

Injury trends among foreign and domestic tourists in Jeju from 2008 to 2018

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Abstract Jeju is the largest island in Korea and one of its key tourist attractions. As the number of foreign tourists steadily increases, so does the number of injuries incurred there. Accordingly, this study aimed to describe and compare the characteristics of injuries suffered by foreign tourists versus those of domestic tourists. As a cross-sectional study of a retrospective medical record survey, the study was conducted with reference to the Jeju Injury Surveillance System from the 11-year period of January 2008 to December 2018. The following factors were investigated: demographic data, mechanism of injury, place of occurrence, activity when injured, patient outcome, and mortality. A total of 92,095 injured Jeju Island visitors was recorded during this time, a number that included 88,050 Koreans and 4,045 foreigners. The gender ratio showed similar patterns between the two groups and there were no significant age differences. In both groups, the most common mechanism of injury was collisions/cuts. Also, more foreigners experienced falls than Koreans. Regarding the location, Koreans had the most road accidents, while foreigners were most likely to be injured at outdoor locations, such as seas and rivers. Furthermore, more foreigners experienced severe injuries requiring hospitalization. Notably, this study showed the differences in injury between foreign and Korean tourists visiting Jeju Island and its findings lend support to targeted safety promotion programs.

Key words: Travel, Tourism, Accidental injuries

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INTRODUCTION

In this era of globalization, barriers are being eliminated, including the economy, society, culture and people,

materials, and technology. In this context, the number of foreigners visiting Korea has steadily increased, from 540,516 in 2008 to 1,224,832 in 2018 (an increase of 2.2 times). Tourists often experience various conditions during

their travel, such as travelers’ diarrhea, infectious diseases, and trauma; therefore, research is being conducted to prevent these conditions.¹⁾

Trauma accounts for about 4% of the conditions experienced by tourists during their travel; however, the frequency of trauma is steadily increasing, with varying degrees of severity, from mild to severe, and even death. According to a US study, heart disease (45%) was the most common cause of death among tourists visiting the US, followed by injuries (23%).²⁾ In a study of Americans visiting Mexico, injuries accounted for 51%, followed by heart disease at 37%.³⁾ Notably, various studies have suggested that injury is one of the main causes of tourists’ deaths.

Jeju Island is a representative tourist destination in Korea. Many tourists visit the island every year because of its easy access. It is approximately one hour by plane from anywhere in Korea. As the number of foreign tourists steadily increases, the number of domestic tourists visiting the island has also risen. This increase in the number of visitors has simultaneously led to a rise in the number of tourists using emergency medical services (EMS).⁴⁾ Various studies have been conducted on the health of tourists worldwide. In fact, there have been reported studies that have identified and compared the characteristics of injuries

among domestic residents and tourists. Even so, few studies have made comparisons between foreign versus domestic tourists. In response, the authors aimed to investigate the characteristics of injuries to domestic and foreign tourists who accounted for 119 incidents requiring EMS on Jeju Island over the last 11 years.^{5,6)}

METHODS

1. Study design

This is a cross-sectional study of retrospective medical records conducted to determine the characteristics of domestic versus foreign tourists who used EMS while visiting Jeju Island.

2. Study population (Fig. 1)

We included tourists who used EMS caused by injuries on Jeju Island, from January 2008 to December 2018 in our study. Specifically, we defined domestic tourists as those whose residential addresses were in Korea—except Jeju Island—and foreign tourists as those with residential addresses in other countries. Patients with missing data were excluded from the study.

