Bulletin of the *Transilvania* University of Braşov
Series VI: Medical Sciences • Vol. 15 (64) No. 1 – 2022
https://doi.org/10.31926/but.ms.2022.64.15.1.1

STUDY ON THE EFFECT OF NOISE POLLUTION ON PUBLIC HEALTH

L. FLOROIAN[1] A. LUNGU[2] M. BADEA[3]

Abstract: *Pollution is a phenomenon that acts on the whole environment, its cause being the human factor, also being the one that faces the negative effects of these aggressive phenomena, confirmed by the incidence of pathologies of systems in the human body and the presence of both physical and mental imbalance of the body.*
This paper aims to systematize information on noise pollution in the literature that is as relevant as possible about the current state of noise pollution, its sources and effects on the human body. It will also be followed, through a questionnaire-type study, the level of knowledge of the people involved in this study about noise pollution, its effects and the measures to be taken to reduce it.

Key words: *Noise pollution, effects of pollution.*

1. Introduction

The last two decades, worldwide, are represented by "fights" against the phenomena of pollution of the natural environment, the actions being necessary due to the increase of the negative effects on all living organisms.

Sounds are one of the possible sources of danger to human health [2].

If noise exposure exceeds a certain limit, noise pollution occurs, which can cause a wide range of non-hearing effects on health, such as sleep disorders, cognitive impairment in children and cardiovascular disease [15]. Most research on the impact of noise pollution on human health has studied the effect of noise pollution on the hearing system, but some research has looked at the effects of noise pollution on non-hearing systems, which have been shown to cause many disorders or diseases. One of the non-auditory systems that is affected by noise pollution is the

[1] Faculty of Electrical Engineering and Computer Science, *Transilvania* University of Brasov
[2] Faculty of Medicine, *Transilvania* University of Brasov
[3] Faculty of Medicine, *Transilvania* University of Brasov
* lauraf@unitbv.ro

brain and the central nervous system [7].

Discomfort is the most common effect of hearing noises in urban and industrial populations and can disrupt daily activities, feelings, thoughts, sleep and rest and can cause anger, weakness and other behavioral disorders [5].

In addition, exposure to auditory noises can stimulate the autonomic nervous system as well as the endocrine system. This type of noise can lead to cognitive impairment, such as communication difficulties, attention deficit, learning disabilities, or depression [1,2].

There are studies that have shown that loud, in pulses sounds can damage tissues and cause the death of animals that are too close to the source of the noise, but many more people are likely to be exposed to sounds at some distance from the source of the noise. smaller, with effects that are manifested in behavioral rather than physiological.

Thus, the effects of anthropogenic noise can range from small (or short-term) behavioral disorders to large physiological changes, even death.

Noise can affect both the anatomy and morphology of an organism by mechanically damaging single cells or even the entire organ [10].

This paper describes the statistical processing of data obtained from the development and distribution of a questionnaire to highlight the level of knowledge of the population about noise pollution and its effects on the human body, and the measures to be taken to reduce it.

2. Methods

The study is a prospective questionnaire study, which was conducted online, the people chosen to participate in this study being people over 18 years of age living in Brasov County (BV) and Covasna County (CV), counties being the criterion by which the lots for study were defined. This study involved 171 people, 74 of them from Brașov County and 97 from Covasna County, both female and male.

The completed questionnaire is one focused on the subject of noise pollution, which contains several types of questions, namely grid questions with one allowed answer, or with several allowed answers, evaluation scale, answer matrix and information about the respondents.

Some of the 37 questions in the questionnaire were completed after documentation in the literature, and some were inspired by other applied questionnaires [8].

Following the data obtained, statistical processing was performed to characterize the study groups.

3. Result and Discussion

This study involved 171 people, 74 of them from Brasov County and 97 from Covasna County, both female and male.

Because one of the criteria for including / excluding people in this study was the age of over 18 years, participants being of various ages, they also belong to different occupational classes, and after processing the results obtained, the percentages of occupational classes which in this case are quite raised in favour of employees, followed by that of students, the two detaching themselves from the rest of the classes by considerable percentages (unemployed, entrepreneur, pensioner).

As the questionnaire applied to the study participants was distributed online, without a clear criterion regarding the

environment from which the participant comes, the percentage distribution of the media from which they come is as follows: 87.83% urban and 12.16% rural for BV, respectively 35.05 % urban and 64.95 rural for CV.

The first questions of the questionnaire applied to the study participants were simple questions in order to integrate the participant in the context of the problem and to capture their attention in order to provide the appropriate answers. Thus, the first question addressed to the participants was about the phenomenon of pollution in general.

