Characteristics and Trends of Pediatric Trauma in Jeju Island, South Korea:

A Community Level Serial Cross-sectional study

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Abstract

Objective: This study aimed to investigate the characteristics and epidemiological trends of pediatric injuries among patients visiting emergency departments (EDs) on Jeju Island.

Method: Employing a community-level serial cross-sectional analysis, we targeted pediatric patients aged 18 years or younger who visited EDs for injuries over a ten-year period. The data, sourced from the Jeju Injury Surveillance System (JISS), facilitated a comprehensive examination of injury characteristics and epidemiological trends. This included an evaluation of the annual incidence and overall trends in pediatric injury cases.

Results: The study found toddlers (42.5% of cases) to be the most frequently injured age group. Males were more prone to injuries, with a male-to-female ratio of 1.7:1. Injuries among visitors accounted for 17.3% of cases, with a seasonal spike in Summer, evenings and weekends. Most incidents occurred at home, predominantly accidental in nature, with adolescents more likely to require EMS services. The common mechanisms of injuries were blunt force (49.2%), slips/falls (22.0%), and motor vehicle collisions (13.2%), leading to bruises, cuts, and sprains. Over the decade, a general increase in pediatric injuries was observed. Accidental injuries initially surged but later stabilized, while self-harm/suicide and assault/violence injuries showed a concerning upward trend. Age-specific analysis revealed increasing trends in infants and adolescents.

Conclusion: The study underscores the crucial need for targeted injury prevention and resource allocation strategies, particularly for high-risk groups and times, to effectively mitigate pediatric trauma on Jeju Island.

Key Words: Pediatric trauma, epidemiological trends, Jeju Island, injury prevention, emergency department

Capsule summary

What is already known

Pediatric trauma is a leading cause of death and injury among children, with its incidence on the rise. These injuries occur in various places and during diverse activities, evolving in characteristics over time.
What is new in the current study

The study identified key patterns in the incidence and nature of pediatric injuries, highlighting age group-specific trends and predominant injury types. Analysis showed a male predominance in trauma cases, primarily occurring as accidental injuries at home, with a significant increase during summer evenings and weekends. Trend analysis over the decade indicated a general increase in pediatric injuries, with specific patterns observed across different age groups and injury types. Our study highlights the urgent need for targeted prevention and resource allocation to reduce high-risk pediatric injuries, particularly in identified settings and times at community-level.
Introduction

Pediatric trauma has become a major cause of death and injury in children as the incidence of pediatric trauma increase [1]. These pediatric trauma occur in various places during various activities and change their characteristics over time [2]. Moreover, because of the nuclear family system, the pediatric trauma account for a relatively large importance in family and more children are visiting the emergency medical center [3]. Accordingly, many studies on pediatric trauma were performed and many preventive programs for pediatric trauma, including education program, were developed. However, there are few studies on pediatric trauma in Jeju Island [2, 4].

Because Jeju Island is geographically isolated from the Korean peninsula, most of the pediatric trauma patients were initially treated in emergency medical center of Jeju Island. All of the data for pediatric trauma patients in emergency medical center of Jeju Island were collected by Jeju Injury Surveillance System. There is a good advantage in understanding the characteristics and trends of pediatric trauma. Moreover, more than one million tourists visit Jeju Island every year [5]. As the pediatric trauma related to sports and leisure activities is increasing, there is a need for many preventive programs for pediatric trauma [6, 7].

This community level cross-sectional observational study investigated the characteristics and trends of pediatric trauma patients who visited emergency departments (EDs) on Jeju Island.
Methods

Study Design and Setting

This study undertook a serial cross-sectional analysis at the community level on Jeju Island, targeting pediatric patients aged 18 years or younger who visited emergency departments (EDs) due to injuries. We aimed to delineate the epidemiology and trends of pediatric injuries, employing comprehensive data from the ED-based Jeju Injury Surveillance System (JISS) that covers all EDs on the island. The study period spanned ten years, from January 2008 to December 2018. The research was conducted on an Island spanning 1,836 km², with a residential population of 641,597 in 2016. The established emergency medical system (EMS) at that time included four prehospital fire departments deploying 30 ambulance units and six emergency medical facilities (a regional emergency medical center [EMC], four local EMC, and an additional local EMS institution), collectively providing 141 operational emergency beds. During the year, the emergency departments handled approximately 184,370 patient visits, with about 31% of these cases being trauma-related. This study was reviewed and approved by the Institutional Review Board (approval number. 2023-11-011), with a waiver for needing informed consent because of the retrospective nature.

