

# Bear-related injuries in remote western China: seasonal patterns, attack circumstances, injury characteristics, and emergency care outcomes—a retrospective observational study

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## Research Article

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# Abstract

## Background

Bear attacks are uncommon but can cause complex, contaminated, multisystem trauma. Patient-level evidence linking attack circumstances to prehospital access, injury patterns, emergency management, and outcomes remains limited in remote western China. This study characterised bear-related injuries treated at a county hospital in Sichuan Province.

## Methods

We retrospectively analysed 35 verifiable bear-related injury encounters treated at Jiulong County People's Hospital during a formal study period from June 2015 through December 2025. Demographic, temporal, exposure, prehospital, anatomical, severity, management, complication, and outcome variables were summarised descriptively. A prespecified exploratory comparison of Injury Severity Score (ISS) between attacks occurring during mushroom or matsutake harvesting and other recorded activities used the Mann–Whitney U test and a Hodges–Lehmann location shift with a 95% confidence interval.

## Results

Mean age was 39.5 years (standard deviation 10.7), and 19 patients (54.3%) were male. Twenty-six attacks (74.3%) occurred in summer, and 19 (54.3%) occurred during documented mushroom or matsutake harvesting. Median injury-to-hospital time was 4.8 h (interquartile range 3.3–6.6); 13 patients (37.1%) arrived after at least 6 h. Upper-extremity, head or facial, and multiple-region injuries affected 30 (85.7%), 16 (45.7%), and 21 (60.0%) patients, respectively. Median ISS was 11 (interquartile range 7.5–15.5), and 9 patients (25.7%) had  $\text{ISS} \geq 16$ . All patients underwent debridement; 33 (94.3%) received systemic antibacterial treatment, 10 (28.6%) underwent surgery, 9 (25.7%) had infection documented during the index hospitalisation, 3 (8.6%) required intensive care, 4 (11.4%) were transferred, and 1 (2.9%) died in hospital. The prespecified ISS comparison did not identify a clear difference (Hodges–Lehmann shift, – 3 points; 95% confidence interval, – 6 to 2;  $P = 0.213$ ).

## Conclusions

In this hospital series, bear-related injuries clustered in summer and frequently occurred during documented mushroom or matsutake harvesting. The predominance of upper-extremity, head or facial, and multiple-region injuries, together with frequent wound care, highlights the emergency-care burden. These findings support seasonally informed preparedness, systematic trauma assessment, and coordinated referral, but do not establish activity-specific risk or causal effects.

# Background

Bear attacks are uncommon in clinical practice but can produce disproportionately severe wildlife-related trauma. Worldwide event data show that encounters occur where human activities overlap with bear habitat, including work, recreation, travel, hunting, and resource collection; the circumstances and consequences vary across regions and bear species [1, 2]. Reported injuries include contaminated soft-tissue wounds, tissue avulsion, fractures, craniofacial injury, multisystem trauma, disability, and death [3–5]. For emergency services, the clinical challenge extends beyond initial resuscitation to wound management, infection prevention, surgical reconstruction, and disposition from hospitals with differing levels of trauma capability. The rarity of these events can complicate preparedness because emergency teams may have limited experience with combined penetrating, blunt, and contaminated wounds, even when airway control, haemorrhage control, or specialist reconstruction is urgently required [4, 5].

Hospital-based studies from Kashmir, central India, Bhutan, and Japan have described recurring, although not identical, epidemiological and clinical patterns [3–11]. Seasonal clustering has been reported in several settings, but the timing of peak attacks differs across regions, consistent with variation in local ecology and patterns of human activity [3, 5, 9]. Head and facial injuries, upper-extremity involvement, extensive soft-tissue wounds, and injuries affecting more than one anatomical region are repeatedly reported [3–11]. A 2025 Eastern Indian series described 30 patients with complex maxillofacial injury, and a 31-patient Japanese CT study applied the Facial Injury Severity Scale to bear-inflicted maxillofacial injury [10, 11]. Management frequently includes wound cleansing and debridement, systemic antibacterial treatment, fracture or reconstructive surgery, and, for selected severe cases, transfusion or intensive care [4–11]. These series differ substantially in referral level, case ascertainment, anatomical classification, and definitions of treatment and infection, which limits direct comparison of reported proportions.

Clinical evidence from Asia is therefore not absent: large hospital series have been published from Kashmir, and integrated clinical series are available from India, Bhutan, and Japan [3–11]. In China, however, published studies identified for the present project have primarily examined the spatial distribution, community context, or management of human–bear conflict [12–14]. Those studies provide important ecological and social context, but patient-level evidence linking activity at the time of attack, prehospital access, standardised injury severity, anatomical injury patterns, emergency and surgical care, and hospital outcomes remains limited in remote western China. This is a geographically bounded gap rather than an absence of Asian evidence. Hospital data can complement conflict surveillance by showing which encounters generate clinically significant trauma and what care is required after arrival; without population or outdoor-exposure denominators, however, they cannot estimate incidence or activity-specific risk.

This study aimed to characterise the temporal distribution and recorded circumstances of bear-related injuries treated at a county hospital in western China and to describe prehospital delays, anatomical injury patterns, injury severity, emergency and surgical management, complications, and clinical

outcomes. A prespecified exploratory objective was to compare injury severity between patients attacked while harvesting matsutake or other wild mushrooms and those attacked during other documented activities.

## **Methods**

### **Study design and reporting**

This was a single-centre retrospective observational study reported as a hospital-based case series with prespecified exploratory within-cohort comparisons. The patient's index bear-related encounter was the unit of analysis; wounds, procedures, and anatomical regions were not treated as independent observations. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations, as applicable to a retrospective observational case series [15].

### **Study setting and period**

This study was conducted at Jiulong County People's Hospital in Jiulong County, Ganzi Tibetan Autonomous Prefecture, Sichuan Province, western China. The hospital is a Grade II Class A general hospital and the county's only comprehensive hospital. It operates an emergency department, an intensive care unit, blood-storage and transfusion capability, and surgical operating facilities, with multispecialty support for emergency critical care. Patients requiring major vascular or neurosurgical treatment or specialist critical care beyond the hospital's capability are referred to higher-level facilities in Kangding or Chengdu. Jiulong County has a mountainous catchment, and remote townships are reached by mountain roads. The formal study period was 1 June 2015 to 31 December 2025; the 35 included bear-related encounters occurred between 26 July 2015 and 24 August 2025.

### **Study population and eligibility**

Patients were identified retrospectively through the hospital information system (HIS) and archived medical records; no separate trauma or bear-injury registry was used. Candidate records were retrieved by searching discharge diagnoses for the Chinese terms for bear bite, black-bear bite, and wild-animal bite, restricted to records with an injury location documented within Jiulong County. Exact ICD-10 codes used in the original query were not retained and are therefore not reported. Patients were eligible when a bear-related injury occurring in Jiulong County was documented during the formal study period. Non-bear animal bites, attacks outside Jiulong County, and repeat records for the same injury event were excluded. When a patient had more than one hospital encounter for the same attack, encounters were collapsed into a single index encounter, defined as the first admission for the index injury; later encounters for that injury were treated as follow-up contacts rather than separate cases.

