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Incidence and related factors of traffic accidents among the older population in a rapidly aging society

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ABSTRACT

Objective: To estimate the incidence of traffic accidents and find related factors among the older population.
Methods: We used the cross-sectional data from the Korean Community Health Survey (KCHS), which was conducted between 2008 and 2010 and completed by 680,202 adults aged 19 years or more. And we used individuals aged 60 years or above (n = 210,914). The incidence of traffic accidents was estimated as number of traffic accidents experienced per thousand per year by a number of factors including age, sex, residential area, education, employment status, and diagnosis with chronic diseases. Multiple logistic regression was used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for each potential risk factor adjusted for the others.
Results: Incidence of traffic accidents was estimated as 11.74/1,000 per year for men, and 7.65/1,000 per year for women. It tended to decline as age increased among women; compared to the youngest old age group (60–64), the older old groups (70–74 and 80+) were at lower risk for traffic accidents. Depressive symptom was the strongest predictor for both men (OR = 1.83, 95% CI = 1.28–2.61) and women (1.70, 1.23–2.35). Risk of traffic accident was greater in employed men (1.76, 1.40–2.22) and women diagnosis with arthritis (1.36, 1.06–1.75).
Conclusion: Given that the incidence of and factors associated with traffic accidents differ between men and women, preventive strategies, such as driver education and traffic safety counseling for older adults, should be modified in accordance with these differences.

1. Introduction

The elderly population is widely believed to be "mobility handicapped" which refers to those who have difficulty walking and/or using transportation. Similarly, people with disabilities, pregnant women, women with babies, children, and people holding heavy luggage are also characterized as such (Transportation Convenience Promotion Act #2, Korea Ministry of Land, Infrastructure and Transportation, 2009). Owing to biological aging, functional status, and health conditions, older adults in particular are more likely to be involved in traffic accidents. Even though the number of deaths caused by traffic accidents in Korea has been declining since 2000, the mortality rate associated with traffic accidents is nonetheless ranked highest of the Organization for Economic Cooperation and Development (OECD) countries. In Korea, death per 100,000 population caused by transport accidents is 13.8, which is much higher than that of the United States (12.4), Japan (4.5), and Denmark (4.0) (OECD, 2014). Further, 8901 deaths resulted from the 129,473 traffic accidents that occurred in Korea over the last 5 years (Korea Road Traffic Authority, 2012).

Major health-related factors in traffic accident risk in the elderly include declining physical function (e.g., eyesight, neurological and cognitive function) (Klein, 1991; Mori & Mizohata, 1995; Wong, 1987) and the presence of medical illnesses (e.g., heart conditions, diabetes, cataracts, arthritis etc.) that cause physical limitations (Karceski & Gold, 2011). Most studies investigating the relationships between health status and car accidents among older individuals have focused on older drivers' health conditions. The variability of older peoples' lifestyles in various countries convincingly reflects the fact that the determinants of traffic accidents may differ across social and environmental contexts. For example, in 2012, it was estimated that 23.1 million drivers were aged 70 and older, representing about 9% of the population of the United States (FH Administration, 2014). Based on data reported by the Korean

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Road Traffic Authority, there were approximately 1 million licensed drivers aged 70 and above in 2012 (about 5% of older population), but most of the elderly accident victims were auto bicycle, bicycle, and cultivator riders who were not in the vehicles (Korea Road Traffic Authority, 2012). In addition, approximately 52% of deaths caused by traffic accidents were reported as pedestrian accidents; thus, efforts should be made to prevent traffic accidents among the elderly when they are walking outside.

Moreover, owing to the rapid economic development that has taken place in Korea since the 1970s, the number of cars has increased 120-fold from the 1970s (~128,000 cars) to 2013 (19,400,000 cars) (Korea Statistics, 2014). It should be noted that the incidence of traffic accidents in the elderly has become one of many social problems in a rapidly aging society. To establish more age-friendly cities, it is necessary to bolster traffic safety education and training programs for high-risk elderly pedestrians and drivers, and expand convenience and relaxation facilities at bus stops for older adults with functional limitations or chronic diseases.

Thus, in the present study, data from representative national community-based surveys conducted in Korea over the past three years were analyzed to reveal the incidence and related factors of traffic accidents among the older population and determine which groups are at high risk for traffic accidents.