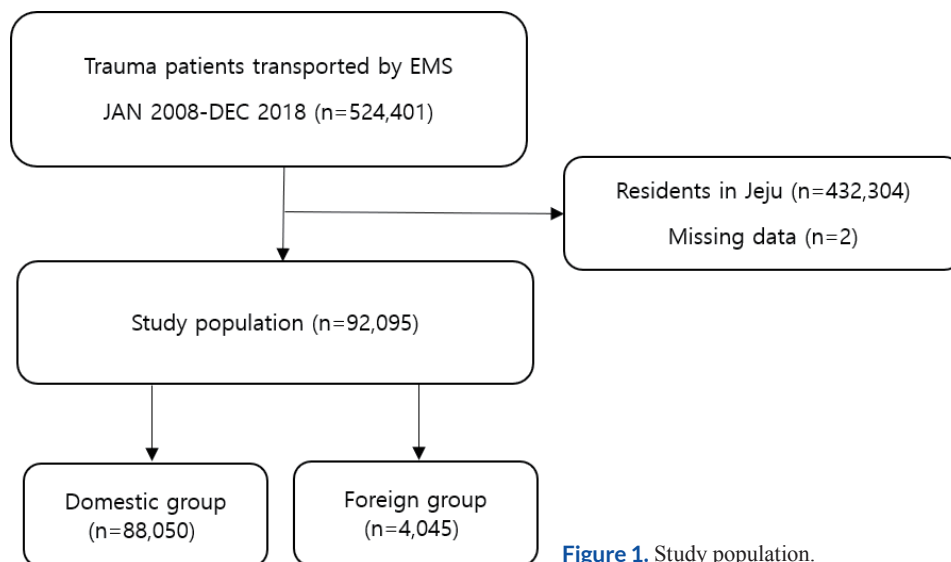


Figure 1. Study population.

3. Data collection

Since 2008, the Jeju Injury Surveillance System (JISS) has been collecting data from the following six general hospitals: Jeju National University Hospital, Halla Hospital, Seogwipo Medical Center, Hanmaeum Hospital, Korea Hospital, and Central Hospital. In addition, the system has been collecting data from 28 119-safety centers. Therefore, we used the JISS data to collect demographic information such as gender, age, nationality, address, injury-related information such as intention, mechanism, severity, disposition, and activity at the time of injury. We also used the tourism statistics data provided by the Jeju Tourism Association (<http://visitjeju.or.kr>), such as the number of monthly tourist arrivals and length of stay.

4. Variables and statistical analysis

We described all variables categorically and presented them as frequencies and percentages. Age was categorized into early childhood, middle childhood, adolescence, early adulthood, middle adulthood, and late adulthood according to life cycle classification. Both groups were compared using Pearson's chi-squared or Fisher's exact test, as appropriate. All statistical analyses were performed using Stata ver. 15.1 (StataCorp, College Station, TX, USA). Finally, the statistical significance was set at $P < 0.05$.

RESULTS

From 2008 to 2018, 120,066,688 tourists visited Jeju Island, and 92,095 tourists used EMS because of injuries. Table 1 shows the demographic characteristics of domestic and foreign tourists. Among the tourists who used EMS for injury, 4,045 (4.3%) were foreigners. The proportion of injured males was 57.9% for domestic tourists and 54.7% for foreign tourists, indicating that more male domestic tourists were injured (Pearson chi-squared, $P < 0.001$). In both groups, most of the injuries occurred among early and middle-aged adults. Table 2 shows injury characteristics between both groups. The most common cause of injury in both groups was blunt/penetrating injuries. The second most common cause was motor vehicle collisions (MVCs) among domestic tourists (25.2%) and falls/slipping among foreign tourists (25.9%). The most common location of injury was on the road for domestic tourists (25.7%) and recreational venues for foreign tourists (25.9%). The most common activity at the time of injury was daily activities, followed by leisure or play in both groups. The hospital admission rate was higher among foreign tourists (11.4% vs. 7.3%). The mortality rate was also higher among foreign tourists (1% vs. 0.4%). Table 3 shows the annual trends in tourist arrivals and injury occurrences. The number of domestic and foreign tourists is increasing every year; notably, it has increased by 2.2 times in 11 years. The number of injuries also increased with this

Table 1. Demographic characteristics between domestic and foreign tourists

	Domestic tourist (n=88,050)	Foreign tourist (n=4,045)	P
Sex			<0.001
Female	37,061 (42.1)	1,832 (45.3)	
Male	50,989 (57.9)	2,213 (54.7)	
Age (yr)			<0.001
Early childhood (0-5)	11,094 (12.6)	266 (6.6)	
Middle childhood (6-12)	6,006 (6.8)	143 (3.5)	
Adolescence (13-18)	6,497 (7.4)	93 (2.3)	
Early adulthood (19-29)	16,390 (18.6)	1,201 (29.7)	
Middle adulthood (30-64)	42,350 (48.1)	2,055 (50.8)	
Late adulthood (65≤)	5,713 (6.5)	287 (7.1)	

Values are presented as number (%).