A total of 35 verifiable cases were identified and included. The final dataset contained no duplicate study identifiers, de-identified hospital record identifiers, or duplicate composite patient-event keys. The original screening log was not retained, and the underlying HIS query could not be rerun; therefore, the total number of candidate records, the numbers excluded at each criterion, and criterion-specific exclusion counts could not be reconstructed. Consecutive inclusion of all eligible patients could not be independently verified, and a participant flow diagram was not constructed. The study size was determined by the verified records available in the frozen database; no post hoc power calculation was performed. The current data do not capture people who died before reaching medical care, did not seek care, or were treated exclusively at other hospitals.

## **Data collection and quality control**

Data were abstracted into a prespecified bilingual patient-level case report form containing 80 variables, including eight derived fields. Source categories in the database comprised emergency or medical records, operative records, hospital administrative records, and reconciled combinations of these sources. The variables covered demographics; attack date, time, activity, setting, and bear-related details; rescue, transport, referral, and prehospital delay; first recorded vital signs; Glasgow Coma Scale (GCS), Injury Severity Score (ISS), and Facial Injury Severity Scale (FISS); seven anatomical body regions; wound management, surgery, transfusion, antibacterial treatment, rabies and tetanus prophylaxis; intensive care; complications; hospital length of stay; transfer; sequelae; mortality; and follow-up. No structured laboratory variables were included. Sheng Yang, based at Jiulong County People's Hospital, abstracted the Jiulong medical records and participated in data collection, data verification, and clinical interpretation.

Data abstraction was performed by a first reviewer (Han Zhang), and every record was independently re-verified in full by a second reviewer (Sheng Yang); all 35 records were double-reviewed in their entirety rather than sampled. Corrections were retained in a versioned change log. Discrepancies were resolved by discussion and joint re-review of the source records, with the decision and its basis recorded in the change log; all 35 records were final-verified. Each record was checked against the original medical record, the hospital information system, and available emergency, operative, and laboratory records. No inter-rater agreement statistic was calculated. To reduce misclassification, activity at attack was coded from the recorded activity rather than inferred from month, occupation, or location; bear species was retained with its documented certainty rather than inferred from injury pattern; and blank, Unknown, and Not applicable were kept as distinct states. Patient identifiers, free-text narratives, village-level labels, and patient-level coordinates were excluded from public analytical outputs.

## **Variables and definitions**

Seasons were defined as spring (March–May), summer (June–August), autumn (September–November), and winter (December–February). Mushroom- or matsutake-harvesting exposure was coded

Yes when the recorded activity at attack was Matsutake harvesting or Other wild-mushroom harvesting; other known activities were coded No. Exposure was not inferred from the month, occupation, or attack location. Prolonged prehospital delay was predefined as at least 6 h from injury to arrival at the study hospital.

Anatomical regions were head/face, neck, thorax, abdomen/pelvis, upper extremity, lower extremity, and back/spine. Region indicators were non-mutually exclusive, and multiple-region injury was defined as involvement of at least two of the seven regions. Surgery was defined as any procedure performed in an operating room for the index injury; debridement included documented formal wound debridement in the emergency department or operating room. Intensive care unit (ICU) admission denoted admission to any ICU during the index hospitalisation. Study-hospital length of stay was calculated using the study hospital's official calendar-day convention as the discharge date minus the admission date. For patients transferred to a higher-level hospital, the transfer date was used in place of the discharge date.

Infection was coded when a clinician documented a wound infection, cellulitis, deep infection, septicaemia, bloodstream infection, or another infection related to the index injury. The infection observation window was the index hospitalisation; infections diagnosed after discharge were outside the defined window. Culture results were not available as a structured cohort-level variable and were not analysed. As a full-cohort coded outcome, sequelae were recorded when persistent functional, cosmetic, neurological, visual, or psychological impairment was documented in the medical record. Among patients discharged or transferred alive, post-discharge follow-up was ascertained from the last documented outpatient, telephone, or readmission contact, and duration was calculated from discharge or transfer to that contact. The patient who died during the index hospitalisation was structurally not applicable to post-discharge follow-up duration. Follow-up reflected routine clinical care and was not standardised at fixed time points. Loss to follow-up among hospital survivors was defined as no documented outpatient, telephone, or readmission contact after discharge or transfer. A supplementary composite outcome classified death first; major nonfatal adverse outcome was then assigned when infection, reoperation, transfer to a higher-level hospital, or sequelae was recorded; all remaining patients were classified as having no recorded major adverse outcome. The composite was not used as the primary outcome because its components were clinically heterogeneous.

## **Injury severity assessment**

The earliest reliable total Glasgow Coma Scale score documented at presentation was recorded. The Injury Severity Score (ISS) was analysed as a 0–75 continuous score [16], and severe injury was predefined as  $ISS \geq 16$ . ISS was calculated from all injuries documented during the index hospitalisation, including injuries identified by imaging or at operation, using the Abbreviated Injury Scale (AIS) 2015 edition. All 35 cases were independently re-coded by two attending trauma surgeons, each with five years of clinical experience and standardised training in AIS and Facial Injury Severity Scale (FISS) coding; both assessors were blinded to study outcomes. Discrepancies were resolved by joint re-review and consensus, with adjudication by a third senior assessor when consensus could not be reached. FISS

was calculated according to the published scoring system [17] by the same two assessors using the same consensus and adjudication process. It was recorded for all 16 patients with head or facial injury and treated as structurally not applicable for the other 19 patients.

## Clinical management variables

The case report form recorded wound contamination category, debridement, primary closure, any surgery and its free-text description, transfusion and red-cell units, systemic antibacterial treatment and treatment duration, rabies post-exposure prophylaxis category, tetanus prophylaxis category, ICU admission, and ICU length of stay. These variables describe care documented in the source records; they do not imply a standardised treatment protocol. Drug choice, dose, route, timing, microbiology, detailed operative sequence, and completion of vaccine schedules were not available as structured variables and were not analysed.

## Outcomes

The primary analytical severity measure for the prespecified exploratory exposure comparison was continuous ISS. Severe injury, defined as  $ISS \geq 16$ , was the key clinically interpretable secondary severity measure. Other secondary outcomes were infection, surgery, transfusion, ICU admission and ICU length of stay, study-hospital length of stay, reoperation, transfer to a higher-level hospital, documented sequelae, mortality status, and follow-up duration. The composite outcome group was used for supplementary description only.