Data Source and Collection

The primary data source for this study was the Jeju Injury Surveillance System (JISS), an ED-based system established in 2007. The JISS was initiated to fulfill the requirements for recognition as an International Safe Community by monitoring injury epidemiology within the community. Operational since 2008, it comprehensively tracks all injured cases handled by prehospital ambulance units and EDs across Jeju. The JISS systematically collects data in key domains: patient identifiers, demographics, injury specifics, prehospital details, and clinical characteristics and outcomes. Data collection is conducted by independent investigators at each ED, who input the information into an electronic form and transmit it in real time to the Fire Safety Headquarters' server.

Study population
Our study targeted patients aged 18 years or younger who visited EDs on Jeju Island from January 2008 to December 2018, diagnosed with injury-related conditions as per the International Classification of Diseases, 10th Edition (ICD-10) codes S00-T88 (injury, poisoning, and certain other consequences of external causes). Out of 524,413 injured ED visits recorded in the JISS, 391,705 were excluded: 391,703 for being over 18 and 2 for unknown age. The remaining 132,708 pediatric injury cases were divided into four age groups for detailed analysis: Infants (less than one year), Toddlers (1 to 5 years), Childhood (6 to 12 years), and Adolescents (13 to 17 years).

**Investigated variables**

In this study, we applied the Haddon Matrix model to systematically categorize our data. Variables were classified into three factors: host (the involved individual), agent (the entity or substance causing the injury), and environment (the setting of the incident), and analyzed across two phases: pre-hospital and in-hospital. Host factors included demographic details such as gender, age, residency (resident or visitor), and nationality. Agent or environmental factors comprised the timing of the injury (season, weekday, time), intent (accidental, self-harm/suicide, assault/violence, or other), and mechanism (e.g., motor vehicle collisions, falls/slips, blunt/laceration injuries, burns, foreign body ingestion, etc.). These factors also accounted for the anatomical site of injury, location (home, school, street, public, commercial, or rural area), activity at the time of injury (e.g., daily living, education-related, leisure/play, etc.), alcohol involvement, and use of EMS ambulance services. Clinical characteristics and outcomes were delineated by care stage, encompassing ED arrival mode, resuscitation efforts, mortality upon arrival, mental status assessment, necessity of surgical intervention, and the final disposition of patients.

**Statistical analysis**

We conducted descriptive statistical analysis on collected pediatric injury data, presenting demographics and injury characteristics across four pediatric age groups. Categorical variables were summarized as frequencies and percentages, while continuous variables were described using means,
standard deviations (SD), medians, and interquartile ranges (IQR), according to their distribution. We compared these demographics and injury characteristics across age groups using ANOVA, Kruskal-Wallis, chi-squared, or Fisher's exact test, as dictated by the data distribution. Despite rejecting the null hypothesis of equal distributions across groups, we refrained from post-hoc pairwise comparisons, as the study's primary aim was not to make comparative inferences. Subsequently, we analyzed epidemiological trends of pediatric injuries at the community-level over ten years. Age-standardized incidence rates were calculated annually, adjusted for demographic changes, using direct standardization to the 2010 Korean census. We evaluated the temporal trends using the LOWESS regression models, with the year as the independent variable and the annual standardized incidence rate as the dependent variable. The annual trend's direction and magnitude was computed using the reverse adjacent contrasts, comparing each year with the previous year. Additionally, the annual change were estimated from the slope and p-value of the poisson regression model to quantify the mean change in incidence rates per year over a decade. All statistical analyses were executed using Stata 17.0 (StataCorp, College Station, TX, USA), with a significance threshold set at p < 0.05 for two-tailed tests.

Results

Demographics, environmental and Injury profiles of the study population

The study included a total of 132,698 pediatric patients who visited EDs in the Jeju region for injuries over the 10-year period. The age distribution showed a higher incidence in toddler, accounting for 42.5% of the total cases (Fig 1). Our decade-long demographics, environmental characteristics, and injury profiles of the study population were summarized in Table 1 and Table 2. A higher incidence of injury was observed in male patients across all pediatric age groups (a male-to-female ratio of 1.7:1), with this trend increasing with age. Visitor injuries accounted for 17.3% of cases, with no age-specific variance. Seasonal fluctuations were minimal, with a slight uptick in summer, yet evening times saw significantly higher injury incidents, especially during weekends when considered proportionally to weekdays. Clinically, the vast majority of pediatric patients were alert upon ED arrival (99.6%), with adolescents being the most likely to require EMS ambulance services (16.5%). The general preference was for arrival by private vehicle or on foot.
The home environment was the leading location for injuries, especially for infants. Schools and kindergartens followed, with a notable incidence among school-aged children. Streets and highways were also common injury sites, particularly for adolescents. Regarding activity at the time of injury, vital activities and leisure were the most reported, with leisure activities peaking notably on weekends. Accidental injuries vastly outnumbered other intentions across all age groups. Incidents of assault and self-harm were low in comparison but presented a critical concern for adolescents. The leading mechanisms of injury were blunting/penetrating force (49.2%), slips/falls (22.0%) and motor vehicle collision (13.2%) contributing to 84.4% of the overall injuries. The most common injury types were bruises/abrasions (50.1%), cut/open wounds (25.2%), and sprain/dislocation (13.8%), together accounting for 89.1% of the pediatric cases.