Table 2. Comparison of injury characteristics between domestic and foreign tourists

	Domestic tourist (n=88,050)	Foreign tourist (n=4,045)	P
Mechanisms			<0.001
Blunt/penetrating	39,028 (44.3)	1,799 (44.5)	
Fall/slip down	14,089 (16.0)	1,049 (25.9)	
MVC	22,180 (25.2)	623 (15.4)	
Assult	3,628 (4.1)	162 (4.0)	
Others	9,125 (10.4)	412 (10.2)	
Places			<0.001
Recreation place	22,052 (25.0)	1,048 (25.9)	
Road	22,650 (25.7)	781 (19.3)	
Residence	17,014 (19.3)	481 (11.9)	
Commercial	7,808 (8.9)	439 (10.9)	
Workplace	3,804 (4.3)	383 (9.5)	
Others	14,722 (16.7)	913 (22.6)	
Activities			<0.001
Daily activities	47,118 (53.5)	1,899 (46.9)	
Leisure or play	22,665 (25.7)	1,024 (25.3)	
Work	11,650 (13.2)	781 (19.3)	
Sports	3,248 (3.7)	136 (3.4)	
Others	3,369 (3.8)	205 (5.1)	
Alcohol-related			<0.001
Yes	7,390 (8.4)	259 (6.4)	
No	76,405 (86.8)	3,464 (85.6)	
Unknown	4,255 (4.8)	322 (8.0)	
Disposition			<0.001
Discharge	78,975 (89.7)	3,431 (84.8)	
DAMA	405 (0.5)	51 (1.3)	
Transfer	1,016 (1.1)	26 (0.6)	
Admission	6,387 (7.3)	461 (11.4)	
Death	385 (0.4)	39 (1.0)	
Others	882 (1.0)	37 (0.9)	

Values are presented as number (%).

MVC: motor vehicle collisions, DAMA: discharge against medical advice.

Table 3. Annual trends of tourist arrivals and injury occurrences on Jeju-island

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Domestic											
Tourist arrivals	5,281,500	5,891,584	6,801,301	7,695,339	8,010,304	8,517,417	8,945,601	11,040,135	12,249,959	13,522,632	13,089,129
Duration of stay	4.57	4.57	4.57	4.57	4.57	4.57	4.57	4.60	4.10	4.51	3.98
Number of injuries	3,561	3,914	4,072	8,152	8,348	5,644	6,852	10,093	12,970	12,573	11,871
Incidence rate per 100,000*	14.7	14.5	13.1	23.2	22.8	14.5	16.7	19.9	25.8	20.6	22.8
Foreign											
Tourist arrivals	540,516	632,354	777,000	1,045,637	1,681,399	2,333,848	3,328,316	2,624,260	3,603,021	1,230,604	1,224,832
Duration of stay	3.41	3.41	3.41	3.41	3.41	3.41	3.41	4.27	4.11	4.44	4.93
Number of injuries	60	65	75	114	229	354	633	575	737	568	635
Incidence rate per 100,000*	3.3	3.0	2.8	3.2	4.0	4.4	5.6	5.1	5.0	10.4	10.5

*Incidence rate=number of injuries/(tourist arrivals×duration of stay)×100,000.

increase in the number of tourists. Over the 11 years period, the number of injuries among domestic tourists increased 3.3 times and that of foreign tourists' by 10.6 times. The injury rate per 100,000 also increased 1.6 times, from 14.7 to 22.8 for domestic tourists and 3.2 times from 3.3 to 10.5 for foreign tourists. Table 4 shows the incidence rate ratio (IRR) from the Poisson regression analysis of injuries and mortality per 100,000 tourists. When the number of tourists increased by 100,000, the injury rate increased by 19% in the domestic group and 58% in the foreign group. When the number of tourists increased by 100,000, the mortality rate increased by 14% in the domestic group and 40% in the foreign group.

The exemption of patient consent has been approved by the Institutional Review Board (IRB) of the Jeju National University Hospital (IRB No. 2021-03-007). All authors declare that this manuscript does not expose any personally identifiable information of the patient, and that this study poses no risk to the patient.