## Statistical analysis

The analysis followed a Statistical Analysis Plan finalized after data cleaning and structural quality checks but before inferential testing. Categorical variables were summarised as n/N (%), where N was the number of patients with known and applicable data. Approximately symmetric continuous variables (age and arrival vital signs) were summarised as mean (standard deviation). Time intervals, bounded scores, treatment duration, hospital length of stay, and follow-up duration were summarised as median (interquartile range); red-cell units and ICU length of stay were reported as median (range) because only three patients were applicable. Exact binomial 95% confidence intervals were reported for selected rare event proportions.

The Shapiro–Wilk test was used as a supplementary distributional assessment for age and the six arrival vital signs in the overall cohort and for age within the two mushroom-exposure groups. It was not used to declare normality solely on the basis of  $P > 0.05$ . GCS, ISS, FISS, prehospital intervals, treatment duration, length of stay, and follow-up duration were handled nonparametrically because they were bounded, discrete, or skewed.

The prespecified primary exploratory comparison contrasted patients attacked while harvesting matsutake or other wild mushrooms (n = 19) with patients attacked during other documented activities (n = 16). Continuous nonparametric outcomes were compared using a two-sided Mann–Whitney U test with a tie-corrected asymptotic normal approximation and continuity correction. Hodges–Lehmann location shifts were reported with 95% confidence intervals obtained by Wilcoxon rank inversion; these intervals were interpreted as conservative in the presence of ties. Binary variables were compared using two-sided Fisher exact tests. Effect measures were the absolute risk difference with a Newcombe–Wilson 95% confidence interval and the conditional maximum-likelihood odds ratio with an exact conditional 95% confidence interval. A Welch two-sample t test was used only for the exploratory comparison of age between the severe- and non-severe-injury groups, with the mean difference and 95% confidence interval reported. No chi-square test was used.

All tests were two-sided, with  $P < 0.05$  used as a descriptive threshold. Only the mushroom-exposure comparison for continuous ISS was designated as the primary exploratory analysis; all other P values were considered exploratory. No formal adjustment for multiple comparisons was applied. Variable-specific available-case analysis was used. Unknown values were retained as such and excluded from inferential denominators; structurally inapplicable blanks were not treated as missing and were not imputed as zero. Multiple imputation was not performed because the primary analytical variables had no applicable missing values and the cohort was small. No sensitivity analyses or interaction tests were performed.

Ordinary univariable logistic screening, multivariable logistic regression, Firth logistic regression, receiver operating characteristic analysis, predictive modelling, and data-driven threshold selection were not performed. Severe injury and infection each occurred in nine patients, while other adverse outcomes were rarer; regression estimates would therefore have been overfitted and unstable. Analyses were conducted using Python 3.12.13, NumPy 2.5.1, and SciPy 1.18.0.

## **Ethical considerations**

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of 363 Hospital (no. 363-IRB-2014-008; 14 November 2014). The Ethics Committee of 363 Hospital waived the requirement for individual informed consent because de-identified routinely collected clinical data were analysed. Jiulong County People's Hospital authorised the use of its clinical records for data analysis and publication. De-identified study data remained under the control of Jiulong County People's Hospital; access requires approval from the relevant ethics committee and Jiulong County People's Hospital.

## **Use of generative artificial intelligence-assisted technologies**

During manuscript preparation in August 2026, the authors used OpenAI ChatGPT and Codex, using GPT-5-family language models. Exact backend model-version identifiers were not consistently exposed in the

user interface and are therefore not stated. The tools were used for consistency checking, and document formatting. No AI tool generated or modified patient data or statistical results. The authors reviewed and edited all output, independently verified references and numerical results against the source materials, and take full responsibility for the final manuscript.

## Results

### 3.1 Study cohort and data completeness

Thirty-five unique patient-level index encounters were included in the analysis. The exact numbers of records initially screened and excluded could not be reconstructed because a screening log was not retained; therefore, a participant flow diagram was not produced. The frozen dataset contained no duplicate study identifiers, de-identified hospital record identifiers, duplicate patient-event keys, or blank patient rows. No invalid categorical codes, clear clinical-range violations, or mismatches in the eight derived variables were identified. Source-verified statistical outliers were retained because they remained clinically plausible.

The prespecified analytical variables had no applicable missing values. Explicit Unknown values were recorded for whether the patient was alone at the time of attack ( $n = 2$ ), whether cubs were present ( $n = 3$ ), referral from another facility ( $n = 2$ ), and rabies prophylaxis ( $n = 1$ ); percentages for these variables were calculated using known-value denominators. The 111 raw blank cells were structurally inapplicable rather than missing: FISS in patients without head or facial injury ( $n = 19$ ), red-cell units in patients not transfused ( $n = 32$ ), antibacterial-treatment duration in untreated patients ( $n = 2$ ), ICU length of stay in patients not admitted to the ICU ( $n = 32$ ), and infection type in patients without infection ( $n = 26$ ).

### 3.2 Patient, temporal, exposure, and prehospital characteristics

The included encounters occurred between 26 July 2015 and 24 August 2025. Mean age was  $39.5 \pm 10.7$  years, 19 patients (54.3%) were male, and 22 (62.9%) were Tibetan. Twenty-six attacks (74.3%) occurred during summer, including 12 in July and 11 in August; together, July and August accounted for 23 of 35 cases (65.7%) (Table 1 and Fig. 1).

Table 1  
Patient, exposure, and initial clinical characteristics

| Characteristic                                 | Overall cohort (N = 35) | Known/applicable N or note |
|------------------------------------------------|-------------------------|----------------------------|
| <b>Demographics</b>                            |                         |                            |
| Age, years, mean (SD)                          | 39.5 (10.7)             | 35                         |
| Male sex, n (%)                                | 19 (54.3)               | 35                         |
| Female sex, n (%)                              | 16 (45.7)               | 35                         |
| Ethnicity: Tibetan, n (%)                      | 22 (62.9)               | 35                         |
| Ethnicity: Han, n (%)                          | 6 (17.1)                | 35                         |
| Ethnicity: Yi, n (%)                           | 5 (14.3)                | 35                         |
| Ethnicity: other, n (%)                        | 2 (5.7)                 | 35                         |
| <b>Temporal and activity characteristics</b>   |                         |                            |
| Spring (Mar–May), n (%)                        | 2 (5.7)                 | 35                         |
| Summer (Jun–Aug), n (%)                        | 26 (74.3)               | 35                         |
| Autumn (Sep–Nov), n (%)                        | 6 (17.1)                | 35                         |
| Winter (Dec–Feb), n (%)                        | 1 (2.9)                 | 35                         |
| Matsutake harvesting, n (%)                    | 16 (45.7)               | 35                         |
| Other wild-mushroom harvesting, n (%)          | 3 (8.6)                 | 35                         |
| Pastoral work/grazing, n (%)                   | 9 (25.7)                | 35                         |
| Forest work, n (%)                             | 2 (5.7)                 | 35                         |
| At/near residence, n (%)                       | 5 (14.3)                | 35                         |
| Mushroom/matsutake-harvesting exposure, n (%)  | 19 (54.3)               | 35                         |
| <b>Attack setting and bear-related details</b> |                         |                            |
| Forest location, n (%)                         | 16 (45.7)               | 35                         |
| Mountain trail, n (%)                          | 14 (40.0)               | 35                         |
| Farmland, n (%)                                | 2 (5.7)                 | 35                         |
| Village/residential area, n (%)                | 3 (8.6)                 | 35                         |
| Reported Asiatic black bear, n (%)             | 29 (82.9)               | 35; reported species       |
| Reported brown bear, n (%)                     | 4 (11.4)                | 35; reported species       |

