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An evaluation of the occupational accidents among logging workers within the boundaries of Trabzon Forestry Directorate, Turkey

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ABSTRACT

The aim of this study was to determine the frequency of occupational accidents among logging workers and the risk factors involved. Data for 378 out of 2994 members of 24 cooperatives engaged in logging in the study area were gathered using face-to-face questionnaires and anthropometric data via the free measurement method. The annual logging accident frequency rate was 30.4%, and the annual incidence of occupational accidents was 2052.9. The accident risk among workers using hookaroons was 2.14 times greater than the risk among those not using them. Five to six rest breaks a day increased the accident frequency rate by 0.37 times. The foot width, which was one of the variables among the measured anthropometric data, was observed to increase the accident risk 0.68 times. The likelihood of an employee suffering from an accident during the working year correlated with the handling of chainsaws, the use of hookaroons, smoking, the number of breaks taken while working, experience, shoulder and knee height, leg and arm length and hand and foot width.

Relevance to industry: Even though Turkey is one of the countries in which occupational accidents are frequent, studies or records concerning occupational accidents involving logging workers are currently lacking in Turkey. In this study, the occupational accidents in the forest-wood industry were analyzed, and the methodology for obtaining the data in this industry was described. The results emphasize the magnitude of occupational accidents in forestry in Turkey.

1. Introduction

The principal timber harvesting system in a number of countries, such as Turkey and Greece (Gallis, 2006), consists of motorized-manual logging-harvesting. Gallis (2006) indicated that motorized-manual timber cutting-harvesting operations, such as cutting, felling, limbing, debranching, debarking, cross-cutting, classification, extraction, loading and transporting, are among the most difficult and labor-intensive types of physical work.

Forestry-related activities take place far from main settlement locations and usually require long-term accommodation at the work site on steep, rough ground and under varying climatic, plant cover and terrain conditions. Due to the heavy physical demand of tasks, such as lifting and carrying heavy loads, the frequent repetition of bending, kneeling and reassuming an upright posture, as well as various negative environmental factors, such as extreme heat, high humidity, wind, snow and rain, noise, vibration, gas and dust, energy consumption is high among logging workers. Logging is recognized as a very hazardous occupation with high injury frequency rates (Sullman et al., 1999) and Forestry work is generally characterized by a combination of personal and environmental risks to the health and safety of the workers within the industry (Lilley et al., 2002). Tsioras et al. (2014) reported that timber harvesting, with or without machinery, is difficult, especially on steep slopes and is connected to high accident risk (Tsioras et al., 2014). Logging activities also appear as a risk group in the “Risk Groups Regarding Occupational Health and Safety Declaration” published in Turkey (The Official Gazette of Turkey, 2004). For the above mentioned reasons and such other reasons, forestry working activities are defined into “hard work category” by the International Labor Organization (ILO) (ILO, 1998).

According to occupational accident reports gathered from a number of selected ILO member states, the average estimated fatal occupational accident frequency rate resulting in fatalities in

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forestry, logging and related services was 14.0/100,000 workers, and the number of fatal accidents was 335,000 (Hamalainen et al., 2006). In Swedish, the frequency of fatal accidents is 13.6/100,000 and the trend appears to be on the increase (Thelin, 2002). According to another study in the same scope published by ILO, the number of non-fatal accidents reported involving equal to or more than three days' off from work varied between 23,545 and 26,370 between 1999 and 2004, respectively; the above data cover the EU, which consisted of only 15 countries from 1999 through 2004 (Malcolm, 2009).

Other factors that contribute to occupational health problems are summarized in the Ergonomic Guidelines for Forest Machines (Gellerstedt, 2000). These factors include having little opportunity to influence the work, a poor psycho-social environment, little recognition for work performed, low self-esteem, lack of experience of the work, smoking, poor physical fitness and a previous history of muscular and joint disorders. These problems may be overcome by providing education and training, as well as by reorganizing the work (Synwoldt and Gellerstedt, 2003). Self-reported data regarding the general activities of forest workers while working in the woods were collected from 156 self-employed small-scale forestry workers, and no significant relationships were determined between the production level, age, use of safety gear or sensation seeking tendencies and the reports of accidents and incidents (Neely and Wilhelmson, 2006). In a study of 251 individuals working in timber processing conducted in Maine, USA, Holcroft and Punnett (2009) determined via multivariate analyses that the variables associated with injury risk were a high physical workload, machine-paced work or an inability to take a break, lack of training, absence of a lockout/tagout program, low seniority and male gender (Holcroft and Punnett, 2009). These factors may increase mental stress, muscular load and the strain on the locomotive systems to ultimately result in musculoskeletal disorders (Gallis, 2006) and occupational accidents.

