# CHARACTARISTICS OF INDUSTRIAL FALL ACCIDENTS IN ELDERLY WORKERS IN JAPAN

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In this study, to examine the necessity of reducing injury risks of fall, the characteristics of industrial fall accidents in the young to middle-aged group (20-49 years) and elderly group (50-69 years), based on reports of more than 4 days of absence from work in 2006, were analyzed. The random sample data represented 25.5% of all reports examined, from which human-induced accidents (n = 5,709) were extracted. From the descriptions of each report, these data were classified into slipping, tripping, and others. Because we found that the most frequent accidents were falls caused by slipping (> 4 times), regardless of age, this study focused on accidents caused by slipping. The prevalence of falls caused by slipping in the elderly group was estimated as being twofold of that in the young to middle-aged group. Upper limb fractures occurred in 46% of all accidents caused by slipping in the elderly group. In particular, it was found that wrist fracture was the most frequent fracture in the elderly group, accounting for 60% of all upper limb fractures. To prevent industrial fall accidents caused by slipping, the following two preventive measures are suggested: the use of footwear with adequate slip resistance and examination of protective equipment for wrists fracture in elderly workers.

## Introduction

In recent years, the large number of falls in industrial accidents has become an issue. Falls were the most common type of accident, accounting for 17.8% of all industrial accidents resulting in leave of four or more days in 2005 (Ministry of Health, Labour and Welfare, 2013). This situation has not improved in the eight years up to 2012, with the proportion actually rising to 21.7% (Ministry of Health, Labour and Welfare, 2013). Roughly 40% of all industrial accidents occurred in tertiary industries, with retail and social welfare facilities reported as being the two sectors in which the most falls occur, accounting for 31.3% and 29.1% of all falls respectively. The percentage of elderly workers above 50 years is also known to be high. While countermeasures are urgently required with the increase in falls, there are no statistics or reports covering all types of industry and examining the relationship between situations that lead to falls, types of injury, and sites of injury, which is basic information required to examine countermeasures. Injury is likely to be particularly serious for elderly workers, who account for a large proportion of those injured. As returning to work may be hindered by aftereffects, it is important to understand the situations in which elderly workers fall and how they are injured and to investigate possible countermeasures for such circumstances. Therefore, the purpose of this study was to divide falls into the main causes of “slipping” and “tripping” based on descriptions of the accident reports, and to calculate frequency of falls according to cause. In order to understand the details of accidents common in elderly workers, we also compared type of injury, site of injury and number of absence days by age group, and investigated future countermeasures while analyzing the existence of characteristics of cases in which elderly workers were affected.

## Methods

Data were sampled randomly 34,195 cases from the reports of more than 4 days of absence from work in 2006 by Ministry of Health, Labour and Welfare (25.5% of all cases). Of these, we analyzed cases where the type of accident had been a fall. However, since this study targeted human-induced falls, falling from heavy machinery such as cranes and falling from vehicles while riding such as bicycles and motorcycles were excluded. Therefore, a total of 5,709 cases were extracted for data analysis. Accidents were divided into "slipping," "tripping" or "others". The categorized data was further divided into 20 to 49-year-olds (young to middle-aged group) and 50 to 69-year-olds (elderly group) and compared according to type of injury and injured site.

## Results

*The number of accidents of each type of fall by age group*

Figure 1 shows falls divided into the three causes. There were 2,421 cases of slipping, accounting for 42.4% of falls in all ages, which was two times more frequent than tripping, which accounted for 1,090 cases (18.0%). Falls were more common in the elderly group in regard to everything when subjects were looked at according to age group, and the proportion of slips for the entire elderly group was 43.6%. This was slightly higher than all other ages. The elderly group also scored slightly higher for tripping, at 19.5%. Therefore, the effect of age was suggested for both slipping and tripping, but we decided to focus on and analyze "slipping" when later comparing different age groups because slipping was an extremely common cause of falls in industrial accidents.

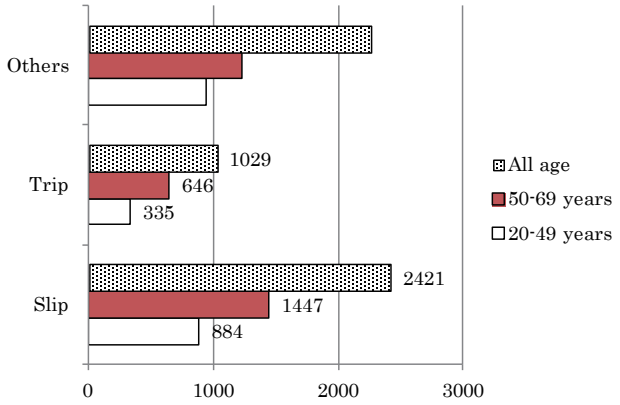


**Figure 1 The number of accidents of each cause of falls by age group**

*Type of injury in falls caused by slipping by age group*

Figure 2 shows the number of cases by age group and the number of cases by type of injury of falls caused by slipping. When all falls caused by slipping were compared by age group, the elderly group comprised 1,447 cases and the young to middle-aged group comprised 884 cases, with the number of cases for the former being more than 1.6 times higher. Fractures were the most common type of injury in both age groups. Fractures accounted for 72% of all injuries in the elderly group and 54% in the young to middle-aged group (Figure 2).

*Type of injury by age group in falls caused by slipping*

As mentioned above, fractures were the most common injury in falls caused by slipping; therefore, we aggregated injury sites by age group solely in regard to fractures. Results revealed that in the young to middle-aged group, lower limb fractures were most common (40%), followed by upper limb fractures (26%). In contrast, upper limb fractures were most common in the elderly group (46%), accounting for nearly half of the total, followed by lower limb

fractures (25%) (Figure 3). No differences were found for other sites.