| Characteristic                                          | Overall cohort (N = 35) | Known/applicable N or note |
|---------------------------------------------------------|-------------------------|----------------------------|
| <b>Demographics</b>                                     |                         |                            |
| Unidentified bear, n (%)                                | 2 (5.7)                 | 35; valid category         |
| Species confirmed by authority/photo, n (%)             | 3 (8.6)                 | 35                         |
| Species based on patient/witness report, n (%)          | 30 (85.7)               | 35                         |
| Species based on clinical inference only, n (%)         | 2 (5.7)                 | 35                         |
| Alone at attack: yes, n (%)                             | 13 (39.4)               | 33; Unknown = 2            |
| Cubs present: yes, n (%)                                | 7 (21.9)                | 32; Unknown = 3            |
| Unprovoked/surprise encounter, n (%)                    | 24 (68.6)               | 35                         |
| Defensive/cubs or food nearby, n (%)                    | 9 (25.7)                | 35                         |
| Human pursuit/attempted capture, n (%)                  | 1 (2.9)                 | 35                         |
| Other encounter status, n (%)                           | 1 (2.9)                 | 35                         |
| Clawing, n (%)                                          | 5 (14.3)                | 35                         |
| Biting, n (%)                                           | 11 (31.4)               | 35                         |
| Clawing and biting, n (%)                               | 17 (48.6)               | 35                         |
| Blunt impact/fall during escape, n (%)                  | 2 (5.7)                 | 35                         |
| <b>Prehospital rescue and transport</b>                 |                         |                            |
| Rescue by companion/local residents, n (%)              | 26 (74.3)               | 35                         |
| Self-rescue, n (%)                                      | 3 (8.6)                 | 35                         |
| Professional rescue/EMS, n (%)                          | 4 (11.4)                | 35                         |
| Police/forestry staff, n (%)                            | 1 (2.9)                 | 35                         |
| Other rescue, n (%)                                     | 1 (2.9)                 | 35                         |
| Time from injury to first medical care, h, median (IQR) | 3.2 (1.9–4.5)           | 35                         |
| Time from injury to study hospital, h, median (IQR)     | 4.8 (3.3–6.6)           | 35                         |
| Arrival at study hospital $\geq$ 6 h, n (%)             | 13 (37.1)               | 35                         |
| Ambulance transport, n (%)                              | 8 (22.9)                | 35                         |
| Private vehicle, n (%)                                  | 15 (42.9)               | 35                         |

| Characteristic                             | Overall cohort (N = 35) | Known/applicable N or note |
|--------------------------------------------|-------------------------|----------------------------|
| <b>Demographics</b>                        |                         |                            |
| Motorcycle, n (%)                          | 8 (22.9)                | 35                         |
| On foot/animal transport, n (%)            | 3 (8.6)                 | 35                         |
| Multiple transport modes, n (%)            | 1 (2.9)                 | 35                         |
| Referred from another facility: yes, n (%) | 6 (18.2)                | 33; Unknown = 2            |
| <b>Initial clinical status</b>             |                         |                            |
| Systolic blood pressure, mmHg, mean (SD)   | 129.5 (16.0)            | 35                         |
| Diastolic blood pressure, mmHg, mean (SD)  | 79.5 (14.1)             | 35                         |
| Heart rate, beats/min, mean (SD)           | 91.9 (22.4)             | 35                         |
| Respiratory rate, breaths/min, mean (SD)   | 19.5 (3.9)              | 35                         |
| Peripheral oxygen saturation, %, mean (SD) | 94.6 (2.9)              | 35                         |
| Temperature, °C, mean (SD)                 | 36.9 (0.6)              | 35                         |

Values are n (%) unless otherwise indicated. Percentages use the known and applicable denominator shown in the third column.

Species refers to the recorded species classification and its documented level of certainty; it was not inferred from injury pattern.

EMS, emergency medical services; IQR, interquartile range; SD, standard deviation.

Bars show patient counts by month and documented activity at attack. Mushroom/matsutake exposure was abstracted from the medical record and was not inferred from calendar month. July included 12 cases and August 11. No inferential test of seasonality was performed. Axes: x, month of injury; y, number of patients.

Sixteen patients (45.7%) were injured while harvesting matsutake and three (8.6%) while harvesting other wild mushrooms, giving a prespecified mushroom/matsutake-exposure group of 19 patients (54.3%). Nine attacks (25.7%) occurred during pastoral work or grazing, two (5.7%) during forest work, and five (14.3%) at or near the patient's residence. Sixteen attacks (45.7%) occurred in forests and 14 (40.0%) on mountain trails. Twenty-four encounters (68.6%) were recorded as unprovoked or surprise encounters, and combined clawing and biting was the most frequently recorded mechanism (17/35, 48.6%).

The bear was recorded as an Asiatic black bear in 29 cases (82.9%), a brown bear in four (11.4%), and unidentified in two (5.7%). Species classification was based on patient or witness report in 30 cases

(85.7%), authority or photographic confirmation in three (8.6%), and clinical inference alone in two (5.7%).

Companions or local residents provided rescue in 26 cases (74.3%). Median time from injury to first medical care was 3.2 h (IQR 1.9–4.5), and median time to the study hospital was 4.8 h (IQR 3.3–6.6). Thirteen patients (37.1%) arrived at least 6 h after injury. Private vehicles were the most common transport mode (15/35, 42.9%); six of 33 patients with known referral status (18.2%) were referred from another facility.

### **3.3 Injury severity and anatomical patterns**

At presentation, median GCS was 15 (IQR 13.5–15), and median ISS was 11 (IQR 7.5–15.5). Nine patients (25.7%) had severe injury, defined as  $ISS \geq 16$ . Among the 16 patients with head or facial injury, median FISS was 5.5 (IQR 4–15.5).

Upper-extremity injury was recorded in 30 patients (85.7%), head or facial injury in 16 (45.7%), lower-extremity injury in nine (25.7%), abdomen or pelvis injury in four (11.4%), back or spine injury in four (11.4%), neck injury in three (8.6%), and thoracic injury in one (2.9%) (Table 2 and Fig. 2). Twenty-one patients (60.0%) had injuries involving at least two anatomical regions. Patients could sustain injuries to more than one anatomical region; therefore, the regional percentages exceed 100%.

