

# Risk Factors Influencing the Occurrence of Injuries in Koreans Requiring Hospitalization

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**Purpose:** This study focused on local communities and the factors influencing injuries requiring hospital admission that affect the quality of life for Koreans. **Materials and Methods:** This study used data collected from 4,400 households during the 2001 Korea National Health and Nutrition Examination Survey (KNHANES). A stratified multistage probability sampling method was applied and the final sample included 7,924 subjects over 20 years old who had completed the questionnaire regarding factors influencing injuries requiring hospital admission. Multiple logistic regression analysis was used to estimate the risk factors influencing injuries. **Results:** The incidence of injuries requiring hospital admission in Koreans was higher in men than in women at 2.3% (95% CI: 1.8-2.8) and 1.7% (95% CI: 1.3-2.1), respectively. Statistically significant factors affecting the occurrence of injuries requiring hospital admission were marital status (OR: 2.60, 95% CI: 2.22-5.56), state of health (OR: 0.63, 95% CI: 0.43-0.92), frequency of heavy drinking (OR: 1.96, 95% CI: 1.01-3.79), normal physical activities (OR: 1.68, 95% CI: 1.07-2.65), and sleep (OR: 1.54, 95% CI: 1.01-2.35). **Conclusion:** The results of this study can be used to develop measures to prevent fatal injuries and be used as basic data for community health programs.

**Key Words:** Injuries, risk factors

## INTRODUCTION

Fatalities from various types of injuries are relatively common, with the greatest number in the under-30 age group.<sup>1</sup> Serious injuries can adversely affect not only the injured person, but

also their families and friends, increasing their physical, mental, and socioeconomic burden. Consequently, injuries constitute one of the biggest problems in public health. For these reasons, activities to prevent injuries and studies leading to an understanding of the risk factors related to injuries are currently being conducted. Studies of the risk factors related to injuries are usually based on analyses of the subjects in high-risk groups. Such studies have identified the following factors: patterns of drinking,<sup>2-6</sup> substance use (prescription/over-the-counter medication or illicit substances)<sup>7,8</sup> and risk-taking behavior by the person who was injured.<sup>9-14</sup> Studies have also reported that parental behavior is a risk factor for injuries in preschool age children.<sup>12-14</sup>

In addition to studies of specific risk groups, other studies have examined active teenagers and preschool children<sup>15-18</sup> as well as incidence rates and risk factors in the elderly whose quality of life deteriorates with serious complications following injury.<sup>19-24</sup> These studies examined patients with injuries who were admitted to hospitals or limited their subjects to the patterns and places associated with injuries. By contrast, this study examined factors in local communities that were related to injuries requiring hospitalization that can affect the quality of life for Korean individuals.

## MATERIALS AND METHODS

### Study subjects

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amination Survey (KNHANES) has been conducted by the Korean Ministry of Health and Welfare every three years since 1998 and includes non-institutionalized Korean civilians. This study was based on data from the 2001 KNHANES, which used a stratified multistage probability sampling design. This study chose 7,924 inpatients over 20 years old who responded to a survey on the factors influencing injuries requiring hospital admission.

### Definition of injury

The definition of injury used in this study is based on hospital admission resulting from accidents or intoxication and the reference period includes all occurrences within one year of the start of the investigation. This study examined a population from local communities and restricted the range of injuries to those recalled by the subjects from their past. The causes of the injuries were classified using the International Statistical Classification of Disease and Related Health Problems, 10th revision (ICD-10).

### Statistics

Variables that influenced the general characteristics of the subjects and the severity of their injuries are reported as a frequency and a percentage. The incidence of injuries requiring hospital admission was given as a percentage with a 95% CI and classified according to sex and age. Multiple logistic regression analysis was used to estimate the risk factors influencing injuries and the data was analyzed statistically using SPSS version 11.0.

## RESULTS

The characteristics of the subjects are summarized in Table 1. The incidence of injuries in Koreans requiring hospital admission was higher in men than in women at 2.3% (95% CI: 1.8-2.8) and 1.7% (95% CI: 1.3-2.1), respectively. The statistically significant variables that affected the occurrence of injuries were 'marital status', 'state of health', 'frequency of heavy drinking', 'normal

physical activities' and 'sleep'. For marital status, people who were divorced, widowed, or separated had a significantly higher incidence of injuries than those who were not (OR: 2.60, 95% CI: 2.22-5.56). For state of health, the subjects who considered themselves healthy had a significantly lower incidence of injuries than those who responded 'unhealthy' (OR: 0.63, 95% CI: 0.43-0.92). Concerning the relationship between drinking habits and the incidence of injuries, there was no significant result for alcohol consumption, but the subjects who responded that they drink heavily often had a higher incidence of injuries than those who never overindulged (OR: 1.96, 95% CI: 1.01-3.79). For normal physical activities, the subjects with a job requiring a considerable amount of activity had a significantly higher incidence of injuries than those with a less active job (OR: 1.68, 95% CI: 1.07-2.65). For sleep, the subjects who slept for less than five hours a night had a significantly higher incidence of injuries (OR: 1.54, 95% CI: 1.01-2.35).