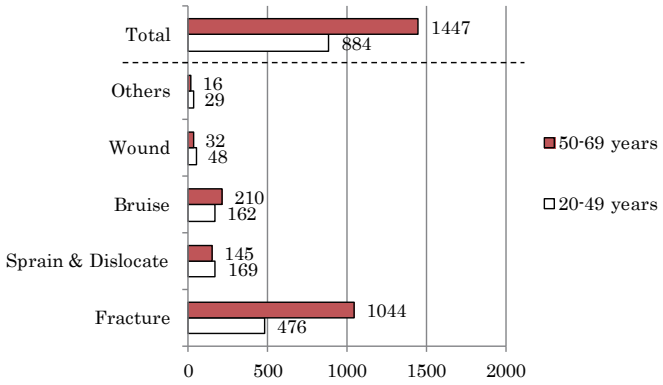


**Figure 2 The number of accidents of each type of injury by age group in regard to falls caused by slipping**

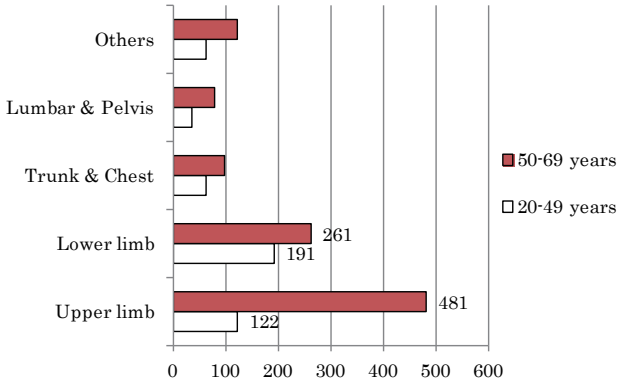


**Figure 3 Accidents for each injury site by age group in regard to fractures from falls caused by slipping**

*Upper limb fracture sites by age group in falls caused by slipping*

Upper limb fractures were the most common in the elderly group in regard to fractures from falls caused by slipping, followed by lower limb fractures (which were most common in the young to middle-aged group); therefore, we aggregated detailed fracture sites by age group for upper and lower limbs. Wrist fractures were most common in the upper limbs for both age groups, and accounted for 60% in the elderly group, which was 20% higher than the young to middle-aged group (Figure 4).

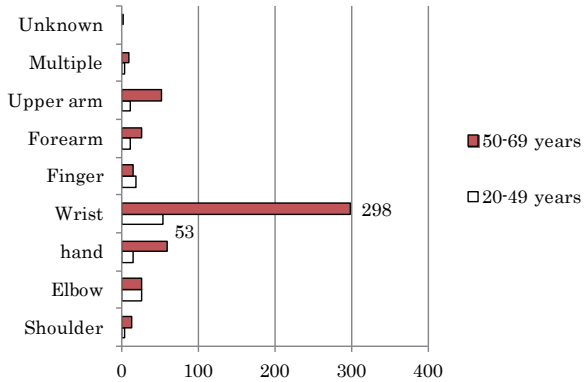


**Figure 4 Upper limb fracture sites in falls caused by slipping**

## Discussion

Slipping caused over 40% of all falls regardless of age, making it the most common cause. This suggested the importance of prioritizing the development of slipping countermeasures. Specifically, these countermeasures included measures for improving the facilities such as laying out anti-slip flooring, wearing slip-resistant shoes (e.g. protective footwear), and educational and managerial measures such as always wiping wet floors. However, measures for facilities incur significant costs, and educational and managerial measures as difficult as they require both time and understanding in order to establish a system. In contrast, wearing slip-resistant shoes is relatively reasonable to introduce in terms of both time and cost and fixed results can be obtained. The spread of slip-resistant shoes is therefore preferable as a realistic countermeasure for slip-prevention. Next, in regard to the characteristics of falls caused by slipping in the elderly group, this study found the number of cases to be approximately 1.6 times higher than the young to middle-aged group, which was corroborated by the large number of falls by elderly workers reported so far. However, the population of employee, which was the denominator of both groups, differed between groups; as a result, it is difficult to compare directly. Therefore, when we compared the number of employees in 2006 (Ministry of International Affairs and Communications, 2013) as the closest denominator of both groups despite not being entirely consistent because this included the self-employed, there were 3,868 cases among 20 to 49-year-olds and 2,451 cases among those aged 50 years or over, with 1.58 times more cases in the elderly group. Based on these results, the number of accidents involving elderly workers may at the very least be two times higher than that of young workers. The trend for all ages in the case of slipping is a 50% chance of fractures. Therefore, the seriousness of slipping must be recognized and it should be emphasized in particular to elderly workers due to their even higher chance of injury.

Upper limb fractures were more common in the elderly group, particularly around the wrist. Therefore, defensive motions and behavior when slipping may have been influenced by age-related changes. More specifically, the stepping motion required to protect against falls cannot be performed satisfactorily due to the decline in muscle strength and agility (reduction in fast-twitch muscle fiber, decreased reaction time etc.) and the individual is not fast in placing their hands on the floor. Furthermore, it may be important to keep wrist fractures in mind in fall countermeasures for elderly workers, since loss of bone density and decreased viscosity and elasticity of subcutaneous tissue in elderly individuals are associated with the degree of severity. However, we could not obtain information such what kind of situations hands were used to break falls in or whether individuals were unable to use their hand to break a fall from the subject data used in this study. Consequently, we were unable to investigate the effect of reducing the risk of injury through the use of protective equipment for the distal end of the forearm bone in this study.

## References

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