Short communication

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Sudden illness while driving a vehicle – a retrospective analysis of commercial drivers in Japan

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Objective We performed a retrospective analysis of commercial drivers to clarify the background of incidents of sudden illness while driving.

Methods The analysis used reports submitted by employers to the Japan Ministry of Land, Infrastructure, Transport, and Tourism regarding commercial drivers who had been ordered to stop driving as a result of health problems.

Results Of 211 cases with an average work history of 15.2 years, there were 88 bus drivers, 70 taxi drivers, and 53 truck drivers, 36.0% of who had died as a result of their disease. Among taxi and truck drivers, more than 70% of incidents were due to cardiac, aortic, and cerebrovascular disease. More than 80% of these were unable to avoid traffic accidents caused by sudden illness. However, among bus drivers, cardiac, aortic, and cerebrovascular disease accounted for only 23.5% of incidents, and accidents were avoided in more than half of the cases. The duration between starting work and the incident time was significantly shorter among bus drivers [mean 3.3 hours, standard deviation (SD) 3.1] than taxi (7.7 hours, SD 5.8) and truck (7.2 hours, SD 6.3) drivers ($P<0.01$).

Conclusions The difference between the sudden illness rates of taxi and truck drivers and those of bus drivers is due to both reporting bias and differences in the awareness needed to prevent disabling events while driving. As a precaution, physicians should advise commercial drivers to stop driving as soon as they detect slight discomfort. To prevent accidents, more assertive health promotion aimed at professional drivers is needed.

Key terms bus; disease; prevention; restrospective study; sudden death; taxi; traffic accident; transportation; truck.

As many occupations require people to drive as part of their work, work-related road traffic accidents represent a significant public health problem.

Although delayed recognition, flawed judgment, and faulty maneuvering are major causes of automotive accidents, the sudden onset of signs and symptoms of disease while driving can also cause accidents (1). In some cases, drivers suffer from sudden illness leading to subsequent death (2). Therefore, the health of commercial drivers must be promoted to minimize the likelihood of sudden-illness-related traffic accidents.

Japanese employers are required to report instances of commercial drivers being forced to stop driving because of sudden onset of disease signs and symptoms to the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT). Using this data, we provide useful information for both promoting occupational drivers' health and preventing traffic accidents.

Methods

Between 2004–2006, the MLIT received 211 reports from Japanese employers regarding commercial drivers (bus, taxi, or truck drivers) who had been ordered to stop driving as a result of a health problem. Because detailed descriptions of the reports were not publicly released, we asked the secretary of the MLIT for access to detailed contents of the reports for our research. Following MLIT approval, we obtained a portion of the information in the reports. Although we were not given access to some items in the reports (eg, drivers' age, hospitalization duration, and previous medical histories), the data allowed us to perform the analyses below. The information about the circumstances surrounding the sudden illness incident, health condition of the drivers, and working conditions were collected from the reports.

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One-way analysis of variance (ANOVA) was used to compare the average values of three groups. Our evaluation using ANOVA with the Tukey-Kramer method showed significant individual differences. The chi-square test was used to compare the rate of various items between the different groups. Differences with a P-value <0.05 were considered significant.

Results

General overview

The 211 cases involved 88 bus drivers, 70 taxi drivers, and 53 truck drivers with an average work history of 15.2 [standard deviation (SD) 13.9] years. Most accidents (83.4%) occurred on streets, followed by highways (10.0%) and parking areas (6.6%). Sudden illness incidents occurred an average of 5.7 (SD 5.4) hours after the start of work.

Cerebrovascular disease was a major cause of traffic-related sudden illness incidents (28.4%), followed by cardiac and aortic disease (26.1%), syncope (8.5%), and digestive disease (8.1%). Of those who had accidents, 76 drivers (36.0%) died of the disease that had caused their accident. Of the 76 fatalities, cardiac and aortic disease were the most frequent (57.9%), followed by cerebrovascular disease (32.9%), and others (9.2%). Of the 187 drivers among whom sudden onset of signs or symptoms of a disease had occurred while in control of a moving vehicle, 66 (35.3%) avoided collisions by attempting avoidance maneuvers (braking or steering). However, 121 (64.7%) drivers lost control of their vehicle and caused traffic accidents, in many cases resulting in injuries to passengers and other road users. The drivers had averaged 8.6 (SD 4.2) days off within 1 month before sudden illness incidents that occurred an average of 3.3 (SD 3.0) working days after their most recent day off. Most of the drivers (178 out of 211, 84.4%) had undergone the health check-up regulated by the Industry Safety and Health Law of Japan.