## DISCUSSION

This study surveyed local community residents to identify factors that affect the incidence of injuries requiring hospital admission in Korea. Primarily using the medical records of injured patients, previous studies have analyzed risk factors influencing injuries requiring hospitalization, including fatal injuries. By contrast, this study analyzed the relationship between the normal habits of the subjects and risk factors contributing to injuries leading to hospitalization for the Korean population at large.

The results of this study could be used to develop measures for preventing severe or fatal injuries and they may be used as basic data for community health programs.

The results of this study showed a relationship between the marital status of the subjects and injury occurrence. The subjects who were divorced, widowed, or separated, had a significantly higher incidence of injuries requiring hospital admission than other groups (OR: 2.60, 95% CI: 2.22-5.56). Previous reports show the incidence of injuries for the elderly is higher for

**Table 1.** Characteristics of Study Subjects

| Variable                    | Measurement                    | No. of men (n = 3,608) | No. of women (n = 4,316) |
|-----------------------------|--------------------------------|------------------------|--------------------------|
| Age (yr)                    | 20 - 39                        | 1,588 (44.0)           | 1,888 (43.7)             |
|                             | 40 - 59                        | 1,433 (39.7)           | 1,556 (36.1)             |
|                             | 60 +                           | 587 (16.3)             | 872 (20.2)               |
| Education level (yr)        | ≤ 9                            | 925 (25.7)             | 1,732 (40.2)             |
|                             | 10 - 12                        | 1,311 (36.4)           | 1,551 (36.0)             |
|                             | 12 <                           | 1,367 (37.9)           | 1,028 (23.8)             |
| Income (\$/month)           | ≤ 1,000                        | 901 (26.4)             | 1,255 (31.0)             |
|                             | 1,001 - 3,000                  | 2,160 (63.3)           | 2,370 (58.5)             |
|                             | 3,001 <                        | 349 (10.2)             | 424 (10.5)               |
| Marital status              | Not married                    | 708 (19.6)             | 592 (13.7)               |
|                             | Married                        | 2,751 (76.2)           | 2,985 (69.2)             |
|                             | Divorced / widowed / separated | 149 (4.1)              | 737 (17.1)               |
| Health status               | Good                           | 1,938 (53.7)           | 1,983 (45.9)             |
|                             | Moderate                       | 1,182 (32.8)           | 1,444 (33.5)             |
|                             | Bad                            | 488 (13.5)             | 889 (20.6)               |
| Stress                      | Severe                         | 1,269 (35.2)           | 1,477 (34.2)             |
|                             | Moderate                       | 1,739 (48.2)           | 2,076 (48.1)             |
|                             | Never                          | 598 (16.6)             | 760 (17.6)               |
| Depression                  | Always                         | 208 (5.8)              | 468 (10.9)               |
|                             | Sometimes                      | 1,695 (47.2)           | 2,559 (59.5)             |
|                             | Never                          | 1,689 (47.0)           | 1,275 (29.6)             |
| Health concern              | Always                         | 615 (17.1)             | 1,010 (23.4)             |
|                             | Sometimes                      | 1,991 (55.2)           | 2,335 (54.2)             |
|                             | Never                          | 998 (27.7)             | 966 (22.4)               |
| Alcohol consumption         | Never                          | 983 (27.2)             | 3,020 (70.0)             |
|                             | Moderate                       | 1,354 (37.6)           | 1,039 (26.4)             |
|                             | Heavy                          | 1,271 (35.2)           | 157 (3.6)                |
| Frequency of heavy drinking | Never                          | 996 (27.6)             | 3,030 (70.2)             |
|                             | Sometimes                      | 2,067 (57.2)           | 1,213 (28.2)             |
|                             | Often                          | 545 (15.1)             | 73 (1.7)                 |
| Exercise (times/wk)         | Never                          | 2,471 (68.5)           | 3,288 (76.2)             |
|                             | 1 - 3                          | 676 (18.7)             | 569 (13.2)               |
|                             | 4 +                            | 461 (12.8)             | 459 (10.6)               |
| Normal physical activity    | Mostly sitting / standing      | 1,654 (46.0)           | 2,353 (54.6)             |
|                             | Moderate                       | 1,359 (37.8)           | 1,780 (41.3)             |
|                             | Heavy / vigorous labor         | 587 (16.3)             | 179 (4.2)                |
| Amount of sleep (hr/day)    | < 5                            | 415 (11.5)             | 603 (14.0)               |
|                             | 6 - 8                          | 2,954 (81.9)           | 3,372 (78.1)             |
|                             | 9 ≤                            | 239 (6.6)              | 341 (7.9)                |