Although “occupational accidents” are defined in Turkey in Article 13 of the Law on Social Security and General Health Insurance, Law No. 5510, the full scale of these accidents is unknown because of unregistered employment and the inadequate nature and inaccurate maintenance of occupational health records. As such, the situation has been described as “the tip of the iceberg.” Nonetheless, the available data indicate that Turkey is one of the countries in which industrial accidents are common (Bilir and Yılmaz, 2004). According to Turkish Social Security Institution records, a total of 80,602 occupational accidents occurred among 8,550,390 insured workers in 2007, of which 1043 proved fatal. The only reliable data somewhat related to harvesting were Turkish Social Security Institution records that showed 36,506 insured workers in paper and lumber production (SSK, 2012).

The number of workers engaged in logging, the risk factors involved and the prevalence and incidence of occupational accidents among them are unknown in Turkey because reliable data concerning these issues are not available. Thus, this study intended to determine the work-related accidents during forest harvesting and the possible risk factors leading to said accidents. To this end, face-to-face questionnaires were performed to establish the work site conditions of logging workers, and anthropometric measurements were also collected.

2. Materials and methods

2.1. Population and sample size

This study was conducted within the boundaries of the Trabzon Regional Forestry Directorate, comprising the provinces of Trabzon, Gumushane and Rize, between April and September of 2007. A total of 2994 logging workers belonging to 24 cooperatives in the three provinces in the region represented the study population.

The sample size was calculated based on a 50% prevalence (P) of occupational accidents with a 5% uncertainty level (D) using the formula “$n = (Z^2NPQ)/(ND^2 + Z^2PQ)$” ($Q = 1 - P$; $N = 2994$, population; $Z = 1.960$, with 95% CI) (Ozdamar, 2001). We estimated that this uncertainty level would necessitate studying 341 logging workers. However, this number was increased by a further 15% because of possible reductions in the number of subjects available due to refusal to participate, etc., in the study. Our target was 390 workers, and 378 were eventually enrolled (a participation rate of 96.9%).

2.2. The screening survey

The multi-stage sampling method was employed. Lists of village cooperatives and workers registered with them were first obtained, and the sample size was determined according to these cooperatives. The sample size to be taken from each cooperative was calculated, following which the names and surnames of workers to be included in the study were acquired via systematic sampling and a sampling list was established. The identified workers were presented with a questionnaire on the subject with face-to-face interviews, and anthropometric measurements were also taken simultaneously.

The questionnaire contained questions about the workers' sociodemographic characteristics (15), personal habits (11), work experience (8), working and the number of days worked (10), the number of occupational accidents suffered and risk factors (17), resulting in a total of 61 questions. In this study, an injury is defined as an intentional wound or damage to the body resulting from falling because of slipping, being struck by logs, timber or the like, being struck by tool or machinery being used, being struck by falling trees, being caught between two objects of workers. Included are open wounds, intracranial and internal injuries. The following questions pertained to the occupational accidents:

1. Did the injury result in damage to your body/extremities? Possible injury-prone organs were the feet and toes, vertebrae (thoracic and lumbar region), legs, pelvis, hands and fingers, knees, arms, ribs, head, shoulder, ear and neck.
2. Would you describe the nature of your injury? Injury types were cuts and lacerations, sprains and strains, crushing and bruising, broken bones/fractures, splinters entering the eye, joint dislocations and internal bleeding.
3. What did you do after the injury had occurred? Steps taken following accidents were measures taken by bystanders and immediate transportation to the nearest health institution.
4. Was there a first aid kit or any certified personnel on site to administer or to attend to you? A positive or negative answer was expected.

2.3. Anthropometric measurements

The anthropometric data and weights shown in Fig. 1 were measured during the study. Measurements were taken with a 1.50 m measuring rod, a 30 cm and 60 cm steel compass and gram-sensitive scales.

2.4. Classifications

Injuries resulting from workers being struck by falling trees, slipping or falling, being struck by a log or other pieces of timber, being struck by a tool or machinery being used, being caught