

# Relationship between Road Traffic Accidents and Drinking Habits in All 47 Prefectures of Japan

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## ABSTRACT

We evaluated the road traffic accidents and drinking habits in all 47 prefectures of Japan by ecological study. Data on traffic accidents were obtained from Ministry of Internal Affairs and Communications, Japan. Drinking habits were also obtained from Ministry of Health Labour and Welfare and The General Insurance Association of Japan. The effect of drinking on road traffic accidents was evaluated by ecological study. Road traffic accidents were  $15442.0 \pm 14404.9$  deaths due to road traffic accidents were  $103.5 \pm 57.5$  and injured subjects due to road traffic accidents were  $19068.3 \pm 17433.6$  in 2010 in all 47 prefectures of Japan. Drinking habits was significantly and negatively correlated with injured subjects due to road traffic accidents. However, road traffic accidents due to drinking was positively correlated with injured subjects due to road traffic accidents ( $r = 0.492$ ,  $p = 0.0004$ ). In conclusion, drinking habits and road traffic accidents due to drunk driving were closely linked to injured subjects due to road traffic accidents in Japan.

**Keywords:** Road Traffic Accidents; Drinking Habits; Ecological Study; Japan

## 1. Introduction

In many countries as well as Japan, automobiles are necessary. Road traffic accidents and its relation to death and injury have still been public health challenge in Japan. For example, a total of 725,773 road traffic accidents and 4363 deaths was reported by Ministry of Internal Affairs and Communications, Japan [1]. Therefore, reducing road traffic accidents and its related death and injury is urgently required in Japan.

Many factors were thought to be associated with road traffic accidents. Number of cars in Japan has dramatically increased last 30 years [2]. Drinking habits and drunk driving are thought to be closely linked to road traffic accidents and many health related problems, and men with drinking habits are reported to be 35.4% in Japan [3]. However, there are differences of drinking habits among 47 prefectures in Japan [4]. In addition, the effect of drinking habits on road traffic accidents still remains to be investigated in the Japanese.

The aim of this study was to explore the link between road traffic accidents and drinking habits in the Japanese by ecological study.

## 2. Data Collection and Analysis

### 2.1. Road Traffic Accidents

Data on road traffic accidents in 2010 in all 47 prefectures of Japan *i.e.* number of traffic accidents, number of death due to road traffic accidents, number of injured subjects due to road traffic accidents, number of death (per ten thousand cars and per a hundred thousand people) and number of injured subjects (per ten thousand cars and per a hundred thousand people) were obtained from official web site of Ministry of Internal Affairs and Communications, Japan [1]. Road traffic accidents due to drinking (per a hundred thousand people with driving license) in 2011 were also employed from The General Insurance Association of Japan [5]. These data were officially and accurately obtained from all 47 prefectures of Japan.

### 2.2. Drinking Habits

Data on drinking habits in men in all 47 prefectures of Japan were obtained from Ministry of Health Labour and Welfare, Japan [4]. These data were also officially and obtained by appropriate sampling. In addition, data were

averaged from 2008 to 2012, and adjusted for age [4]. Men with over the alcohol level of 1 go (180 ml of Japanese rice wine) per a day and 3 days per a week were defined as having drinking habits. The effect of drinking habits on road traffic accidents was evaluated by using ecological study.

### 2.3. Statistical Analysis

A simple correlation analysis was used to test the significance of the linear relationship among continuous variables, and multiple regression analysis was also performed to adjust parameters:  $p < 0.05$  was considered to be statistically significant.

## 3. Results

Profiles of all 47 prefectures of Japan were summarized in **Table 1**. Road traffic accidents were  $15442.0 \pm 14404.9$ , death due to road traffic accidents were  $103.5 \pm 57.5$  and injured subjects due to road traffic accidents were  $19068.3 \pm 17433.6$  in 2010 of Japan.