The vast majority of the pediatric injuries were not severe, with a high percentage resulting in discharge directly from the ED. A small, yet significant, proportion 4.2% of patients required hospitalization, notably higher in adolescents (7.4%), which may reflect more severe injuries in this group. Fatalities were rare and overall crude mortality was reported at 0.04%.

In visitors, the countryside (sea, river) was leading location for injuries and leisure was the leading activity at the time of injury. The most common injury types were bruises/abrasions and leading mechanisms of injury were blunting/penetrating injury (Supplementary table 1 and 2). In countryside (sea, river) injury, the leisure was the leading activity at the time of injury. The most common injury types were bruises/abrasions and leading mechanisms of injury were blunting/penetrating injury (Supplementary table 3 and 4).

**Epidemiological Trends over 10 years**

Figure 2 delineates the decade-long trends of pediatric injuries on Jeju Island, categorized by the intentionality of the injury—encompassing overall, accidental, self-harm/suicide, and assault/violence cases. Overall, pediatric injuries demonstrate an increasing trend, with a subtle yet steady rise in incidence rates per 100,000 people, as depicted by the LOWESS regression. Accidental injuries, which constitute the majority, initially surged and then reached a plateau. Incidences of self-harm and suicide,
though less common, show a notable increase over the years. Assault and violence-related injuries, despite year-to-year variations, generally indicate an upward trend throughout the decade (Fig 2 and Table 3).

Figure 3 uncovers age-specific trends in pediatric injuries, showing a steady increase without sudden spikes in cases among infants. Toddlers’ injury rates initially rose and then stabilized. Childhood injury incidences spiked early on, followed by a decline, while adolescent cases consistently rose, underscoring the ongoing need for intervention strategies for older children. The annual change bars effectively illustrate year-to-year fluctuations, underscoring specific years that deviate significantly from the overall trend. These bars indicate years with notable shifts—both increases and decreases in injury cases—suggesting the impact of various external factors during those times.

The hospitalization and mortality rates were not significantly changed during the periods of study according to age distribution (Table 3). Moreover, the mortality rate of pediatric injury according to the mechanism was not significantly changed during the periods of study (Table 4). The incidence of visitor of pediatric injury was increased during the periods of study. According to the intentional pediatric injury, vital activity injury as well as leisure injury (play, exercise, tour) and education-related injury were increased during the periods of study (Table 4, 5). However, the hospitalization rate and mortality rate of pediatric injury according to the intension were not significantly changed during the periods of study (Table 5).
Discussion

In this study, we performed the retrospective cross-sectional observational study to investigate the pediatric trauma patients who visited emergency department. With these results, the characteristics and trends of pediatric trauma in Jeju could be analyzed. Moreover, this study focused on providing a comprehensive epidemiological overview of pediatric trauma in Jeju.

In this study, we confirmed that the pediatric trauma occurs more frequently in male children and, it tends to significantly increase with age. It is thought to be due to differences in the way boys and girls play.[3] Due to the nature of Jeju Island, which is visited by many tourists, it has been confirmed that pediatric trauma caused by visitors accounts for a large portion of the cases. The largest number of patients visited the ED at evening, and the incidence of pediatric trauma was significantly increased as the evening went on. This is because the pediatric trauma cannot be treated in outpatient clinic due to the increase in dual-income parents.[4] Moreover, the pediatric trauma can be treated in ED after outpatient clinic was closed.[8] In this study, most of the patients visited the ED without EMS ambulance and were discharged after proper treatment. Shannon et al. reported that 94.7% of pediatric trauma patient visited ED were discharged after proper treatment and only 4.0% of pediatric trauma patient were admitted for further treatment.[1] You et al. also reported that 94.6% of pediatric trauma patient visited ED were discharged after proper treatment.[3] It is thought that the severity of the pediatric trauma visited ED may be low.

