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Physical and cognitive functions affecting road traffic injuries among senior drivers

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ABSTRACT

Background: The size of elderly populations is growing in most areas of the world. The Thai Eleventh National Economic and Social Development Plan revealed an increase in the elderly, while numbers of younger, working-age adults decreased. Thailand has become an aging society since 2015, which is significant in that senior adults have a higher risk of involvement in motor vehicle accidents and are more susceptible to injuries and fatalities. This study investigated the role of physical and cognitive function with regard to road traffic injury in senior drivers.

Methods: A community survey was carried out among people aged 60 years and older in the villages representing four regions of Thailand. Face-to-face interviews and anthropometric measurements were used to gather data including individual characteristics, medical history, risk behaviors, cognitive function and traffic injury within the last 12 months. Associations between risk factors and injury were assessed by the chi-square tests, and comparison of the cognitive function score between the injury and non-injury groups was identified using the independent t-test.

Results: A total of 314 completed questionnaires were used for analysis. Ten percent of respondents had experienced a road traffic injury in the last 12 months. Analysis revealed that level of cognitive function, smoking behavior and been diagnosed with arthritis were associated with road traffic injury incidence in senior drivers (p-value < 0.05).

Conclusion: Results revealed the potential need for strategies to increase road traffic safety in senior drivers. Special protection should be prioritized for the elderly with physical and cognitive impairment.

1. Introduction

The number of elderly citizens is growing in most areas of the world. By the year 2025, the global human population aged 50 years and above is estimated to exceed those younger than 15 years old. The Thai elderly population is increasing, while the proportion of young and working-age adults has decreased (National Economic & Social Development Board, 2011). Thailand will become an aged society by 2021 and a super aged society by 2031; that is, 19 million people (28% of the population) will be elderly.

Globally, approximately 1.24 million people die every year on the roads, and another 20–50 million sustain non-fatal injuries as a result of road traffic accidents (World Health Organization, 2013). Older adults have been reported as prone to traffic accidents due to their reduced driving capacity. Further, senior adults or people who are 50 years and older experience an increased prevalence of multimorbidity (World Health Organization, 2015). Research has shown that those seniors have high motor vehicle-related injury and fatality rates, likely in part due to their increased frailty (Naumann et al., 2011). In 2016, Thailand recorded the second highest road traffic fatality rate in the world at 36.2 per 100,000, with an annual estimate of more than 2400 deaths, or 66 per day. Vulnerable road users (pedestrians, cyclists and motorcyclists) accounted for 49% of road traffic deaths globally; in Thailand this rate was 83% including 73% among motorcyclists, or 48 per day. As a consequence, Thailand loses 3%–5% of its GDP due to road traffic accidents (World Health Organization Thailand, 2017).

Health research in less developed countries has historically focused more on younger populations. As the global population ages, there is an increasing need to protect the safety of seniors. A research study identified that older adults face a number of challenges associated with nature aging, including sensory, perceptual, cognitive and motor declines that may impact their driving (Lombardi et al., 2017). Several factors have been identified as predictors of crash involvement in senior and older drivers. Physical factors play a crucial role regarding

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susceptibility injury (Anstey et al., 2005; De Raedt & Ponjaert-Kristoffersen, 2000; Marmeleira et al., 2009; Sandlin et al., 2013; Thorslund et al., 2014; Vance et al., 2006) while cognitive status has been determined as a predictor of crash risk (Anstey et al., 2012, 2006; Hirth et al., 2007; Vance et al., 2006).

Cognitive function is influenced by many factors such as genes, home environment during childhood, education and occupation. Decline of cognitive function is first detectable in the fifth decade of life, with age-related decline from this point onwards (Peltzer & Phaswana-Mafuya, 2012; Richards et al., 2004). A study of cognitive and visual abilities indicated that the capacity of drive safety declines with chronological ages, and this associated with age-related in several higher order cognitive abilities involving manipulation and storage of visuospatial information under speeded conditions(Anstey et al., 2012). A longitudinal study in people with Mild Cognitive Impairment (MCI) found that decline in cognition and function predicts subsequent driving cessation. In older adults with MCI, they had significantly safety rating on the on-road driving test (Anstey et al., 2017).

However, little is known regarding the effect of these factors on crash involvement in Thai senior drivers. To the best of our knowledge, a limited number of studies have applied the available body of knowledge regarding the roles of physical, cognitive health and well-being to determine the risk of traffic injury in a developing country. The results of this study will be applied as an input in the context of planning and preparing social protection mechanisms to meet the needs of the senior population.