Following the answers received to this first question, we can say that we humans are aware of the reality of this phenomenon called "pollution", a fact supported by the percentages of 100% and 97.94% of the BV and CV lots in which the answer was chosen. exactly what defines the phenomenon of pollution.

The answers given to the question regarding the knowledge of the notion of “noise pollution” were affirmative from 98.64% of the study participants for the BV group and 89.69% for the CV group, respectively.

At present, the acoustic quality of the environment in urban areas is threatened. The urban environment consists of several sound sources: traffic (road, rail, air), industrial facilities, civil engineering and social activities (fairs, parties, outdoor markets, residential noise). All this contributes to the conversion of sound into noise pollution, thus becoming a source of noise pollution. Noise from road traffic is considered the main source of noise in large urban cities [11].

The participants of the study also had to choose from several variants of the answer those that they believe are sources of noise pollution, and after processing, the answers can be seen in Fig. 1.

To find out if the participants are influenced in their decisions about the choice of workplace, home or other level of noise pollution in that environment, the people answers were analysed: 78.37% of the persons belonging to the BV group and 61.86% of those belonging to the CV group take into account the noise in choosing the domicile, this answer being followed by the choice of the place where the persons they spend their free time being represented by 72.97% of the subjects of the BV group and 56.70% of the subjects of the CV group. Regarding the choice of holiday, 67.56% of the participants in the BV group and 62.89% of the participants in the CV group claim that noise is a decisive factor.

In recent years, people's interest in health has grown considerably. This happens either due to an intellectual evolution or for fear of not developing a certain pathology. Study participants were asked if they considered noise to have a direct effect on their health. From the answers received we can see that the subjects of the study groups consider that noise has direct effects on health, 55.40% of people belonging to the BV group choosing the option "Yes, always", and 44.59% of them the option "Yes, sometimes". for the CV group, the variant “Yes, always” was chosen by 45.36% of the participants and respectively “Yes, sometimes” by 54.64% of the participants.

Noise on people has a different effect because everyone has their own tolerance limit. The participants in this study had the opportunity to choose from several negative effects that they consider that noise has on the human body.

Numerous studies have shown that strong discomfort caused by noise has been associated with twice the prevalence of depression and anxiety among the population. The contribution of noise in sleep disorders, fatigue, the development of cardiovascular disease and most severely in hearing loss has also been demonstrated [4, 13, 14].

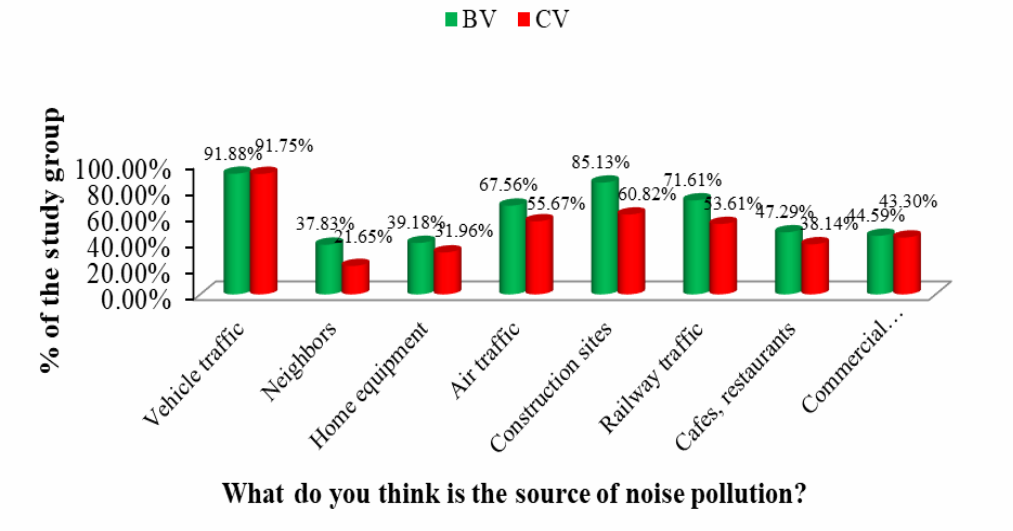

Fig.1. *Distribution of study group responses according to the choice of noise pollution sources*

Following the processing of the answers received, all the negative effects presented to the subjects as response variants accumulated considerable percentages. For the BV study group, 83.78% of the participants chose "lack of concentration", followed by "stress" with 79.72% and "fatigue" and "agitation" with 78.37%, and "sleep disorders" were chosen by 72.97%. "Hypertension" and "hearing loss" were chosen to 13.51% and 37.83% respectively of the subjects of the BV group.