**Table 2.** The Injury Incidence Rate\*

| Injury           | Men (n = 3,608) |                 | Women (n = 4,316) |                 |
|------------------|-----------------|-----------------|-------------------|-----------------|
|                  | No. (%)         | 95% CI          | No. (%)           | 95% CI          |
| Traffic accident | 47 (1.3)        |                 | 28 (0.6)          |                 |
| Fall             | 31 (0.9)        |                 | 31 (0.7)          |                 |
| Yes              |                 |                 |                   |                 |
| Violence         | 4 (0.1)         |                 | 12 (0.3)          |                 |
| Others           | 1 (0.0)         |                 | 3 (0.1)           |                 |
| Sub total        | 83 (2.3)        | (1.81 - 2.79)   | 74 (1.7)          | (1.31 - 2.09)   |
| No               | 3,525 (97.7)    | (97.21 - 98.19) | 4,242 (98.3)      | (97.91 - 98.69) |

\*no response or unknown data are excluded.  
CI, confidence Interval.

those who live alone than for those who live with family members. In addition, a study to determine the factors influencing the incidence of fatal accidents in male adults found the risk was greater for those who were not married (OR: 1.3 CI: 1.2 - 1.5).<sup>25</sup>

Concerning the relationship between drinking habits and the incidence of injuries, there was no significant result for alcohol consumption, although the subjects who responded that they often drink too much had a relatively higher incidence of injuries than those who never over-indulged (OR: 1.96, 95% CI: 1.01 - 3.79). According to the World Health Organization (WHO; 2000) estimate, 37 - 43% of road injuries worldwide were related to alcohol, 15 - 35% of injuries from a fall, 38 - 45% from fire injuries, 23 - 38% from drowning, 7 - 25% from occupational/machine injuries and 24 - 47% of injuries from assaults were connected with drinking.<sup>26</sup> These injuries occurred due to the loss of coordination, reasoning and balance that takes place when the concentration of alcohol in the blood increases.<sup>27</sup> More specifically, a study showed a relationship between acute alcohol intake and the incidence of injuries. It classified the time of alcohol intake as 'alcohol within 6 hours before the injury', 'alcohol 6-24 hours before', and 'no alcohol' and found that the incidence for 'alcohol within 6 hours before the injury' was 2.71 times (95% CI: 1.9 - 3.8) higher than for 'no alcohol'. Consequently, the more recent the consumption of alcohol, the greater the risk of injury.<sup>24</sup> A different study reported that

beverage type influences injury risk. The nature of injury varied with beverage type. The consumption of beer and spirits was related to injuries resulting from violence or aggression. In a study that compared the consumption of beer, spirits and wine with injury risk, as opposed to those who did not drink, the injury risk increased in the following order; wine (OR: 1.09, 95% CI: 0.2 - 6.7), beer (OR: 1.99, 95% CI: 0.6 - 6.1), spirits (OR: 3.06, 95% CI: 0.8 - 12.1) and any combination (OR: 5.08, 95% CI: 1.1 - 23.9).<sup>24</sup> In particular, the incidence of fatal accidents was significantly higher for individuals who drove drunk or rode with a drunk driver as compared to those who did not (OR: 1.4 CI: 1.0 - 1.9).<sup>25</sup> Similarly, numerous other studies have shown that alcohol intake increases the risk of injury.<sup>4</sup>

Regarding normal physical activities, the incidence of injuries requiring hospital admission was higher in the subjects who typically performed work requiring a significant amount of activity. In an investigation of the incidence of injuries among the elderly, the incidence of injuries among the less active group was lower than in the more active group (OR: 0.76, 95% CI: 0.60 - 0.97). We found the amount of sleep was related to injury occurrence; the subjects who slept for less than five hours a night had a higher incidence of injuries requiring hospital admission. The study of incidence of fatal injuries in male adults showed the incidence of fatal accidents in the group who slept for 'less than six hours' was higher than in those who tended to sleep longer