2. Materials and methods

2.1. Recruitment and sampling

This was a cross-sectional study in four provinces, representing four different regions of Thailand. The Chief Medical Officer in each province was contacted to obtain permission prior to data collection. Multi-stage sampling was employed to select the villages in four provinces representing all regions. Community leader and health staff each village were approached to request the collaboration and selection of the subjects. Simple random sampling was employed to enrolled eligible senior adults in the household. Adults aged 60 years and older who can operate a vehicle were recruited by four trained research assistants. If there was more than one eligible subject in a household, only one was randomly selected. After obtaining their consent, the subjects were interviewed, then their anthropometric measurements (weight, height) were recorded using the WHO standard guidelines. Ethical clearance was obtained from the Committee for Research Ethics (Social Science), Mahidol University. Data collection was conducted between May and July 2016.

2.2. Research instrument

The questionnaire consisted of five parts. Part I requested data on individual characteristics including sex, age, marital status, education and occupation and perceived well-being. In part II, subjects responded to questions about alcohol and smoking consumption during the prior three months. The respondents were asked, “Did you have a drink containing alcohol?” Smoking was assessed by asking “Did you smoke a cigarette containing tobacco?” If the answers were “yes,” then the subject was classified as positive for alcohol and/or smoking. Part III asked whether the subject was ever diagnosed with a chronic disease by a doctor, and a measurement of anthropometrics was taken. In part IV, subjects were asked to respond to questions about any traffic injuries sustained in the 12 months prior to data collection.

In addition, the Montreal Cognitive Assessment (MOCA) protocol was used to measure the cognitive function of the subjects, with a total possible score of 30. There are seven components of the MOCA; visuospatial and executive functioning (0–5), animal naming (0–3), attention (0–6), language (0–3), abstraction (0–2), delay recall or short-term memory (0–5) and orientation (0–6). One point was added to the test-taker’s score if he or she had 12 years or less of formal education. The MOCA score represents the sum of individual item scores and was analyzed according to the following levels: 0–18 points (moderate to severe), 19–25 points (mild) and 26–30 points (normal).

2.3. Data analysis

Characteristics of the respondents were analyzed using descriptive statistics. Chi-square tests were used to identify associations between the risk of traffic injury and various risk factors. The cognitive function scores (MOCA) between the injury and non-injury groups were analyzed by the independent t-test. A $p\text{-value} < 0.05$ was considered statistically significant.

3. Results

A total of 331 subjects were approached, the response rate was 95%, and 314 completed questionnaires were ultimately used for analysis. Descriptions of the respondents and their traffic injury characteristics are presented in Tables 1 and 2. The mean age of the respondents was 67 (SD 5.9) with the range 60–89 years. Over half of the subjects were female (59.6%), married (66.6%), and they were farmers (53.5%). Approximately 60% has high BMI (23 kg/m^2 or more), and hypertension was a common non-communicable disease among the respondents. Majority (60.8%) were classified as having moderate to severe cognitive impairment (Table 1).

A total of 34 cases had experienced traffic injury during the prior 12 months and most of these were motorcyclists (70.6%). The majority (87.9%) of injuries were caused by a fall off a bicycle or motorcycle due to loss of control and/or less concentration while driving. Over two-thirds of those who sustained an injury were treated at health facilities and approximately 12% of the participants reported that they were unable to use their hand(s) or arm(s) or walk properly after the injury (Table 2).

Table 1
Characteristics of the respondents (n = 314).

Characteristics		n (%)
Sex	Male	127 (40.4)
	Female	187 (59.6)
Age in years	60-69	218 (69.4)
	70 +	96 (30.6)
	Mean 67.1, SD. 5.9, Min. 60, Max. 89	
Marital status	Married	209 (66.6)
	Other	105 (33.4)
Education in years	Less than 6	279 (88.9)
	More than 6	35 (11.1)
Occupation	Farmer	168 (53.5)
	Employee	85 (27.1)
	Other	25 (8.0)
	Do not work/retired*	36 (11.5)
Perceived well-being	Poor	189 (60.2)
	Good	125 (39.8)
BMI (kg/m^2)	Less than 23	131 (41.7)
	23 or higher	183 (58.3)
Medical history	Hypertension; Yes	137 (43.6)
	Diabetes; Yes	70 (22.3)
	Low back pain; Yes	87 (27.7)
	Arthritis; Yes	72 (22.9)
	Cataract; Yes	41 (13.1)
Risky behavior	Smoking; Yes	35 (11.1)
	Drinking alcohol; Yes	77 (24.5)
Cognitive function	Moderate to severe	191 (60.8)
	Mild	108 (34.4)
	Normal	15 (4.8)
	Mean 16.7, SD.5.5	

* Age of retirement was 60.