Table 2  
Anatomical distribution and injury patterns

| Characteristic                                          | Overall cohort (N = 35) | Applicable N or note |
|---------------------------------------------------------|-------------------------|----------------------|
| <b>Injury severity</b>                                  |                         |                      |
| GCS, median (IQR)                                       | 15 (13.5–15)            | 35                   |
| ISS, median (IQR)                                       | 11 (7.5–15.5)           | 35                   |
| Severe injury (ISS $\geq$ 16), n (%)                    | 9 (25.7)                | 35                   |
| FISS among patients with head/face injury, median (IQR) | 5.5 (4–15.5)            | 16                   |
| <b>Anatomical region, n (%)</b>                         |                         |                      |
| Head/face                                               | 16 (45.7)               | 35                   |
| Neck                                                    | 3 (8.6)                 | 35                   |
| Thorax                                                  | 1 (2.9)                 | 35                   |
| Abdomen/pelvis                                          | 4 (11.4)                | 35                   |
| Upper extremity                                         | 30 (85.7)               | 35                   |
| Lower extremity                                         | 9 (25.7)                | 35                   |
| Back/spine                                              | 4 (11.4)                | 35                   |
| Multiple anatomical regions ( $\geq$ 2), n (%)          | 21 (60.0)               | 35                   |
| <b>Wound contamination, n (%)</b>                       |                         |                      |
| Clean/minimal                                           | 6 (17.1)                | 35                   |
| Contaminated                                            | 16 (45.7)               | 35                   |
| Heavily contaminated                                    | 13 (37.1)               | 35                   |

Values are n (%) unless otherwise indicated. Patients could sustain injuries to more than one anatomical region; therefore, regional percentages may exceed 100%.

FISS was structurally applicable only to the 16 patients with head or facial injury. Fracture, open injury, vascular injury, nerve injury, tendon injury, eye injury, and soft-tissue injury subtype were not available as structured variables.

FISS, Facial Injury Severity Scale; GCS, Glasgow Coma Scale; IQR, interquartile range; ISS, Injury Severity Score.

Bars show the number and percentage of the 35 patients with injury in each anatomical region. Patients could sustain injuries to more than one region; therefore, regional percentages may exceed 100%. Twenty-one patients (60.0%) had injuries involving at least two regions. Axes: x, patients with injury in the region; y, anatomical region.

Wounds were classified as clean or minimally contaminated in six patients (17.1%), contaminated in 16 (45.7%), and heavily contaminated in 13 (37.1%). Fracture, open injury, vascular injury, nerve injury, tendon injury, eye injury, soft-tissue injury subtype, and a structured shock diagnosis were not available as structured variables and were not analysed.

### **3.4 Emergency and surgical management**

All 35 patients underwent documented debridement, and primary closure was performed in 17 (48.6%). Ten patients (28.6%) underwent surgery. Three patients (8.6%) received red-cell transfusion, with a median of 2 units (range 2–4). Systemic antibacterial treatment was administered to 33 patients (94.3%) for a median of 11 days (IQR 7–13) (Table 3).

Table 3  
Clinical management, complications, and outcomes

| Characteristic                                           | Overall cohort | Applicable denominator or 95% CI     |
|----------------------------------------------------------|----------------|--------------------------------------|
| <b>Clinical management</b>                               |                |                                      |
| Debridement, n (%)                                       | 35 (100.0)     | N = 35                               |
| Primary closure, n (%)                                   | 17 (48.6)      | N = 35                               |
| Any surgery, n (%)                                       | 10 (28.6)      | N = 35                               |
| Red-cell transfusion, n (%)                              | 3 (8.6)        | N = 35                               |
| Red-cell units among transfused patients, median (range) | 2 (2–4)        | n = 3                                |
| Systemic antibacterial treatment, n (%)                  | 33 (94.3)      | N = 35                               |
| Antibacterial-treatment duration, days, median (IQR)     | 11 (7–13)      | n = 33                               |
| Rabies prophylaxis: none, n (%)                          | 5 (14.7)       | N = 34                               |
| Rabies vaccine only, n (%)                               | 6 (17.6)       | N = 34                               |
| Vaccine plus rabies immunoglobulin, n (%)                | 23 (67.6)      | N = 34                               |
| Rabies prophylaxis Unknown, n                            | 1              | Excluded from percentage denominator |
| Tetanus prophylaxis: none, n (%)                         | 3 (8.6)        | N = 35                               |
| Tetanus vaccine/toxoid, n (%)                            | 19 (54.3)      | N = 35                               |
| Tetanus immunoglobulin plus vaccine, n (%)               | 12 (34.3)      | N = 35                               |
| Previously protected, n (%)                              | 1 (2.9)        | N = 35                               |
| <b>Complications and outcomes</b>                        |                |                                      |
| ICU admission, n (%)                                     | 3 (8.6)        | Exact 95% CI 1.8%–23.1%              |
| ICU length of stay, days, median (range)                 | 14 (2–21)      | n = 3                                |
| Infection during index hospitalization, n (%)            | 9 (25.7)       | Exact 95% CI 12.5%–43.3%             |
| Reoperation, n (%)                                       | 1 (2.9)        | Exact 95% CI 0.1%–14.9%              |
| Study-hospital length of stay, days, median (IQR)        | 6 (3–12)       | N = 35                               |
| Transfer to a higher-level hospital, n (%)               | 4 (11.4)       | Exact 95% CI 3.2%–26.7%              |
| Recorded sequelae, n (%)                                 | 2 (5.7)        | N = 35; exact 95% CI 0.7%–19.2%      |
| In-hospital death, n (%)                                 | 1 (2.9)        | N = 35                               |

| Characteristic                                                                 | Overall cohort   | Applicable denominator or 95% CI |
|--------------------------------------------------------------------------------|------------------|----------------------------------|
| <b>Clinical management</b>                                                     |                  |                                  |
| Alive at last outcome ascertainment, n (%)                                     | 34 (97.1)        | N = 35                           |
| Post-discharge follow-up duration among hospital survivors, days, median (IQR) | 217 (89.8–283.5) | N = 34                           |
| <b>Supplementary composite outcome</b>                                         |                  |                                  |
| Death, n (%)                                                                   | 1 (2.9)          | N = 35                           |
| Major nonfatal adverse outcome, n (%)                                          | 12 (34.3)        | N = 35                           |
| No recorded major adverse outcome, n (%)                                       | 22 (62.9)        | N = 35                           |

Values are n (%) unless otherwise indicated. Exact confidence intervals are Clopper–Pearson intervals from the locked formal analysis.

Infection was assessed during the index hospitalisation. Recorded sequelae were retained as a full-cohort coded outcome (N = 35). Post-discharge follow-up duration was summarised among the 34 hospital survivors; it reflected routine clinical care and was not standardised at fixed time points.

For transferred patients, the transfer date substituted for discharge date; study-hospital length of stay therefore does not represent total acute-care length of stay.