Among the people belonging to the CV group, 72.17% chose agitation, 70.10% "lack of concentration", 69.07% "fatigue", 66.21% "stress", anxiety, hypertension and hearing loss obtaining much lower percentages, namely 40.20%, 10.31% and 37.11% respectively (Figure 2).

In general, noise pollution is not a constant phenomenon in terms of intensity, but depends on the area and the time interval. So, the participants in the study were asked what time of day they feel most disturbed by the noise.

The processing of the obtained data shows that for 41.89% of the subjects of the BV group the noise is the most annoying at night, during the day the noise being considered annoying only for 25.67% of them. The subjects of the CV group chose "night" 31.96% of them, and "day" 32.99%. Some of the study participants claim that they are bothered by noise both day and night, 25.67% of those belonging to the BV group and 28.86% of those belonging to the CV group.

Another question asked the participants in the study about what they think makes the sound unbearable, the answer being presented in Figure 3.

Compared with the data obtained from

a similar study conducted in France, it can be observed that 65% of study participants in France and 39.20% of study participants in

Romania considers that both the volume and the time of exposure to noise make it to make it unbearable.

There are a lot of adverse reactions associated with noise pollution like anger, dissatisfaction, disappointment, isolation, helplessness, anxiety, depression, lack of concentration, fatigue or agitation. Lack of perceived control over noise intensifies these negative effects [12].

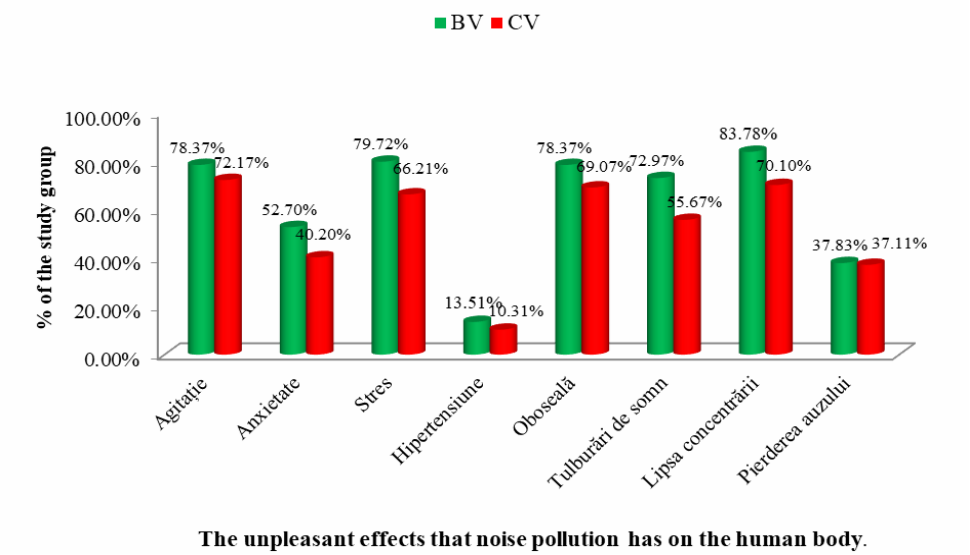

Fig.2. *Distribution of study group responses to the negative effects of noise on the human body*

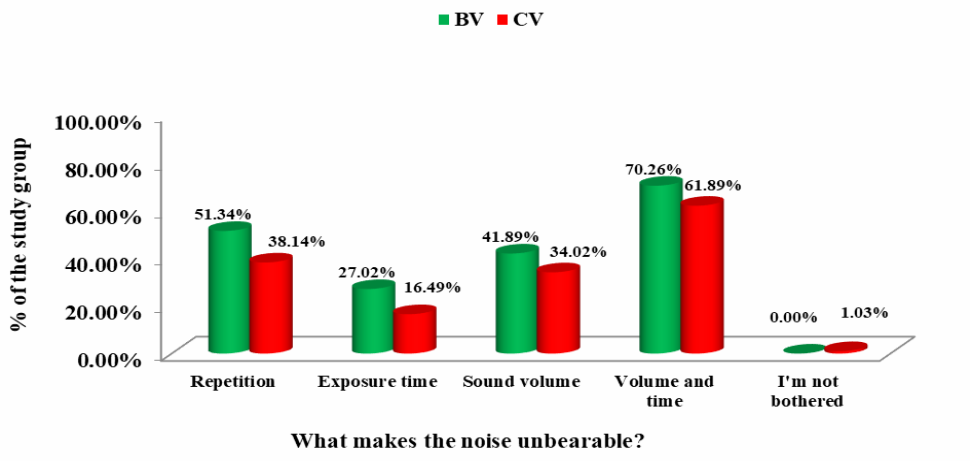

Fig. 3. *Distribution of study group responses regarding characteristics that make the sound unbearable*

The number of pieces of evidence confirming that noise pollution has both temporary and permanent effects on the human body (and other mammals) through the endocrine and nervous systems is constantly increasing [13].