2. Materials and methods

2.1. Data

We used the data collected from the Korean Community Health Survey (KCHS), which was conducted annually by the Korea Center for Disease Control and Prevention (KCDC) between 2008 and 2010. The KCHS is a nationwide, cross-sectional study using a stratified, multistage probability sampling design for the selection of household units. This community-based, cross-sectional survey assessed the health status, health behaviors, medical utilization, quality of life, and socioeconomic state of the community. A total of 680,202 adults aged 19 and above were recruited for the three years. In our study, data from subjects aged 60 years or more (60 to 110 years) (n = 211,099) were analyzed. After excluding cases in which information regarding the major variables was missing, data from 210,914 (89,111 men and 121,803 women) were finally analyzed.

2.2. Measurements

To estimate the incidence of traffic accidents, we created a new variable for the experience of a traffic accident within the previous 12 months (0: none, 1: yes) using the responses to the questions, "Have you experienced an accident or a poisoning event that required treatment in hospital within the last 12 months?" (yes/no) and "Then, what was the specific cause of the accident or poisoning event?" We estimated the incidence of traffic accidents as the number of subjects who experienced a traffic accident in the last 12 months per 1,000 subjects aged 60 years or over (unit:/1,000 per year). Considering that the KCHS adopted a nationwide representative sampling strategy, weighted frequency was estimated using weight values matched to each individual, as described in the statistical analysis section below.

General characteristics included age (60–64, 65–69, 70–74, 75–79, and ≥80), residential area (urban/rural), house type (general house/apartment), livelihood protection (yes/no), education (none, elementary school, middle school, and high school), employment status (yes/no), spouse (yes/no), and body mass index (BMI: < 25.0 kg/m^2, 25.0–30.0, ≥30.0). National Basic Livelihood beneficiaries are those without caregivers or those who have caregivers unable to provide economic assistance and earn less than the minimum cost of living.

Depressive symptom was surveyed by one question whether experienced of feeling of sadness or despair that continuously limited daily living activities for more than 2 weeks in the last 12 months. Health status was based on whether the subject was ever diagnosed by a doctor with diabetes mellitus, arthritis, osteoporosis, cardiovascular disease (CVD) (angina, myocardial infarction, or cerebral vascular accident), hypertension, and cataract. Information on smoking and drinking (yes/no) was also collected as a measure of subjects' health related behavior.

2.3. Statistical analysis

All analyses were performed separately for men and women, considering that there were significant gender differences in the incidence of traffic accidents on an absolute and time-course level, as well as in the causes of traffic accidents.

All statistical analyses were performed with a survey procedure (i.e., proc surveyfreq, proc surveymeans, and proc surveylogistic) in SAS 9.2 (SAS Institute, Cary, NC, USA) to take into account the sampling design by using the stratification variable, cluster variable, and weight variable to estimate representative values for the whole population.

Descriptive statistics were calculated for demographic variables, health status, and health behavior, and the incidence of traffic accidents and 95% confidence intervals (CIs) were also estimated in Table 1. Simple logistic regression analysis was conducted to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for a number of variables such as general characteristics, health status (i.e., diagnosis with diabetes mellitus, arthritis, osteoporosis, cardiovascular disease, hypertension, and cataract), and health behaviors (i.e., smoking and drinking). Multiple logistic regression was then conducted to adjust for potential confounding effects, limiting the explanatory variables to general characteristics and those selected based on statistical significance level ($p < 0.05$ either for men or women) in prior simple logistic regression analysis (Table 2). The final model included age, residential area, house type, livelihood protection, education, employment status, spouse, BMI, depressive symptom, and health status (i.e., diagnosis with arthritis, osteoporosis, cardiovascular disease, and hypertension).

Additionally, injury patterns of traffic accidents were summarized in Table 3. However, incidence calculation and logistic regression analysis were not able to be performed given that most variables related with injury pattern were not collected for all survey years analyzed in this study (i.e., 2008, 2009, and 2010) and thus sufficient statistical power could not be ensured.

3. Results

A total of 1923 subjects (1138 men and 785 women) were involved in traffic accidents (Table 1). The age range of all subjects (210,914: 89,111 men and 121,803 women) was 60–110, and most subjects were between the ages of 60 and 74. About 60% of the subjects were recruited from rural areas, and less than 20% lived in an apartment. The incidence of traffic accidents was 9.40/1,000 per year in total: 11.74/1,000 per year for men and 7.65/1,000 per year for women.

The incidence of traffic accidents tended to differ by sex. As shown in Table 1, a remarkable decrease in incidence was observed as age increased in women. On the other hand, no significant decrease was observed until age 80 in men. The incidence of traffic accidents was higher in rural areas (14.45/1,000 per year) than in urban areas (10.59/1,000 per year) among men; whereas the incidence in urban areas (8.41/1,000) was higher than in rural areas (5.98/1,000) among women. The level of incidence was