Comparison among commercial drivers

Distribution of diagnosed disease among commercial drivers is shown in figure 1. Cardiac, aortic, and cerebrovascular disease were major causes of sudden illness among taxi drivers and truck drivers (80.0% and 73.5%), a significantly higher rate (P<0.001) than among bus drivers (23.5%). Among bus drivers, syncope, digestive disease, and vertigo were the major causes of sudden illness incidents. Other diseases among bus drivers included fatigue, infectious disease, and low-back pain.

More than half of taxi and truck drivers died of the disease immediately following the sudden illness incident. However, among bus drivers, 93.2% survived the incident, which was significantly higher than among taxi and truck drivers (P<0.001) (table 1).

The sudden-illness-related accident-avoidance rates among moving bus drivers was significantly higher than for other vehicle types (P<0.001, table 1). In 76 of 88 incidents on buses, passengers were on board. In the buses carrying passengers, there was an average of 13.9 (SD 14.1) passengers on board and, of those, an average of 5.2 (SD 5.6) passengers in 10 buses were injured. Of 70 taxi drivers, 17 caused accidents, in which an average of 1.7 (SD 1.5) passengers or other road users per accident was injured. Of 53 truck drivers, 10 also caused accidents, with a mean of 5.6 (SD 6.7) injured road users.

The duration between starting work and the sudden illness incident among bus drivers was significantly shorter than for other vehicle types (P<0.01). Furthermore, there were no significant differences among drivers in the number of days off within one month before the incident and consecutive working days since the most recent day off (table 1). Of 88 (96.6%) bus drivers, 85 had undergone an annual health check-up, but the rate was significantly lower among taxi or truck drivers (P<0.001; table 1).

Discussion

By some reports, natural deaths of drivers accounted for between 0.2–19.0% of all vehicle deaths (3–5). According to a recent report in Finland, incapacity of the driver caused by sudden illness was the immediate cause of the accident in 10.3% of all fatal motor vehicle accidents (6). Recently, as the number of elderly individuals with valid driving licenses and access to cars is increasing, sudden illness while driving has become an important issue (7). According to the MLIT, as of 2009, the average ages of commercial drivers are 46.4, 57.4 and 43.3 years among bus, taxi and truck drivers, respectively. As the driver population ages, prevalence of disease may increase, thus further attention might be needed to protect commercial drivers' health. Because occupational drivers must regularly stay awake and drive for long periods, and work irregular driving schedules and night shifts, both employers and drivers need to take precautions to prevent sudden illness while driving and related accidents. Because the details of these reports have not been widely published, this study offers novel findings. However, as the data is based on voluntary reports by employers, there may be a reporting accuracy bias owing to differences in incentives and circumstances of reporting among companies. Therefore, in the future,

