



# INJURIES FROM INDUSTRIAL NOISE AMONG METALLURGICAL WORKERS IN BULGARIA

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## Introduction

Sound represents mechanical vibrations transmitted through an elastic medium. When sound is perceived as unpleasant, irritating, or without informational value, it is defined as noise. In most manufacturing industries, occupational exposure to high noise levels remains a significant health risk.

Prevention of diseases associated with excessive occupational noise requires continuous monitoring and systematic risk assessment, particularly in metallurgical production. Major noise sources in metallurgy include electric arc furnaces, sintering processes, and ore preparation units.

In 2006, Bulgaria adopted Regulation No. 6, which sets the minimum requirements for ensuring the health and safety of workers exposed to noise-related risks. This regulation introduced hygienic standards defining exposure limit values and action levels. The upper exposure action value is set at 85 dB (A). Steel production is one of the noisiest industrial sectors, where noise levels often exceed the safe limit of 85 dB(A) and can reach over 115-120 dB(A) in certain areas. Due to the work with heavy metal, high temperatures and powerful machinery, noise exposure is a serious risk to workers' health. The actual exposure level of workers must be assessed, taking into account the attenuation provided by personal protective equipment.

## Aim

The aim of the study is to clarify the impact of industrial noise on metallurgical workers and to propose measures for the prevention of health damage in the professional group under consideration.

## Materials and Methods

The subject of the study are 170 people working in a steel production company in Bulgaria. In view of the aural and extraaural effects of industrial noise, the study used clinical, laboratory, functional and instrumental diagnostic methods. A blood test was performed (complete blood count, glucose, urea, creatinine, electrolytes); X-ray examinations, an electrocardiogram an audiogram and a consultation with an otorhinolaryngologist were performed on all examined individuals. Hearing impairment and accompanying diseases in the studied individuals were examined.

The data from the study were processed with software statistical packages Statgraphics Pro for Windows, MS Excel 2016.

## Results and discussion

Damage to the investigated workers, exposed to industrial noise is manifested by decreased hearing and tinnitus. In 70% of the examined persons with more than 10 years of work experience, socially significant diseases were found.

The total number of people observed was 170, of whom 162 were men and 8 were women (Figure 1).

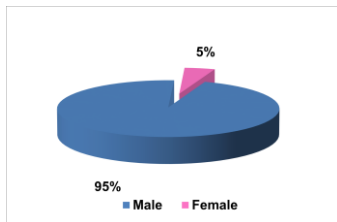


Figure 1.

The age distribution is from 29 to 66 years, with a mean age of  $55.21 \pm 8.46$  years (n=170) (Figure 2).

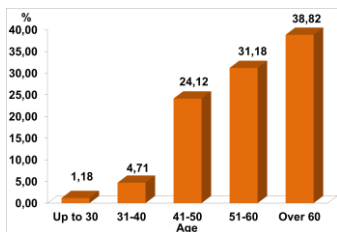


Figure 2. Distribution by age

The work experience of the surveyed workers, related to contact with industrial noise, is over 5 years (from 6 to 30 years), on average  $17.37 \pm 4.04$  (n = 170) years. (Figure 3).

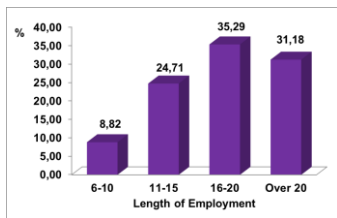


Figure 3. Distribution by work experience

Damage to the investigated workers, exposed to industrial noise is manifested by decreased hearing, tinnitus and vestibular disorders. People with hearing loss - 85%. People with vestibular disorders - 15% (Figure 4).

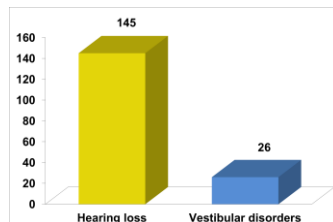


Figure 4. Distribution by diagnoses

From the hearing examination with pure tone threshold audiometry: bilateral sensorineural hearing loss within  $30 \pm 50$  dB (for the low-frequency spectrum) and  $40 \pm 75$  dB (for the high-frequency spectrum).

In 70% of the examined persons with more than 10 years of work experience, socially significant diseases were found. These were 109 workers surveyed (Figure 5).

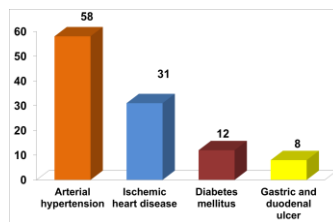


Figure 5. Socially significant diseases

## Conclusion

Injuries from industrial noise are a current healthy problem for metallurgical workers. Professional experience and the characteristics of the working conditions in the cases discussed are a prerequisite for the presence of occupational hearing loss. The prolonged impact of industrial noise predisposes to socially significant diseases such as diabetes mellitus, coronary heart disease, arterial hypertension, etc. A hearing test should be performed during periodic preventive examinations.

## Recommendations

1) Control measures: Use of soundproof booths, acoustic enclosures, machine upgrades, and mandatory personal protective equipment (earmuffs). To ensure a rational work and rest regime during work.

2) Noise levels are highest in smelting and rolling mills, requiring strict control and monitoring to protect workers from permanent damages.

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