In this study, the most common place of injury was home, followed by the countryside (sea, river). However, Lee et al reported that the most common place of pediatric injury was home, followed by the road (small or general road).[9] You et al. also reported that the most common place of pediatric injury was home, followed by the playground in Korea. The result that the countryside (sea, river) was the second most common place of injury is unique to Jeju Island. Therefore, preventive programs for pediatric trauma injury in country side (sea, river) should be developed to reduce the pediatric injury in Jeju Island.

Although the most of the patients were injured during daily living activity, the proportion of daily living activity was decreased with the age. However, the leisure (play, exercise, tour) was increased
with the age. This may be due to an increase in leisure activities as age increase. Moreover, the leisure
(play, exercise, tour) related injury tended to increase over time. Physical activity including organized
sports and leisure activity provides a lot of benefits to health and well-being in children.[10] However,
participating in physical activity is a major risk factor for unintentional injury and hospitalization in
adolescent and childhood.[6, 7, 11] A recent study demonstrated that a neuromuscular training reduced
the risk of physical activity related injury in organized sports.[12] Moreover, the rate of leisure time
physical activity injury was reduced by using the protective equipment, such as helmet.[13] Therefore,
to prevent leisure (play, exercise, tour) related injury, it may be effective to perform neuromuscular
training and to wear protective equipment. The supervision and continuous attention may be also need
during the leisure activities.

In this study, most of the pediatric trauma in Jeju Island were low-energy injury (blunt/laceration or
slip/fall) and superficial injury (bruise/superficial injury or cut/open wound). Kang et al. also reported
that most of the injury type of pediatric injury visiting emergency department was superficial injury
including abrasion or open wounds.[2] While protective equipment is beneficial in specific risk-prone
activities, broader preventive measures such as enhancing supervision and public education about common
hazards may be more appropriate and effective for reducing these types of injuries in general settings.
Moreover, the safety strategy such as, using handrails, keeping shoe tied, not to climb on furniture and
trees could help reduce the slip/fall injury.

The fertility rate of South Korea has been decreased rapidly overtime, which have contributed to
decreasing the pediatric population. The fertility rate of Jeju Island has also been decreased over time.
However, the incidence of pediatric injury of Jeju Island has been increased over time. Therefore,
effective preventive programs are necessary to manage the rapid increase of pediatric trauma of Jeju
Island.

We confirmed that the proportion of visitor among pediatric trauma tended to increase over time in
Jeju Island. The number of tourists who visited to Jeju Island during the study period was increased,
reflecting an annual increase of approximately 10%.[14] With the increase of the number of tourists,
the trauma of tourists also increased.[14] Ball et al. reported that the injury risk during the leisure or
tour is higher than that of daily life.[15] With this concern, systematic and strategic approaches are required to prevent the travel related injury.[14] In visitors, the country side (sea, river) was leading location for injuries and leisure was the leading activity at the time of injury. The most common injury types were bruises/abrasions and leading mechanisms of injury were blunting/penetrating injury. More specific education for leisure activity and protective equipment for superficial injury are needed for visitor among pediatric injury in Jeju Island.

This study has several limitations. First, it is difficult to generalize the results of this study because the population of this study were collected from JISS. However, we investigated the characteristics and trends of pediatric trauma patients in Jeju Island. Second, because this study was performed retrospectively based on JISS data, there may be inaccurate classification due to insufficient record.

**Conclusion**

The incidence of pediatric injury of Jeju Island has been increased over time. Therefore, this study underscores the crucial need for targeted injury prevention and resource allocation strategies, particularly for high-risk groups and times, to effectively mitigate pediatric trauma on Jeju Island.
**Ethics statement**

This study was approved by Institutional Review Board of Jeju national University Hospital (IRB, ethics committee). Informed consent was waived because of the retrospective nature of the study.

**Conflict of interest**

No potential conflict of interest relevant to this articles was reported.

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**Author Contributions**

Conceptualization: CL, SWS; Data curation: JHO, JRY, SYK, JHK, SKL; Formal analysis: WJ, GMS, HJL; Visualization: CHK, JHM, IS; Writing-original draft: CL; Writing-review: CL, HJY, MO, SWS; All authors read and approved the final manuscript.