The supplementary composite classified death first, followed by infection, reoperation, transfer, or recorded sequelae as a major nonfatal adverse outcome. ICU, intensive care unit; IQR, interquartile range.

Among 34 patients with known rabies-prophylaxis status, five (14.7%) received no prophylaxis, six (17.6%) received vaccine alone, and 23 (67.6%) received vaccine plus rabies immunoglobulin. Tetanus vaccine or toxoid alone was recorded in 19 patients (54.3%), tetanus immunoglobulin plus vaccine in 12 (34.3%), no tetanus prophylaxis in three (8.6%), and previous protection in one (2.9%). Three patients (8.6%) were admitted to the ICU; their median ICU length of stay was 14 days (range 2–21).

Wound irrigation as a separate structured variable, repeated-debridement counts, operation counts, and standardised reconstructive, orthopaedic, or vascular procedure categories were not available and were not inferred from free-text treatment descriptions.

### 3.5 Complications and outcomes

Infection related to the index injury was recorded during the index hospitalisation in nine patients (25.7%; exact 95% CI 12.5%–43.3%). One patient (2.9%; exact 95% CI 0.1%–14.9%) underwent reoperation. Median study-hospital length of stay was 6 days (IQR 3–12). Four patients (11.4%; exact 95% CI 3.2%–

26.7%) were transferred to a higher-level hospital, and two of 35 (5.7%; exact 95% CI 0.7%–19.2%) had recorded sequelae under the full-cohort coded outcome. One patient (2.9%) died during hospitalisation.

Among the 34 patients discharged or transferred alive, post-discharge routine-care follow-up was documented for all 34, with a median duration of 217 days (IQR 89.8–283.5; range 15–361). The patient who died during the index hospitalisation was not included in the post-discharge follow-up denominator. This survivor-only summary was recalculated directly from the frozen patient-level dataset; no patient-level value was altered. Thirty-four of 35 patients (97.1%) were alive at the last outcome ascertainment. Follow-up was not conducted at standardised time points; these findings therefore represent recorded clinical follow-up rather than uniform long-term functional assessment.

### 3.6 Prespecified and limited exploratory analyses

The prespecified comparison included 19 patients attacked during mushroom or matsutake harvesting and 16 attacked during other documented activities. Median ISS was 9 (IQR 6–14) in the mushroom-exposure group and 12.5 (IQR 10–15.2) in the other-activity group (Fig. 3). The Hodges–Lehmann location shift, oriented as mushroom exposure minus other activity, was –3 ISS points (95% CI –6 to 2;  $P = 0.213$ ). Severe injury occurred in 5/19 (26.3%) and 4/16 (25.0%) patients, respectively, corresponding to a risk difference of +1.3 percentage points (95% CI –27.2 to +28.2) and an odds ratio of 1.07 (95% CI 0.18–6.72;  $P = 1.000$ ). The confidence intervals were wide and encompassed the null.

Patient-level points are de-identified. Boxes indicate the interquartile range, horizontal lines the median, and whiskers the most extreme values within 1.5 times the interquartile range. The dashed horizontal line marks  $ISS \geq 16$ . The prespecified comparison used a two-sided Mann–Whitney U test with a tie-corrected asymptotic normal approximation ( $U = 114.0$ ;  $P = 0.213$ ); the Hodges–Lehmann shift was –3 points (95% CI –6 to 2), oriented as mushroom exposure minus other activity. Axes: x, documented activity group; y, Injury Severity Score. No significance stars were used.

Median time to the study hospital was 4.9 h (IQR 3.2–6.4) versus 4.5 h (IQR 3.5–7.6), with a Hodges–Lehmann shift of –0.6 h (95% CI –2.3 to 1.0;  $P = 0.456$ ). Surgery was performed in 3/19 (15.8%) versus 7/16 (43.8%) patients, corresponding to a risk difference of –28.0 percentage points (95% CI –53.2 to +2.1) and an odds ratio of 0.25 (95% CI 0.03–1.45;  $P = 0.132$ ). Infection occurred in 4/19 (21.1%) versus 5/16 (31.2%), with a risk difference of –10.2 percentage points (95% CI –37.6 to +17.9), an odds ratio of 0.60 (95% CI 0.09–3.51), and  $P = 0.700$ . Median study-hospital length of stay was 5 days (IQR 2.5–10.5) versus 7.5 days (IQR 3.8–12.2), with a Hodges–Lehmann shift of –1 day (95% CI –5 to 3;  $P = 0.485$ ). Full estimates are provided in Supplementary Table S1.

In the limited severe-injury analysis, all three ICU admissions occurred among the nine patients with  $ISS \geq 16$ , compared with none among the 26 patients with  $ISS < 16$  (risk difference +33.3 percentage points, 95% CI +8.5 to +64.6; Fisher exact  $P = 0.013$ ). Multiple-region injury occurred in 8/9 (88.9%) versus 13/26 (50.0%) patients (risk difference +38.9 percentage points, 95% CI +1.9 to +59.0; odds ratio 7.60, 95% CI 0.82–381.70;  $P = 0.056$ ). These comparisons were descriptive and exploratory, and the odds-ratio

intervals were very wide because of sparse cells. The remaining severe- versus non-severe-injury comparisons are reported in Supplementary Table S2.

Among patients arriving at least 6 h after injury, infection occurred in 5/13 (38.5%), compared with 4/22 (18.2%) among those arriving earlier. The risk difference was + 20.3 percentage points (95% CI -8.8 to + 48.5), the odds ratio was 2.72 (95% CI 0.45–17.91), and  $P = 0.243$ . Median study-hospital length of stay was 12 days (IQR 5–14) versus 4.5 days (IQR 3–7.8), with a Hodges–Lehmann shift of + 4.5 days (95% CI 0–9;  $P = 0.057$ ). The latter comparison did not meet the prespecified descriptive significance threshold; both delay analyses are included in Supplementary Table S2.

No univariable screening model, multivariable logistic regression, or Firth logistic regression was fitted. Severe injury and infection each occurred in only nine patients; ICU admission and transfusion occurred in three each, and reoperation and death in one each.

## Discussion

### Principal findings

In this retrospective hospital-based series of 35 patients with bear-related injuries in remote western China, the principal findings were a marked summer concentration, frequent attacks during documented mushroom or matsutake harvesting, and an anatomical pattern dominated by upper-extremity, head/facial, and multiple-region injuries. Nine patients met the prespecified ISS threshold for severe injury. Care commonly involved debridement and systemic antibacterial treatment, while smaller subsets required surgery, transfusion, intensive care, or transfer, and one patient died in hospital. The prespecified comparison between patients attacked during mushroom or matsutake harvesting and those attacked during other activities produced wide confidence intervals and did not identify a clear difference in injury severity. The study therefore contributes an integrated description of temporal pattern, recorded attack circumstances, prehospital access, clinical injury, treatment, and outcomes. It does not establish activity-specific risk, causation, or a prognostic model.