Drinking habits are well known to be one of major cause of road traffic accidents. Therefore, we also investigated the relationships between road traffic accidents parameters and drinking habits in men (**Table 2**). Drinking habits in men were significantly and negatively correlated with injured subjects (per ten thousand cars and per a hundred thousand people) due to road traffic accidents (**Figure 1**). However, road traffic accidents due to drinking (per a hundred thousand people with driving license) were significantly and positively correlated with injured subjects (per a hundred thousand people) due to road traffic accidents (**Table 3** and **Figure 2**). There was not significant relationship between drinking habits in men and road traffic accidents due to drinking (per a hundred thousand people with driving license) ( $r = -0.286$ ). Finally, multiple regression analysis was also performed to evaluate the effect of drinking habits in men and road traffic accidents due to drinking (per a hundred thousand people with driving license) on road traffic accidents [injured subjects (per a hundred thousand people) due to road traffic accidents =  $1284.511 - 23.211$  drinking habits in men +  $41.329$  road traffic accidents due to drinking (per a hundred thousand people with driving license),  $r^2 = 0.427$ ,  $p < 0.0001$ ].

## 4. Discussion

We firstly evaluated the link between road traffic accidents and drinking in Japan by ecological study. Drinking habits were closely associated with road traffic accidents.

Drinking is a strong risk factor for traffic accident. Matsushita reported that subjects with drunken driving experience were to be 30% in men and 8% in women in

**Table 1. Profiles of all 47 prefectures of Japan.**

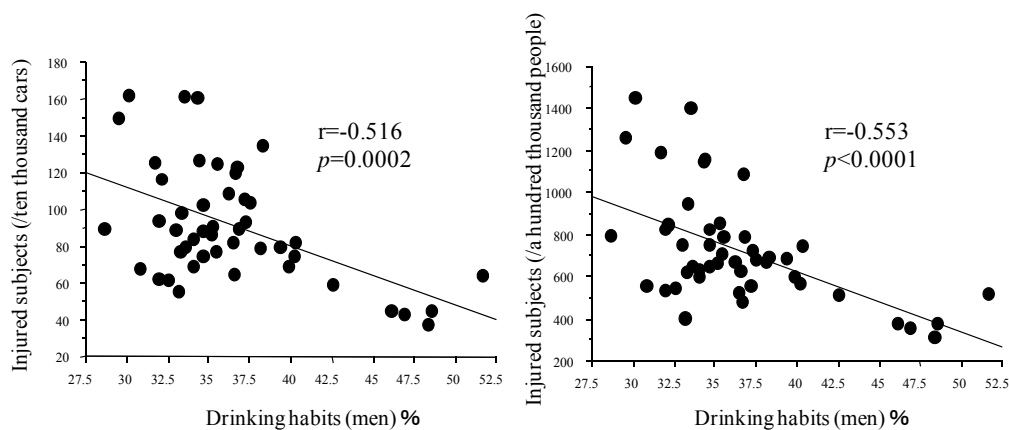
	Mean $\pm$ SD	Minimum	Maximum
Prefectures	47		
Road traffic accidents	$15442.0 \pm 14404.9$	181.2	55014
Death due to road traffic accidents	$103.5 \pm 57.5$	31	215
Injured subjects due to road traffic accidents	$19068.3 \pm 17433.6$	2261	62836
Death (per ten thousand cars)	$0.6 \pm 0.1$	0.4	0.8
Injured subjects (per ten thousand cars)	$91.3 \pm 31.4$	37.2	162.1
Death (per a hundred thousand people)	$4.8 \pm 1.4$	1.7	7.3
Injured subjects (per a hundred thousand people)	$728.3 \pm 263.0$	314.9	1454.3
Drink habits (men) (%)	$36.4 \pm 5.1$	28.6	51.6
Road traffic accidents due to drinking (per a hundred thousand people with driving license)	$7.0 \pm 2.3$	3.2	14.0