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11. Mattila, V., et al., Participation in sports clubs is a strong predictor of injury hospitalization: a


Table 1. Characteristics of host and environmental factors in pediatric trauma

<table>
<thead>
<tr>
<th></th>
<th>Total (N=132,698)</th>
<th>Infant (N=4,864)</th>
<th>Toddler (N=56,345)</th>
<th>Childhood (N=41,846)</th>
<th>Adolescent (N=29,643)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Female</td>
<td>49,132(37.0)</td>
<td>2,187(45.0)</td>
<td>22,969(40.8)</td>
<td>14,695(35.1)</td>
<td>9,281(31.3)</td>
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</tr>
<tr>
<td>Inhabitant</td>
<td></td>
<td></td>
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<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Resident</td>
<td>109,720(82.7)</td>
<td>4,148(85.3)</td>
<td>45,701(81.1)</td>
<td>35,697(85.3)</td>
<td>24,174(81.6)</td>
<td></td>
</tr>
<tr>
<td>Visitors</td>
<td>22,978(17.3)</td>
<td>716(14.7)</td>
<td>10,644(18.9)</td>
<td>6,149(14.7)</td>
<td>5,469(18.4)</td>
<td></td>
</tr>
<tr>
<td>Season</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Spring</td>
<td>35,356(26.6)</td>
<td>1,205(24.8)</td>
<td>14,204(25.2)</td>
<td>11,171(26.7)</td>
<td>8,776(29.6)</td>
<td></td>
</tr>
<tr>
<td>Summer</td>
<td>37,942(28.6)</td>
<td>1,344(27.6)</td>
<td>16,022(28.4)</td>
<td>12,748(30.5)</td>
<td>7,828(26.4)</td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td>34,476(26.0)</td>
<td>1,321(27.2)</td>
<td>14,502(25.7)</td>
<td>10,619(25.4)</td>
<td>8,034(27.1)</td>
<td></td>
</tr>
<tr>
<td>Winter</td>
<td>24,924(18.8)</td>
<td>994(20.4)</td>
<td>11,617(20.6)</td>
<td>7,308(17.5)</td>
<td>5,005(16.9)</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Night</td>
<td>5,015(3.8)</td>
<td>221(4.5)</td>
<td>1,683(3.0)</td>
<td>941(2.3)</td>
<td>2,170(7.3)</td>
<td></td>
</tr>
<tr>
<td>Morning</td>
<td>16,751(12.6)</td>
<td>832(17.1)</td>
<td>7,145(12.7)</td>
<td>4,714(11.3)</td>
<td>4,060(13.7)</td>
<td></td>
</tr>
<tr>
<td>Afternoon</td>
<td>46,651(35.2)</td>
<td>1,593(32.8)</td>
<td>18,185(32.3)</td>
<td>17,102(40.9)</td>
<td>9,771(33.0)</td>
<td></td>
</tr>
<tr>
<td>Evening</td>
<td>64,281(48.4)</td>
<td>2,218(45.6)</td>
<td>29,332(52.1)</td>
<td>19,089(45.6)</td>
<td>13,642(46.0)</td>
<td></td>
</tr>
<tr>
<td>Week</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Weekday</td>
<td>82,130(61.9)</td>
<td>3,115(64.0)</td>
<td>32,826(58.3)</td>
<td>25,394(60.7)</td>
<td>20,795(70.2)</td>
<td></td>
</tr>
<tr>
<td>Weekend</td>
<td>50,568(38.1)</td>
<td>1,749(36.0)</td>
<td>23,519(41.7)</td>
<td>16,452(39.3)</td>
<td>8,848(29.9)</td>
<td></td>
</tr>
<tr>
<td>Mental status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Alert</td>
<td>132,245(99.6)</td>
<td>4,850(99.7)</td>
<td>56,194(99.7)</td>
<td>41,722(99.7)</td>
<td>29,479(99.5)</td>
<td></td>
</tr>
<tr>
<td>Verbal response</td>
<td>246(0.2)</td>
<td>7(0.1)</td>
<td>94(0.2)</td>
<td>68(0.2)</td>
<td>77(0.3)</td>
<td></td>
</tr>
<tr>
<td>Painful response</td>
<td>116(0.1)</td>
<td>2(0.0)</td>
<td>35(0.1)</td>
<td>33(0.1)</td>
<td>46(0.2)</td>
<td></td>
</tr>
<tr>
<td>Unresponsiveness</td>
<td>91(0.1)</td>
<td>5(0.1)</td>
<td>22(0.0)</td>
<td>23(0.1)</td>
<td>41(0.1)</td>
<td></td>
</tr>
<tr>
<td>ED Arrival mode</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td>&lt;0.001</td>
</tr>
<tr>
<td>EMS ambulance</td>
<td>13,380(10.1)</td>
<td>376(7.7)</td>
<td>3,828(6.8)</td>
<td>4,292(10.3)</td>
<td>4,884(16.5)</td>
<td></td>
</tr>
<tr>
<td>Other vehicle</td>
<td>82,671(62.3)</td>
<td>3,248(66.8)</td>
<td>38,045(67.5)</td>
<td>25,501(60.9)</td>
<td>15,877(53.6)</td>
<td></td>
</tr>
<tr>
<td>Walking</td>
<td>32,287(24.3)</td>
<td>803(16.5)</td>
<td>11,293(20.0)</td>
<td>11,566(27.6)</td>
<td>8,625(29.1)</td>
<td></td>
</tr>
<tr>
<td>Others</td>
<td>4,360(3.3)</td>
<td>437(9.0)</td>
<td>3,179(5.6)</td>
<td>487(1.2)</td>
<td>257(0.9)</td>
<td></td>
</tr>
<tr>
<td>ED disposition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Discharge</td>
<td>125,261(94.4)</td>
<td>4,607(94.7)</td>
<td>54,330(96.4)</td>
<td>39,327(94.0)</td>
<td>26,997(91.1)</td>
<td></td>
</tr>
<tr>
<td>Admission</td>
<td>5,582(4.2)</td>
<td>157(3.2)</td>
<td>1,223(2.2)</td>
<td>2,003(4.8)</td>
<td>2,199(7.4)</td>
<td></td>
</tr>
<tr>
<td>Transfer</td>
<td>340(0.3)</td>
<td>13(0.3)</td>
<td>121(0.2)</td>
<td>111(0.3)</td>
<td>95(0.3)</td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>52(0.4)</td>
<td>5(0.1)</td>
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<td>10(0.2)</td>
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<td>Others</td>
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<td>657(1.2)</td>
<td>395(0.9)</td>
<td>329(1.1)</td>