### Temporal pattern and recorded attack circumstances

Nearly three quarters of the cases occurred during summer, and July and August together accounted for almost two thirds of the cohort. More than half of the attacks occurred while patients were documented as harvesting matsutake or other wild mushrooms. Seasonal and resource-collection contexts have been described previously. In Kashmir, most cases occurred from July to November [3], while a Japanese series included patients collecting wild vegetables [8]. Interview data from central India identified non-timber forest-product collection as a common activity during sloth-bear encounters [18], and administrative conflict data from Qinghai recorded a summer peak in human attacks [13]. These comparisons support the plausibility of seasonal overlap between outdoor livelihood activities and bear habitat, but they do not show that mushroom harvesting caused the attacks in Jiulong.

The timing of peak attacks is not universal. Studies from Kashmir, Japan, central India, and Qinghai have reported different temporal patterns [3, 5, 9, 13, 18], which may reflect differences in bear species, climate, human activity, case ascertainment, and referral patterns. In the present study, activity at the time of attack was abstracted directly rather than inferred from month. However, no denominator was available for the number of residents harvesting mushrooms, the duration of exposure, or bear abundance. The finding therefore describes the circumstances of hospital-treated injuries and cannot estimate individual risk or population incidence. Its main added value is the patient-level linkage of a frequently recorded livelihood-related activity in this cohort to prehospital and clinical data.

## **Anatomical injury pattern and severity**

Upper-extremity injury was the most common anatomical finding, followed by head or facial injury, and 60.0% of patients sustained injuries to at least two anatomical regions. Craniofacial injury has been repeatedly reported in Asian hospital series [3–11]. Upper-limb trauma has also been described, particularly in Kashmir and orthopaedic referral cohorts [3, 6, 19]. Recent series focused on complex maxillofacial injury and CT-based FISS assessment provide additional context for the substantial facial-injury burden that can accompany bear attacks [10, 11]. The lower proportion of head or facial injury in the present cohort than in several referral-heavy series should not be interpreted as a formal regional difference. Case mix, referral pathways, bear species, coding rules, and specialty selection differed substantially. The combined upper-extremity and head/facial pattern may be compatible with close-range interaction and protective positioning, but attack posture was not recorded and the present data cannot reconstruct biomechanics.

Under the prespecified  $ISS \geq 16$  grouping, nine patients were classified as having severe injury. All three ICU admissions occurred in that subset, but the comparison was based on sparse cells and was exploratory. Similarly, multiple-region injury was more frequent among patients with  $ISS \geq 16$ , yet the odds-ratio confidence interval was extremely wide and included the null. These observations are clinically coherent but do not establish prediction. The prespecified activity comparison was also inconclusive: the ISS location shift was  $-3$  points (95% CI  $-6$  to  $2$ ;  $P = 0.213$ ), and the severe-injury risk difference was  $+1.3$  percentage points (95% CI  $-27.2$  to  $+28.2$ ). The estimates neither demonstrate a severity difference nor establish equivalence between activity groups. Although the scoring procedure was standardised, retrospective recoding and the absence of a formal inter-rater reliability estimate remain limitations.

## **Attack-to-care pathway and emergency management**

The median time from injury to the study hospital was 4.8 h, and 37.1% of patients arrived after at least 6 h. Companions or local residents provided rescue in most cases, and private vehicles were the most frequently recorded transport mode. These findings show that informal rescue and transport were prominent components of the observed attack-to-care pathway. The study hospital is Jiulong County's only comprehensive Grade II Class A general hospital, with emergency, intensive-care, transfusion, and operative capacity; patients requiring major vascular, neurosurgical, or specialist critical care beyond its

capability are referred to higher-level centres in Kangding or Chengdu. Penjor and Dorji described emergency care and referral after bear mauling in Bhutan [7], while Akiyama et al. emphasised early transport and prompt care [8]. The mountainous catchment provides relevant context, but the patient-level data do not identify which geographical, transport, dispatch, or referral factors produced the observed intervals.

Exploratory comparisons did not establish that delayed arrival worsened outcomes. Infection occurred in 5 of 13 patients arriving after at least 6 h and in 4 of 22 arriving earlier, with a risk difference of + 20.3 percentage points (95% CI – 8.8 to + 48.5;  $P = 0.243$ ). Median study-hospital length of stay was longer in the delayed group, but the Hodges–Lehmann shift of + 4.5 days had a 95% CI of 0 to 9 and  $P = 0.057$ . Study-hospital length of stay was calculated as transfer or discharge date minus admission date; for transferred patients it therefore did not represent the complete acute-care stay. The estimates were unadjusted, vulnerable to confounding by injury severity and referral, and imprecise. They should not be described as a trend or as evidence that delay caused infection or prolonged hospitalisation.

## **Wound management, infection, and outcomes**

Most wounds were classified as contaminated or heavily contaminated. Every patient underwent documented debridement, 94.3% received systemic antibacterial treatment, and 28.6% underwent surgery. These data illustrate the wound-care burden of bear-related trauma but do not measure the effectiveness of any intervention. Prior Asian series have reported debridement, antibacterial treatment, reconstructive procedures, and multidisciplinary management for complex craniofacial and limb wounds [4–11]. Broad animal-bite literature indicates that infected wounds may be polymicrobial and that variation in culture methods and infection definitions complicates comparison across studies [20]. In the present dataset, wound irrigation as a separate field, repeated-debridement counts, detailed operative categories, and structured microbiology were unavailable. Accordingly, the study should not be used to recommend a specific antibacterial or operative regimen.

Using the prespecified definition of clinician-documented infection related to the index injury during the index hospitalisation, nine patients met the study definition. The exact binomial confidence interval was wide, and direct comparison with infection proportions reported by other bear-injury series would be misleading because surveillance windows, clinical criteria, referral case mix, and culture practices differ [4, 5, 20]. The database grouped wound infection, cellulitis, septicaemia, and other clinician-documented infection under one outcome and contained no structured cohort-level microbiology results. Rabies and tetanus prophylaxis were documented, but schedule completion, timing, and drug-level detail were not structured variables. The recorded proportions should therefore be interpreted as documentation of care rather than adherence or effectiveness measures.

Critical outcomes were uncommon but clinically consequential: three patients required intensive care, three received transfusion, four were transferred to a higher-level hospital, one underwent reoperation, and one died in hospital. Sparse event counts precluded stable regression modelling, and absence of statistical significance in subgroup comparisons should not be interpreted as absence of clinically

important differences. All 34 patients discharged or transferred alive had a recorded routine-care post-discharge contact, but follow-up timing and modality were not standardised. The in-hospital death was not included in that post-discharge denominator. Study-hospital length of stay and routine-care follow-up provide useful descriptive context, but they do not constitute complete episode-of-care or standardised long-term functional outcomes. For transferred patients, the confirmed length-of-stay rule captured time at the study hospital only; receiving-hospital procedures and total acute-care length of stay were not available as structured variables.

