


## Chainsaw operators' exposure to occupational risk factors and incidence of professional diseases specific to the forestry field

Marius D. Iftime<sup>a</sup>, Adela-Eliza Dumitrascu <sup>b\*</sup> and Valentina D. Ciobanu<sup>a</sup>

<sup>a</sup>Department of Forest Engineering, Forest Management Planning and Terrestrial Measurements, Transilvania University of Brasov, Romania; <sup>b</sup>Department of Manufacturing Engineering, Transilvania University of Brasov, Romania

**Purpose.** This article focuses on detailed studies regarding the analysis of occupational risk factors on health and occupational disease, namely, the influence of noise, hand–arm vibration, wet bulb globe temperature (WBGT) index and exposure to particulates. **Methods.** This study measured the equivalent acoustic level ( $LA_{eq}$ ), daily vibration exposure ( $A(8)$ ), WBGT index and particulate concentration in the respirable area of the worker. The inferential analysis consisted of the application of specific statistical methods: a probability plot with 95% confidence interval, the Anderson–Darling statistic and 87th percentile estimation. A sample of 107 chainsaw operators was medically evaluated, out of which 30 workers were suspected of having professional pathologies and were hospitalized in the university clinic. **Results.** The measurements highlight: exceeding the legal limit for noise exposure; 13% of cases exceeding the limit of  $2.5 \text{ m/s}^2$  for hand–arm vibration; dust exposure generally within legal limits; WBGT shows the thermal stress of the workers. Following the medical evaluation, osteomusculoskeletal disorders (25.23%), Raynaud's syndrome (0.93%) and bilateral hearing loss (3.74%) were identified. **Conclusions.** Analysis of the levels of exposure to the risk factors, the typology and the incidence of occupational diseases requires the need to adopt new preventive measures.

**Keywords:** chainsaw operator; exposure to risk factor; probability plot; Anderson–Darling statistic; 87th percentile estimation; occupational disease; professional pathologies

### 1. Introduction

The assessment of professional risk factors aims at preventing occupational hazards, training and informing workers as well as implementing a management system that allows effective implementation of the necessary measures [1–4]. That is why alignment of goals, desires and motivations is essential – people who share common goals communicate better, are more efficient and feel more comfortable during the working process. Thus, organizational risks are easier to manage, and people are aware of the importance of their work. Assessing occupational health and safety and preventing accidents and occupational illnesses should be a priority for any organization. In this way, an appropriate working environment can be ensured in accordance with the work done by the performer, and also contributes to increasing labour productivity by adapting work.

Under national and international norms, employers must take the necessary measures for the safety and health protection of their workers, including the prevention of occupational risks. This is quite a fundamental principle in the law of many countries [3,5–7].

In the forestry field, workers are exposed to occupational hazards. The harvesting of wood using chainsaws is one of the most dangerous tasks carried out in forests. Accidents with chainsaws are generally severe [8].

Working conditions are difficult due to the presence of these numerous occupational hazards. The main physical factors that pose a health risk are noise and vibration produced by exposure to forest work [9–11]. The carbon monoxide exposure emitted by chainsaws can negatively impact health in forestry workers [12]. Also, the wet bulb globe temperature (WBGT) is still widely used in the management of occupational health for the evaluation of heat stress conditions [13,14]. Also, the exposure of chainsaw operators to excessive physical exertion is a significant risk factor in the occurrence of professional osteomuscular diseases. In the harvesting wood process, the consumption of kilocalories during the operations is as follows: felling, 7.77 kcal/min; sectioning, 6.80 kcal/min; trimming, 7.15 kcal/min [15]. It follows that these activities fall into the category of those with very high physical exertion.

When referring to the health condition of exposed forest workers, despite technological and ergonomic improvements, some risk factors are still relatively high, and some new risks have emerged [16,17]. The operators' exposure to such harmful factors, as well as the difficulty of the work experienced by the operators, depend to a great extent on the particularities of operational conditions, which vary widely in forestry and which, by the recommended and adopted work procedures as well as by the specific time

\*Corresponding author. Email: [dumitrascu\\_a@unitbv.ro](mailto:dumitrascu_a@unitbv.ro)