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*Others* includes patients who left the ED against medical advice, left without being seen, or were directed to alternative care facilities, including specialized clinics or community health services.
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<th>Injury type</th>
<th>Total (N=132,698)</th>
<th>Infant (N=4,864)</th>
<th>Toddler (N=56,345)</th>
<th>Childhood (N=41,846)</th>
<th>Adolescent (N=29,643)</th>
<th>p-value*</th>
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<td>34,779(61.7)</td>
<td>13,666(32.7)</td>
<td>7,735(26.1)</td>
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<td>Countryside/sea/river</td>
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<td>3,012(5.4)</td>
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<td>17,522(59.1)</td>
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<td>Leisure</td>
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<td>276(5.7)</td>
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<td>2,508(8.5)</td>
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<td>Intention</td>
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<td>4,641(95.4)</td>
<td>53,257(94.5)</td>
<td>39,976(95.5)</td>
<td>26,309(88.8)</td>
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<td>Slip/Fall</td>
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<td>Blunting/penetrating</td>
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<td>1,455(29.9)</td>
<td>28,561(50.7)</td>
<td>21,004(50.2)</td>
<td>14,233(48.0)</td>
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<td>by objects</td>
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<td>Burn</td>
<td>6,598(5.0)</td>
<td>796(16.4)</td>
<td>3,629(6.4)</td>
<td>1,458(3.5)</td>
<td>715(2.4)</td>
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<td>Foreign body</td>
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<td>2,765(4.9)</td>
<td>1,183(2.8)</td>
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<tr>
<td>Others</td>
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<td>270(5.6)</td>
<td>3,518(6.2)</td>
<td>2,027(4.8)</td>
<td>3,586(12.1)</td>
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<tr>
<td>Injury type</td>
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</tr>
<tr>
<td>Bruise/abrosis</td>
<td>66,480(50.1)</td>
<td>2,665(54.8)</td>
<td>27,454(48.7)</td>
<td>21,506(51.4)</td>
<td>14,855(50.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Cuts/open wound</td>
<td>33,370(25.2)</td>
<td>669(13.8)</td>
<td>16,188(28.7)</td>
<td>10,293(24.6)</td>
<td>6,220(21.0)</td>
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<tr>
<td>Fracture</td>
<td>8,730(6.6)</td>
<td>143(2.9)</td>
<td>2,028(3.6)</td>
<td>3,627(8.7)</td>
<td>2,932(9.9)</td>
<td>&lt;0.001</td>
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<tr>
<td>Sprain or dislocation</td>
<td>18,353(13.8)</td>
<td>401(8.2)</td>
<td>6,934(12.3)</td>
<td>5,615(13.4)</td>
<td>5,403(18.2)</td>
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<td>Spinal cord injury</td>
<td>89(0.7)</td>
<td>1(0.02)</td>
<td>19(0.3)</td>
<td>27(0.06)</td>
<td>42(0.14)</td>
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<td>Vascular injury</td>
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<td>386(0.7)</td>
<td>234(0.6)</td>
<td>136(0.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Muscle/tendon injury</td>
<td>661(0.5)</td>
<td>18(0.4)</td>
<td>168(0.3)</td>
<td>211(0.5)</td>
<td>264(0.9)</td>
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<tr>
<td>Intracranial injury</td>
<td>1,841(1.4)</td>
<td>193(4.0)</td>
<td>719(1.3)</td>
<td>563(1.4)</td>
<td>366(1.2)</td>
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<td>Crushing injury</td>
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<td>1(0.02)</td>
<td>30(0.5)</td>
<td>23(0.05)</td>
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<tr>
<td>Traumatic amputation</td>
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<td>3(0.06)</td>
<td>39(0.7)</td>
<td>18(0.04)</td>
<td>12(0.04)</td>
<td>0.223</td>
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<td>Minor burn</td>
<td>5,900(4.5)</td>
<td>725(14.9)</td>
<td>3,240(5.8)</td>
<td>1,297(3.1)</td>
<td>638(2.2)</td>
<td>&lt;0.001</td>
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<tr>
<td>Major burn</td>
<td>56(0.04)</td>
<td>5(0.10)</td>
<td>29(0.05)</td>
<td>17(0.04)</td>
<td>5(0.02)</td>
<td>0.019</td>
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</table>
Note: Prior to 2019, the JISS categorized both blunt and penetrating injuries under a single category due to the integration of these types in the data collection framework. From 2019 onwards, injuries are distinctly categorized as either blunt or penetrating, aligning with updated surveillance practices.
Table 3. The age-adjusted incidence, hospitalization and mortality rates of pediatric group and year of life lost