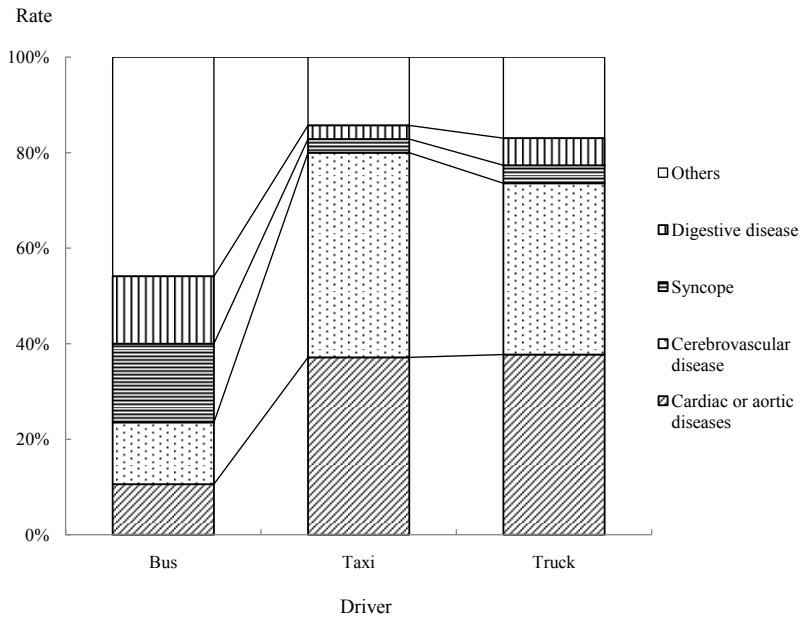

Figure 1. Distribution of disease diagnosis among the commercial drivers.

Table 1. Underlying medical and working conditions of the drivers. [SD=standard deviation.]

	Bus			Taxi			Truck		
	Mean	SD	%	Mean	SD	%	Mean	SD	%
Duration between starting work and the incident (hours)	3.3 [a]	3.1		7.7	5.8		7.2	6.3	
Number of days off within one month before the incident	8.4	3.7		9.5	5.2		7.8	3.1	
Consecutive working days since the most recent day off	3.5	3.1		2.8	3.5		2.6	1.7	
Post sudden illness driver survival rate			93.2 [b]			48.6			35.8
Sudden-illness-related accident avoidance rates among drivers of moving vehicles			56.8 [b]			17.6			14.6
Annual health check-up attendance rates of drivers			96.9 [b]			78.6			71.7

[a] Significantly shorter than taxi or truck drivers (P<0.01).
[b] Significantly higher than taxi and truck drivers (P<0.001).

a no-fault reporting system is needed to increase the rate that drivers take preventative measures for health reasons to avoid subsequent accidents.

In the analysis of incidents in moving vehicles, approximately two thirds of drivers were unable to avoid collisions by attempting avoidance maneuvers. Our results support the theory that most drivers cannot stop or avoid an accident during a sudden-illness incident (2).

In this study, we found interesting differences between taxi, truck, and bus drivers. Among bus drivers, cardiac, aortic, and cerebrovascular disease accounted for only 23.5% of sudden illness incidents, and related accidents were avoided in more than half the cases. Furthermore, 93.2% of bus drivers survived the sudden illness. We suggest that this difference is due to reporting bias, ie bus drivers have a lower threshold for the reporting of sudden illness than taxi or truck drivers. In addition, there is the difference in the awareness of their own health problems among drivers that is needed to avoid sudden illness incidents while driving. This hypothesis is supported by the results for time of illness onset, because the bus drivers held the belief that for passengers' safety, if a driver is aware of any health problem, they should voluntary stop the vehicle to prevent a major attack and subsequent accidents. Indeed, most of the sudden illnesses among bus drivers were relatively minor diseases. Because some of these diseases may be precursory symptoms of major attacks, this preventative attitude should be adopted by taxi and truck drivers. The above hypothesis was also confirmed by the attendance rate for annual health check-ups. As drivers' lifestyle and metabolic risk factors affect disease onset, efforts to increase commercial drivers' attendance rate for annual health check-ups and improve health prob-

lems are strongly recommended. However, even among bus drivers with high rates of annual health check-up attendance, some accidents due to sudden illness while driving have occurred. We found that drivers had taken a notable number of days off within 1 month before an accident (>7 days); the number of consecutive working days since the most recent day off was <4. Therefore, taking more days off is not sufficient to prevent sudden illness while driving.

The preventive strategies include advising professional drivers to take necessary precautions to stop the vehicle at the first sign of discomfort, as shown for most bus drivers, and establishing effective procedures for reporting sudden medical symptoms among commercial drivers.

In addition to expanding the scope of accident surveys, knowledge should be shared among medical personnel and relevant government agencies, and a system should be created to ensure that these accidents are not overlooked. Furthermore, measures should be implemented to prevent traffic accidents resulting from sudden illness.

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