**Table 2. Simple correlation analysis between road traffic accidents and drinking habits (men).**

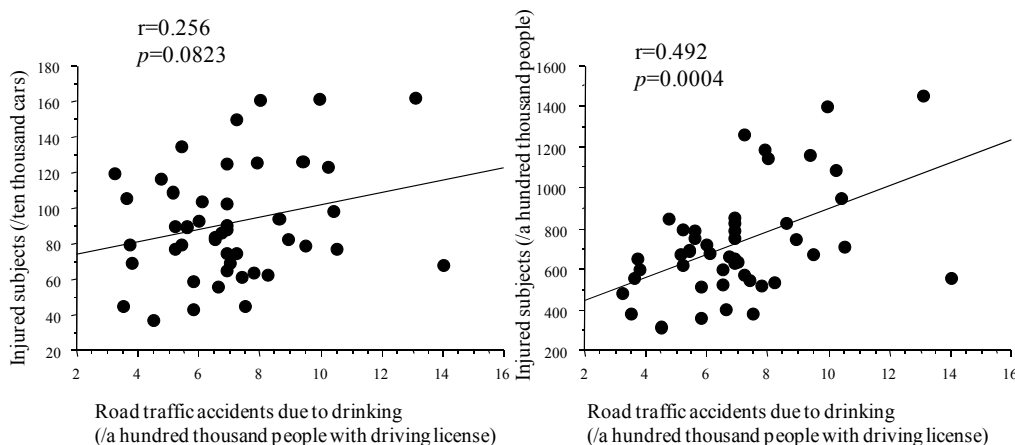
	r	p
Death (per ten thousand cars)	0.010	0.9457
Injured subjects (per ten thousand cars)	-0.516	<b>0.0002</b>
Death (per a hundred thousand people)	-0.044	0.7674
Injured subjects (per a hundred thousand people)	-0.553	<b>&lt;0.0001</b>

**Table 3. Simple correlation analysis between road traffic accidents and road traffic accidents due to drinking (per a hundred thousand people with driving license).**

	r	p
Death (per ten thousand cars)	0.127	0.3937
Injured subjects (per ten thousand cars)	0.256	0.0823
Death (per a hundred thousand people)	0.276	0.0602
Injured subjects (per a hundred thousand people)	0.492	<b>0.0004</b>



**Figure 1.** Simple correlation analysis between injured subjects (per ten thousand cars and per a hundred thousand people) and drinking habits (%) in men in all 47 prefectures of Japan.  $r$ : correlation coefficient,  $p$ :  $p$  value.



**Figure 2.** Simple correlation analysis between injured subjects (per ten thousand cars and per a hundred thousand people) and road traffic accidents due to drinking (per a hundred thousand people with driving license) in all 47 prefectures of Japan.  $r$ : correlation coefficient,  $p$ :  $p$  value.

Japan. In addition, men in their 40's - 60's and women in their 30's had higher drunk driving experience [6]. The effect of drinking on driving factors *i.e.* reaction time, tracking, attention, watching and driving skills were observed at extremely low concentration of alcohol [7,8]. It has been reported that most of the blood ethanol concentration of the victims in case of fatal self crash injury by drinking driving ranges between 1 - 2 mg/ml [9]. This may be due to the impairment of coordination or movement, and changes in processing information by alcohol.

Fujita *et al.* examined and decreased the number of drunken driving accidents at Kagawa prefecture, after the change in the Road Traffic Law, Japan [10]. We proved the road traffic accidents due to drinking (per a hundred people with driving license) were positively correlated with injured subjects due to road traffic accidents. However, drinking habits were negatively correlated with injured subjects due to road traffic accidents by ecological study. According to the National Nutrition Survey in Japan, The criterion of the prevalence of subjects with

drinking habits is thought to be comparatively strict [4]. Taken together, subjects with obvious higher drinking habits may not drive. However, low concentration of alcohol may induce traffic accidents due to drunken driving. Therefore, it is reasonable that we need to deal with drunk driving with low concentration of alcohol in Japan.

Potential limitations still remain in this study. First, we used an ecological study. The link between road traffic accidents and drinking habits, which was noted in this study, may not apply for the link among individuals. In fact, Impinen *et al.* reported that social factors, such as low level of education, unemployment, living and divorce, were associated with drunken driving [11]. Second, detailed daily and individual (*i.e.* age and sex) data of road traffic accidents and drinking could not be obtained and analyzed in this study. The third, we could not obtain the data of drinking habits in women. Therefore, we could not evaluate the link between road traffic accidents and drinking as accurately as we wished. Further ongoing

investigations are urgently required to prove such a link.

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