<table>
<thead>
<tr>
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<td>Total pediatrics</td>
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<td>6,121</td>
<td>6,848</td>
<td>9,255</td>
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<td>10,552</td>
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<td>11,192</td>
<td>10,910</td>
<td>11,438</td>
<td>10,778</td>
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<td>156.8</td>
<td>225.2</td>
<td>257.3</td>
<td>387.8</td>
<td>393.4</td>
<td>361.0</td>
<td>431.0</td>
<td>397.3</td>
<td>396.5</td>
<td>446.4</td>
<td>422.2</td>
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<tr>
<td>Toddlers: 1-5 years old</td>
<td>1,950</td>
<td>2,391</td>
<td>2,628</td>
<td>3,561</td>
<td>3,938</td>
<td>4,427</td>
<td>4,587</td>
<td>4,467</td>
<td>4,408</td>
<td>4,713</td>
<td>4,332</td>
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<tr>
<td>Childhood: 6-12 years old</td>
<td>1,580</td>
<td>1,926</td>
<td>2,091</td>
<td>2,963</td>
<td>3,148</td>
<td>3,340</td>
<td>3,761</td>
<td>3,684</td>
<td>3,640</td>
<td>3,804</td>
<td>3,548</td>
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<tr>
<td>Adolescent s: 13-17 years old</td>
<td>1,360</td>
<td>1,578</td>
<td>1,871</td>
<td>2,343</td>
<td>2,619</td>
<td>2,423</td>
<td>2,466</td>
<td>2,642</td>
<td>2,646</td>
<td>2,473</td>
<td>2,475</td>
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<td>Hospitalization rate</td>
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<tr>
<td>Total pediatrics</td>
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<td>343.8</td>
<td>373.8</td>
<td>478.2</td>
<td>448.9</td>
<td>490.9</td>
<td>559.4</td>
<td>453.5</td>
<td>353.7</td>
<td>333.5</td>
<td>286.4</td>
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<td>Infants: &lt;1 years old</td>
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<td>4.8</td>
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<td>12.2</td>
<td>15.5</td>
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<td>12.4</td>
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<td>9.1</td>
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<td>58.4</td>
<td>58.3</td>
<td>81.9</td>
<td>84.3</td>
<td>68.3</td>
<td>98.1</td>
<td>128.4</td>
<td>93.4</td>
<td>81.7</td>
<td>83.3</td>
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<td>170.1</td>
<td>196.1</td>
<td>194.5</td>
<td>149.3</td>
<td>131.0</td>
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<td>153.3</td>
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<td>198.4</td>
<td>181.2</td>
<td>223.0</td>
<td>198.4</td>
<td>128.4</td>
<td>132.3</td>
<td>112.7</td>
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<td>Morality rate</td>
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<tr>
<td>Total pediatrics</td>
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<td>5.3</td>
<td>1.5</td>
<td>3.9</td>
<td>4.0</td>
<td>5.5</td>
<td>4.0</td>
<td>4.2</td>
<td>2.6</td>
<td>2.5</td>
<td>4.8</td>
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<td>Toddlers: 1-5 years old</td>
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<td>0.8</td>
<td>1.5</td>
<td>1.5</td>
<td>0.0</td>
<td>0.0</td>
<td>0.0</td>
<td>2.9</td>
</tr>
<tr>
<td>Childhood: 6-12 years old</td>
<td>0.0</td>
<td>2.1</td>
<td>0.0</td>
<td>1.5</td>
<td>0.0</td>
<td>0.0</td>
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<td>1.7</td>
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### 6-12 years old

