city.

Despite the many studies of the action of acoustic irritants on humans, we have not found in the available literature a single work devoted to the effect of noise on other non-infectious diseases. On this basis, we set ourselves the task of studying the correlation between the outside (transport, enterprise) and inside noise, the equivalent sound level in dBA and non-infectious diseases. Correlation, as is well known, is a cause-effect relationship and can be of considerable help in studying the effect of noise on the given diseases.

Measurements of the external and internal noise were made twice a year - in autumn-winter (September) and in spring-summer (March) at 10 points in a contaminated area of a city. The intensity of the outside noise was 67.9-75 dBA and of the inside - 53.9-57.8 dBA.

The morbidity was studied in accordance with the instructions [6] and recommendations [7]. The scope of the studies was described in a previous paper [2].

The correlation coefficient was determined by means of a study of the connections between the yearly average level of the external and also the internal noise and the yearly average values of non-infectious diseases over 14 years (1982-1995).

It was established that the correlation between the outside noise and diseases of the blood and circulatory organs in children was 0.82 ($p < 0.01$), diseases of the eye - 0.81 ($p < 0.01$), diseases of the upper respiratory tracts - 0.76 ($p < 0.01$), other diseases of the respiratory organs - 0.64 ($p < 0.02$), middle otitis and mastoiditis, diseases of the ear and the mastoid process - 0.75 ($p < 0.01$), diseases of other branches of the alimentary system - 0.71 ($p < 0.01$), diseases of the urinogenital system - 0.53 ($p < 0.05$), diseases of the skin and subcutis - 0.82 ($p < 0.01$), and the total morbidity - 0.76 ($p < 0.01$). The only exception was the nosological group of rheumatism in the active phase and rheumatic diseases of the heart, for which the correlation with outside noise was only 0.14 ($p > 0.11$), i.e. was clearly insignificant.

The correlation between the inside noise and the indicated diseases varied in the range from 0.01 to 0.17 and from 0.01 to -0.25 ($p > 0.1$), i.e. was insignificant.

An analogous picture was found in adults. The correlation between the outside noise and malignant tumours was 0.89 ($p < 0.01$), disease of the blood and circulatory organs - 0.77 ($p < 0.01$), disease of the eye - 0.75 ($p < 0.01$), other diseases of the respiratory organs - 0.62 ($p < 0.01$), middle otitis, mastoiditis, diseases of the ear and the mastoid process - 0.92 ($p < 0.01$), hypertonic disease - 0.79 ($p < 0.01$), ischemic heart disease - 0.62 ($p < 0.02$), diseases of other branches of the alimentary system - 0.72 ($p < 0.01$), diseases of the urinogenital system - 0.54 ($p < 0.01$), and total morbidity - 0.72 ($p < 0.01$).

The correlation between the outside noise and diseases of the endocrine system, the upper respiratory pathways, rheumatism in the active phase, chronic rheumatic diseases of the heart, diseases of the skin and subcutis were not significant in adults and had values of 0.03, 0.24, 0.28 and 0.24 ($p > 0.1$).

The correlation between the inside noise and rheumatism and rheumatic diseases of the heart, diseases of the skin and subcutis were significant and had values of 0.76 ($p < 0.01$) and 0.62 ($p < 0.02$).

The correlation between the inside noise and the remaining non-infectious diseases varied in the limits from 0.03 to 0.47 ($p > 0.1$) and from 0.02 to 0.09 ($p > 0.1$), i.e. were not significant.

Noise acts mainly on the central nervous system and then only on the receptors of Corti's organ [5, 8, 9]. The existence of high correlation coefficients between outside noise and non-infectious diseases indicates that the latter arise as a result of the action of a set of anthropogenic agents of the external environment (noise, air, water

and meteorological factors) on the central nervous system and peripheral organs.

Chronic acoustic exposure causes the following stages of changes in the functional state of the nerve cells of the cortex, subcortical and truncal formations of the brain and the body as a whole: stress, temporary over-stress and chronic over-stress [9]. It may be assumed that ecological factors (anthropogenic agents of the atmospheric basin, drinking water and meteorological factors) in the action on humans together with noise cause similar stages. The ecological stress stage can be considered as an adaptation of the body to the action of the external factors, manifested in a mobilization of the reserve forces and compensatory possibilities of the indicated sections of the brain and body as a whole (increase in non-specific and specific resistance) and the temporary over-stress stage as periodic weakening of the adaptive reactions of the body. The chronic over-stress stage is apparently equivalent to neurotic states with disturbances of the functions of the peripheral organs (blood and circulatory organs, chronic and stable increase or decrease of blood pressure, stomach and duodenal ulcers and so on).

Conclusion

A high coefficient of correlation has been found between the outside noise and non-infectious diseases, indicating a cause-effect relationship between them. On this basis, there is a need for timely repair of transport roads, redirection of the traffic flow and the building of bypass roads around cities.

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Flights fewer, complaints fewer still

Fallout from the Sept. 11 terrorist attacks caused takeoffs and landings at Minneapolis - St. Paul International Airport to drop nearly 20 percent recently from a year earlier, while complaints about jet noise plummeted even more - about 60 percent. One theory is that, given the enormity of the September 11 attacks, to complain about noise is currently seen as trivial, so less complaints are being made. Another theory is that the majority of complaints are only triggered when the number of noise-events (ie takeoffs and landings) passes a certain level: 20% less take-offs and landings is sufficient for a proportionately much great decrease in the number of complaints.

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