Acute noise exposure activates nervous and hormonal responses leading to temporary increases in blood pressure, heart rate and vasoconstriction. Studies of people exposed to occupational or environmental noise show that prolonged exposure and exposure increases heart rate and peripheral resistance, blood pressure, blood viscosity, blood lipids, changes in electrolytes, and increases in epinephrine, norepinephrine, and norepinephrine [9].

Studies that have been performed on the effects of environmental noise have shown an association between noise exposure and subsequent cardiovascular disease [6].

In Figure 4 the perceived negative effects and the percentages in which they were chosen by the study subjects can be observed.

Of all the negative effects listed, as a percentage, fatigue stands out from the others being chosen by 79.72% and 81.22% of the subjects of the BV group, respectively CV. Also, headache, lack of concentration and irritation are negative effects that were chosen by about 50% of the subjects in both study groups.

Noise pollution is not considered a cause of mental illness, but is thought to accelerate and intensify the latent development of mental imbalances. Noise pollution can cause or contribute to the following side effects: anxiety, nervousness, stress, nausea, emotional instability, headache, mood swings, increased social conflict, hysteria, neurosis and psychosis [9].

Noise pollution also interferes with your ability to understand normal speech and can lead to behavioral changes. These include problems with concentration, uncertainty, fatigue, lack of self-confidence, misunderstandings, irritation, decreased work capacity, and disrupt interpersonal relationships. Some of these effects can lead to communication disruptions and even affect academic performance in children or those who are less proficient in speech language [3].

Participants in this study answered a question about places where they had difficulty holding a conversation because of ambient noise. 62.15% of the subjects of the BV group and 45.36% of those in the CV group claim that they encountered difficulties in cafes / bars / restaurants, on the second place being the public transport in which 41.89% of the BV group and 44 respectively, 33% of the CV group have difficulty in holding conversations.

Although we are concerned about our health and discuss global protection measures against pollutants, we must be aware that every pollution phenomenon, whether it refers to air, soil, water or noise pollution, it has degenerated from our actions, that of the people. In view of this, we asked the study participants if they were considered responsible for certain noise pollution.

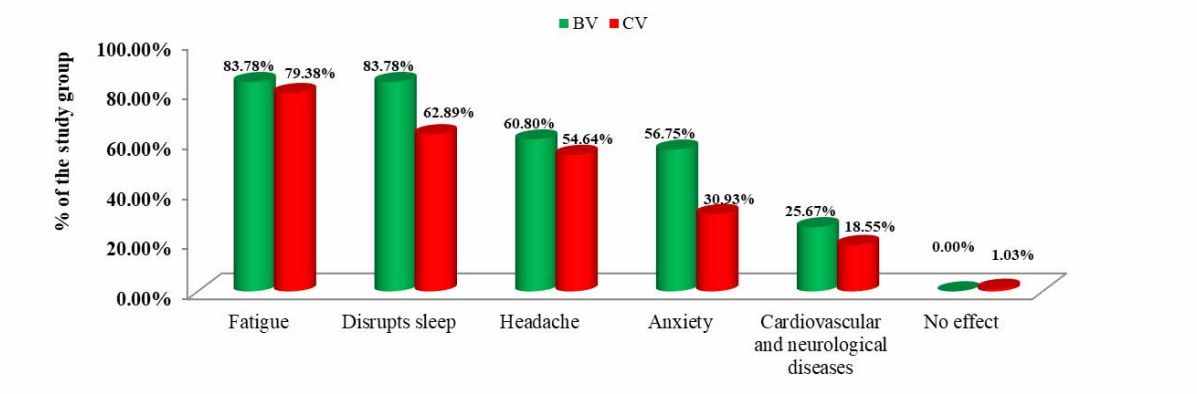

Fig. 4. *Distribution of study group responses to noise effect*

The subjects of the study who claim that they do not feel responsible for noise pollution represent 43.24% of the BV group and 37.11% of the CV group. Approximately 35.13% of people belonging to the BV group and 37.11% belonging to the CV group feel responsible for certain noisy pollution in their homes. Just over 10% of participants in both groups responded that they felt responsible at work or on the street for certain noise pollution.