DISCUSSION

International travelers are exposed to the risk of diseases and trauma, and the injuries and deaths associated with traveling continue to be a concern. Trauma is known as the major cause of death associated with travel, and it is 25 times more common than death associated with infectious diseases. The leading causes of travel-related trauma include MVCs, water activity-related injuries, and assault.⁷⁾ This study aimed to investigate the demographic

and epidemiologic characteristics of the domestic and foreign tourist groups who were injured on Jeju Island through the JISS. The number of domestic and foreign tourists who visited Jeju Island during the study period was approximately 5.85 million in 2008 (5.28 million Koreans, 540,000 foreigners) and 14.3 million in 2018 (13.08 million Koreans, 1.22 million foreigners), reflecting an annual increase of approximately 10%. During this period, 92,095 tourists (88,050 Koreans, 4,045 foreigners) used EMS for trauma. Alongside the increase in the number of tourists, the number of trauma patients also increased by more than 10% annually. Owing to the popularity of Jeju Island among tourists, the number of tourists far exceeds the number of residents on Jeju Island—by almost 20 times, considering the population of Jeju Island in 2018 was 658,282. Thus, a high demand of medical services is expected. To respond appropriately, this concern must be managed through systematic and strategic approaches to efficiently use the limited medical resources and measures must be implemented to systematically undertake prevention, early detection, and appropriate treatment measures for travel-related accidents. In addition, the injury incidence rate per 100,000 tourists adjusted to the total number of tourists was identified as 14.7 cases in 2008 and 22.8 cases in 2018 for domestic tourists and 3.3 cases in 2008 and 10.4 cases in 2018, for foreign tourists, respectively. This reflects an increasing trend in the injury rate per 100,000 people alongside the increase of tourists. A Poisson regression analysis was performed to calculate the injury and death rate per 100,000 people according to the increase in the number of tourists. When the number of tourists increased by 100,000, the injury rate increased by 19% for domestic tourists and 58% for the foreign tourists. The mortality rate increased by 14% for domestic tourists; by contrast, it showed a massive increase of 40% for foreign tourists. A study on tourist-related injuries in Europe in 2005 similarly demonstrated the risk of trauma-related death to be four times higher for foreign tourists than for residents. Such an imbalance is caused by the tourists' long-distance travel in a car, which increases the risk of MVC and from a high

Table 4. The IRR from Poisson regression analysis of injuries and mortality per 100,000 tourists

Variable	IRR	P
Injury		
Domestic	1.186174	<0.001
Foreign	1.577867	<0.001
Mortality		
Domestic	1.140148	<0.001
Foreign	1.400156	0.009

IRR: incidence rate ratio.

likelihood of sustaining injuries associated with leisure activities.⁸⁾ A previous study showed the risk of injury during leisure activities, such as mountain climbing, winter sports, and water leisure activities, to be 5 to 50 times higher than that for daily life activities.⁹⁾ As 69.8% of tourists at Jeju Island are engaged in activities on the beach and 55% are engaged in hiking, bush walks, Olle trails, or trekking, there is a high possibility of sustaining injuries related to these activities. Therefore, education and safety measures are necessary for their prevention.¹⁰⁾ In terms of the mechanism of damage, blunt/penetrating injuries occurred the most in both groups. The second common cause of injury was MVC in the domestic group and falls/slips in the foreign tourist group. This is thought to be due to the higher rate of rental car usage in the domestic tourist group. According to the Jeju Tourist Survey conducted to identify the main means of transportation in 2018, 80% of domestic tourists used rental cars while only 15% of foreign tourists used rental cars. The remaining majority used public transportation such as taxis, buses, or chartered buses.¹⁰⁾ As such, tourists become exposed to unfamiliar road conditions when they rent cars, and the risk of traffic accidents increases for foreigners because of communication problems owing to the language barrier and the unfamiliar road rules and regulations. In order to prevent such traffic accidents among tourists, there is a need for safety measures such as reinforcement of car rental standards and implementation of orientation courses. The limitation of this study is its reliance on the residential address provided for the classification of residents, foreign tourists, or domestic tourists. It is possible that Jeju Island residents may have been inappropriately included as study subjects if their addresses reported on their resident registration were in mainland Korea and did not correspond to their actual residential addresses in Jeju Island.

CONCLUSION

This study outlined comprehensive information on the characteristics of injuries encountered by domestic and foreign tourists who visited Jeju Island over the past 11 years. Such analyses can be used to establish various preventive measures against injuries for tourists and can serve as the basis for appropriate redistribution and support provision of EMS resources in the Jeju Island area.

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