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</tbody>
</table>

| Years of Life Lost (YLL) | 144.6 | 251.2 | 71.2 | 179.8 | 182.4 | 249.2 | 183.0 | 185.6 | 109.9 | 102.8 | 210.4 |

*Incidence, hospitalization and mortality represents a rate of the event per 100,000 people.
Table 4. The age-adjusted incidence and mortality rates of injury mechanism in pediatric injury

<table>
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<tbody>
<tr>
<td>Accidental injury, total</td>
<td>4,670.</td>
<td>5,784.</td>
<td>6,521.</td>
<td>8,813.</td>
<td>9,472.</td>
<td>9,759.</td>
<td>10,591.</td>
<td>10,515.</td>
<td>10,336.</td>
<td>10,574.</td>
<td>9,755.</td>
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<tr>
<td>Motor vehicle collision</td>
<td>844.7</td>
<td>964.6</td>
<td>1,152.</td>
<td>1,386.</td>
<td>1,457.</td>
<td>1,301.</td>
<td>1,513.</td>
<td>1,528.8</td>
<td>1,384.9</td>
<td>1,294.1</td>
<td>1,069.</td>
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<td>Slip/Fall</td>
<td>1,058.</td>
<td>1,271.</td>
<td>1,341.</td>
<td>1,656.</td>
<td>2,041.</td>
<td>2,343.</td>
<td>2,656.4</td>
<td>2,688.5</td>
<td>2,544.6</td>
<td>2,564.4</td>
<td>2,455.</td>
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<td>Blunting by objects</td>
<td>2,335.</td>
<td>3,036.</td>
<td>3,456.</td>
<td>4,970.</td>
<td>5,079.</td>
<td>5,065.</td>
<td>5,282.2</td>
<td>5,261.0</td>
<td>5,319.4</td>
<td>5,722.0</td>
<td>5,355.</td>
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<td>Burn</td>
<td>287.8</td>
<td>328.4</td>
<td>338.7</td>
<td>435.4</td>
<td>524.7</td>
<td>561.1</td>
<td>554.6</td>
<td>530.6</td>
<td>571.1</td>
<td>522.5</td>
<td>478.2</td>
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<tr>
<td>Drowning</td>
<td>18.0</td>
<td>9.1</td>
<td>12.4</td>
<td>15.8</td>
<td>20.5</td>
<td>15.7</td>
<td>17.3</td>
<td>19.7</td>
<td>24.8</td>
<td>18.6</td>
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</tr>
<tr>
<td>Intentional injury, total</td>
<td>165.2</td>
<td>209.4</td>
<td>199.4</td>
<td>251.2</td>
<td>243.9</td>
<td>237.7</td>
<td>216.5</td>
<td>209.4</td>
<td>209.1</td>
<td>206.9</td>
<td>214.0</td>
</tr>
<tr>
<td>Self-harm/suicide</td>
<td>22.6</td>
<td>32.5</td>
<td>37.0</td>
<td>57.1</td>
<td>56.2</td>
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*Incidence, hospitalization and mortality represents a rate of the event per 100,000 people.
Table 5. The age-adjusted incidence and mortality rates of special group in pediatric injury

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*Incidence, hospitalization and mortality represents a rate of the event per 100,000 people.
Figure Legends

**Figure 1.** Flow chart of the study population
Figure 2. The decade-long trends of pediatric injuries on Jeju Island, categorized by the intentionality of the injury.
Figure 3. The decade-long age-specific trends of pediatric injuries on Jeju Island