3. Conclusions

Following the results obtained, it can be confirmed that the people participating in the study belonging to the CV group spend less time in noise-polluted areas.

Regarding the level of knowledge about noise pollution and its negative effects on the human body, the percentage differences between the two study groups are insignificant, which shows that people are aware of the danger posed by noise, feel the effects caused by noise pollution, but cannot be protected from the environment in which they live.

Reducing noise pollution is very important not only for improving the quality of life, but also for maintaining physical and mental health and requires the involvement of all, management, authorities, individuals, legal entities.

Noise pollution is a danger for the entire population which is very difficult to control and which requires the imposition of clear and effective measures to reduce the scale of this phenomenon.

These measures can be integrated into actions aimed at improving aspects of a society, road safety, air quality, bike lanes and so on, but the most effective and necessary method is to reduce noise pollution directly from the source.

References

1. Acharya H, Kusumadevi MS, Shivakumar V. Effect of noise pollution on hearing threshold in school children of Bangalore city. *Journal of Evolution of Medical and Dental Sciences* 2013, 2(12):1840-53.
2. Allahverdy A, Homayoun A. Non-auditory Effect of Noise Pollution and Its Risk on Human Brain Activity in Different Audio Frequency Using Electroencephalogram Complexity. *Iran Journal Public Health* 2016, 45(10):1332-9.

3. Basner M, Babisch W, Davis A, Brink M, Clarck C, Janssen S, Stansfeld S,. Auditory and non-auditory effects of noise on health. *THE LANCET* 2014, 383(9925):1325-32.
4. Beutel ME, Jünger C, Klein EM, Wild P, Lackner K, Blettner M, Binder H, Michal M, Wiltink J, Brähler E, Münzel T. Noise Annoyance Is Associated with Depression and Anxiety in the General Population- The Contribution of Aircraft Noise. *PLOS ONE* 2016, 11(5).
5. Fritschi L, Brown L, Kim R, Schwela D, Kephalopolous S. Burden of disease from environmental noise: Quantification of healthy years life lost in Europe", 2011, www.who.int/quantifying_ehimpacts/ publications/e94888/en/., accesed at 05.07.2019
6. Hahad O, Kröller-Schön S, Daiber A, Münzel T. The Cardiovascular Effects of Noise. *Deutsches Arzteblatt Int*. 2019, 116(14):245-50.
7. Ibrahim I, Aremu A, Ajao K, Ojelabi A. Evaluation of Noise Pollution and Effects on Workers during Wheat Processing. *J. Appl. Sci. Environ. Manage.* 2014, 18(4):599-601.
8. Johnson TA, Cooper S, Stamper GC, Chertoff M. Noise Exposure Questionnaire (NEQ): A Tool for Quantifying Annual Noise Exposure. *Journal of the American Academy of Audiology* 2017, 28(1):14-35.
9. Jariwala HJ, Syed HS, Pandya MJ, Gajera YM. Noise Pollution & Human Health: A Review. Journal of the Gujarat Research; 2017
10. Kunc HP, McLaughlin KE, Schmidt R. Aquatic noise pollution: implications for individuals, populations, and ecosystems. *Proc Biol Sci*. 2016, 283(1836).
11. Paiva Vianna KM, Alves Cardoso MR, Calejo Rodrigues RM. Noise pollution and annoyance: An urban soundscapes study. *Noise Health* 2015, 17(76):125-33.
12. Parajuli S. Noise Mapping of an Educational Enviromment: A Case Study of South Dakota State University 2018, Electronic Theses and Dissertations, 2863.
13. Smith RB, Fecht D, Gulliver J, Beevers SD, Dajnak D, Blangiardo M, Chosh RE, Hansell AL, Kelly FJ, Anderson HR, Toledano MB. Impact of London's road traffic air and noise pollution on birth weight: retrospective population based cohort study BMJ 2017, 359.
14. Sułkowski W, Owczarek K, Olszewski J. Contemporary noise-induced hearing loss (NIHL) prevention. *Otolryngol Pol*. 2017; 71 (4): 1-5.
15. Van Kempen E, Babisch W. The quantitative relatonship between road traffic noise and hypertension: a meta-analysis. *J. Hypertens*. 2012, 30(6):1075-86.