**Table 3.** Factors Influencing the Occurrence of Injuries Requiring Hospitalization

| Variables                   | Measurement                    | OR    | 95% CI        |
|-----------------------------|--------------------------------|-------|---------------|
| Sex                         | Male                           | 1.33  | (0.89 - 1.98) |
|                             | Female                         | 1.0   | (referent)    |
| Age (yr)                    | 20 - 39                        | 1.0   | (referent)    |
|                             | 40 - 59                        | 0.87  | (0.56 - 1.33) |
|                             | 60 +                           | 0.79  | (0.44 - 1.43) |
| Income (\$/month)           | ≤ 1,000                        | 1.0   | (referent)    |
|                             | 1,001 - 3,000                  | 0.91  | (0.63 - 1.33) |
|                             | 3,001 ≤                        | 1.07  | (0.57 - 2.01) |
| Education level (yr)        | < 10                           | 0.98  | (0.64 - 1.52) |
|                             | 10 ≤                           | 1.0   | (referent)    |
| Marital status              | Not married                    | 1.0   | (referent)    |
|                             | Married                        | 1.72  | (0.95 - 3.11) |
|                             | Divorced / widowed / separated | 2.60* | (2.22 - 5.56) |
| Health State                | Good                           | 0.63* | (0.43 - 0.92) |
|                             | Moderate                       | 1.49  | (0.94 - 2.33) |
|                             | Bad                            | 1.0   | (referent)    |
| Stress                      | Severe                         | 0.69  | (0.48 - 0.99) |
|                             | Moderate / never               | 1.0   | (referent)    |
| Depression                  | Always                         | 0.67  | (0.36 - 1.25) |
|                             | Sometimes / never              | 1.0   | (referent)    |
| Health concern              | Always                         | 1.19  | (0.79 - 1.79) |
|                             | Sometimes / never              | 1.0   | (referent)    |
| Alcohol consumption         | Never                          | 1.0   | (referent)    |
|                             | Moderate                       | 1.12  | (0.71 - 1.78) |
|                             | Heavy                          | 0.89  | (0.47 - 1.68) |
| Frequency of heavy drinking | Never                          | 1.0   | (referent)    |
|                             | Sometimes                      | 1.22  | (0.73 - 2.07) |
|                             | Often                          | 1.96* | (1.01 - 3.79) |
| Exercises (times/wk)        | Never                          | 1.0   | (referent)    |
|                             | 1 - 3                          | 0.87  | (0.54 - 1.41) |
|                             | 4 +                            | 0.79  | (0.45 - 1.36) |
| Normal physical activity    | Sitting / standing / moderate  | 1.0   | (referent)    |
|                             | Heavy / vigorous labor         | 1.68* | (1.07 - 2.65) |
| Amount of sleep (hr/day)    | ≤ 5                            | 1.54* | (1.01 - 2.35) |
|                             | 6 - 8                          | 1.0   | (referent)    |
|                             | 9 ≤                            | 1.23  | (0.70 - 2.18) |

\* $p < 0.05$ .

OR, odds ratio; CI, confidence interval.

(OR: 1.3 CI: 1.0-1.7).<sup>24</sup> In a similar study on the relationship between rest and sleep patterns and injury occurrence, the incidence of injuries in the 'regular' group was lower than in the 'not regular' group (OR: 0.65, 95%, CI: 0.49-0.88).<sup>22</sup>

In addition, one study found a relationship between the education level and injury occurrence, although the difference was not statistically significant. In the elderly, the incidence of injuries was higher in the elderly group who graduated from an university than other groups (OR: 1.46 CI: 1.13-1.89).<sup>22</sup> By contrast, a different study on the correlation of the education level of male adults and the incidence of accidental death, found the incidence of accidental death was higher in the group with a lower education (OR: 1.2 CI: 1.0-1.4).<sup>25</sup> The results from the elderly study may have occurred because the place of injury was limited to the home and elderly individuals with a higher education may be involved more in outdoor activities. The latter study looked at the incidence of fatal injuries in male adults in the workforce. Moreover, the US National Health Interview Survey (NHIS) found that university graduates have a higher incidence of injuries than those who did not graduate from high school.<sup>28</sup> Consequently, regarding the level of education, the results appear to differ according to the characteristics of the subjects and the degree of injury.

One limitation of this study was minor injuries were not included and only injuries requiring hospitalization were considered. Moreover, the size of the injured group was very small because only individuals with injuries requiring hospital admission were studied.

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