## **Clinical and regional implications**

Four cautious implications follow from these data. First, emergency preparedness and prevention messaging may reasonably be intensified during months when hospital-treated cases cluster, while avoiding the assumption that the calendar alone identifies individual risk. Second, the high frequency of upper-extremity, head/facial, and multiple-region injury supports a systematic whole-body trauma assessment with particular attention to these regions. Third, the predominance of contaminated wounds and the frequent need for debridement support early evaluation of tissue viability, contamination, prophylaxis status, and the possible need for surgical consultation. These are operational implications rather than interventions tested by this study. Fourth, the several-hour attack-to-care interval and the occurrence of ICU admission and transfer support early coordination of transport and referral for severe or anatomically complex injuries. Published series emphasise prompt assessment and referral [4, 8], together with multidisciplinary or specialist management for complex craniofacial and limb injuries [4, 6, 9, 19]. Broader animal-bite evidence supports careful evaluation of contaminated wounds and microbiological uncertainty [20].

## **Strengths and limitations**

This study has several strengths. It describes an uncommon clinical population from an underrepresented region of western China and links the recorded activity and location of attack with rescue, transport, injury severity, anatomy, treatment, and outcomes at the patient level. Data were entered in a prespecified bilingual case-report form, subjected to duplicate and range checks, and analysed under a Statistical Analysis Plan that prioritised descriptive estimates and restrained exploratory comparisons. Denominators, Unknown values, and structural non-applicability were reported explicitly. Effect estimates and confidence intervals were retained even when imprecise, and multivariable or Firth regression was not forced onto sparse events. These features improve transparency, although they cannot remove the limitations of retrospective hospital data.

The retrospective, single-centre, hospital-based design restricts generalisability and cannot estimate population incidence or activity-specific risk. Because prehospital deaths, untreated injuries, and injuries managed exclusively at other hospitals were not captured, the cohort may underrepresent both immediately fatal events and less severe injuries that did not present to the study hospital; the net direction of bias in the observed severity and mortality distributions is therefore uncertain. The search strategy and eligibility criteria were documented, but no contemporaneous screening log was retained

and the HIS query could not be rerun; exact screened and excluded counts cannot be reconstructed, consecutive inclusion of all eligible patients cannot be independently verified, and the resulting selection uncertainty is of unknown direction. The small sample and low number of ICU admissions, transfusions, reoperations, transfers, and deaths produced limited power, risk of type II error, and wide confidence intervals. Multiple exploratory comparisons were unadjusted, and residual confounding could not be addressed with stable multivariable models.

Measurement limitations also apply. Bear species was recorded as Asiatic black bear in most cases, but only three species classifications were confirmed by an authority or photograph. Most relied on patient or witness report, and two were based on clinical inference. Attack circumstances and provocation categories may be affected by recall or classification error. Fracture, open injury, neurovascular injury, detailed soft-tissue injury, wound irrigation, repeated debridement, standardised reconstructive or orthopaedic procedures, and microbiology were not available as structured variables. Injury severity was retrospectively assigned, and no inter-rater agreement estimate was available. Restricting infection ascertainment to the index hospitalisation likely underestimates infections first diagnosed after discharge. Follow-up among hospital survivors reflected non-standardised routine care rather than fixed-time assessment; absence of a recorded sequela does not establish normal recovery. For transferred patients, use of the transfer date as the endpoint likely underestimates total acute-care length of stay, and receiving-hospital procedures and outcomes were not available as structured variables.

## Future research

A multicentre registry across western China would improve case ascertainment and permit more stable estimation of uncommon severe outcomes. Prospective collection should use standardised definitions for species certainty, attack circumstances, anatomical injury, AIS/ISS/FISS scoring, contamination, infection, operative procedures, and prehospital intervals. Linkage with receiving hospitals would capture the complete acute-care episode after transfer. Standardised microbiological sampling and fixed-time functional, cosmetic, neurological, visual, and psychological outcome measures would clarify complications that routine records may miss. Where privacy safeguards permit, aggregated geographic and environmental linkage, together with activity-exposure denominators, could support prevention research without converting hospital case counts into unsupported population-risk estimates.

## Conclusion

In this 35-patient retrospective hospital series from remote western China, bear-related injuries were concentrated in summer, and more than half occurred during documented mushroom or matsutake harvesting. Injuries most often involved the upper extremities, with frequent head/facial and multiple-region trauma. Care commonly required debridement and systemic antibacterial treatment, while a smaller subset required surgery, transfusion, intensive care, or transfer, and one patient died. The prespecified activity-group comparison was imprecise and did not establish a difference in injury severity. This series highlights a summer-concentrated hospital-presentation pattern and a clinically

important emergency-care burden. These findings support timely trauma assessment, contaminated-wound evaluation, and coordinated referral. Because the cohort was small, single-centre, and hospital based, subgroup findings should be interpreted as exploratory rather than predictive or causal.

## Abbreviations

AIS, Abbreviated Injury Scale; CI, confidence interval; EMS, emergency medical services; FISS, Facial Injury Severity Scale; GCS, Glasgow Coma Scale; HIS, hospital information system; ICU, intensive care unit; IQR, interquartile range; ISS, Injury Severity Score; OR, odds ratio; RD, risk difference; SD, standard deviation; STROBE, Strengthening the Reporting of Observational Studies in Epidemiology.

## Declarations

### Ethics approval and consent to participate

This study was conducted in accordance with the Declaration of Helsinki and was approved by the Ethics Committee of 363 Hospital (no. 363-IRB-2026-008; 14 July 2026). The Ethics Committee of 363 Hospital waived the requirement for individual informed consent because de-identified routinely collected clinical data were analysed. Jiulong County People's Hospital authorised the use of its clinical records for data analysis and publication.

### Consent for publication

Not applicable. The manuscript reports de-identified aggregate findings and contains no directly identifying participant information or images.

## Competing interests

The authors declare that they have no competing interests.

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## Author Contribution

Conceptualisation: HZ and XL. Methodology: HZ and QZ. Formal analysis and investigation: HZ. Medical-record abstraction, data collection, data verification, and clinical interpretation: SY. Writing—original draft preparation: HZ. Writing—review and editing: QZ and XL. Supervision: XL. All authors read and approved the final manuscript.

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## Authors' information

Not applicable.

# Data Availability

The de-identified participant-level data are controlled by Jiulong County People's Hospital and are not publicly available because of participant privacy, ethics requirements, and institutional restrictions. Requests for access may be directed to the corresponding author and will be considered only with approval from the relevant ethics committee and Jiulong County People's Hospital. Supplementary methods and exploratory analyses are provided in Additional file 1; the analysis specification, variable dictionary, and aggregated statistical results are provided in Additional file 2.

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Figures

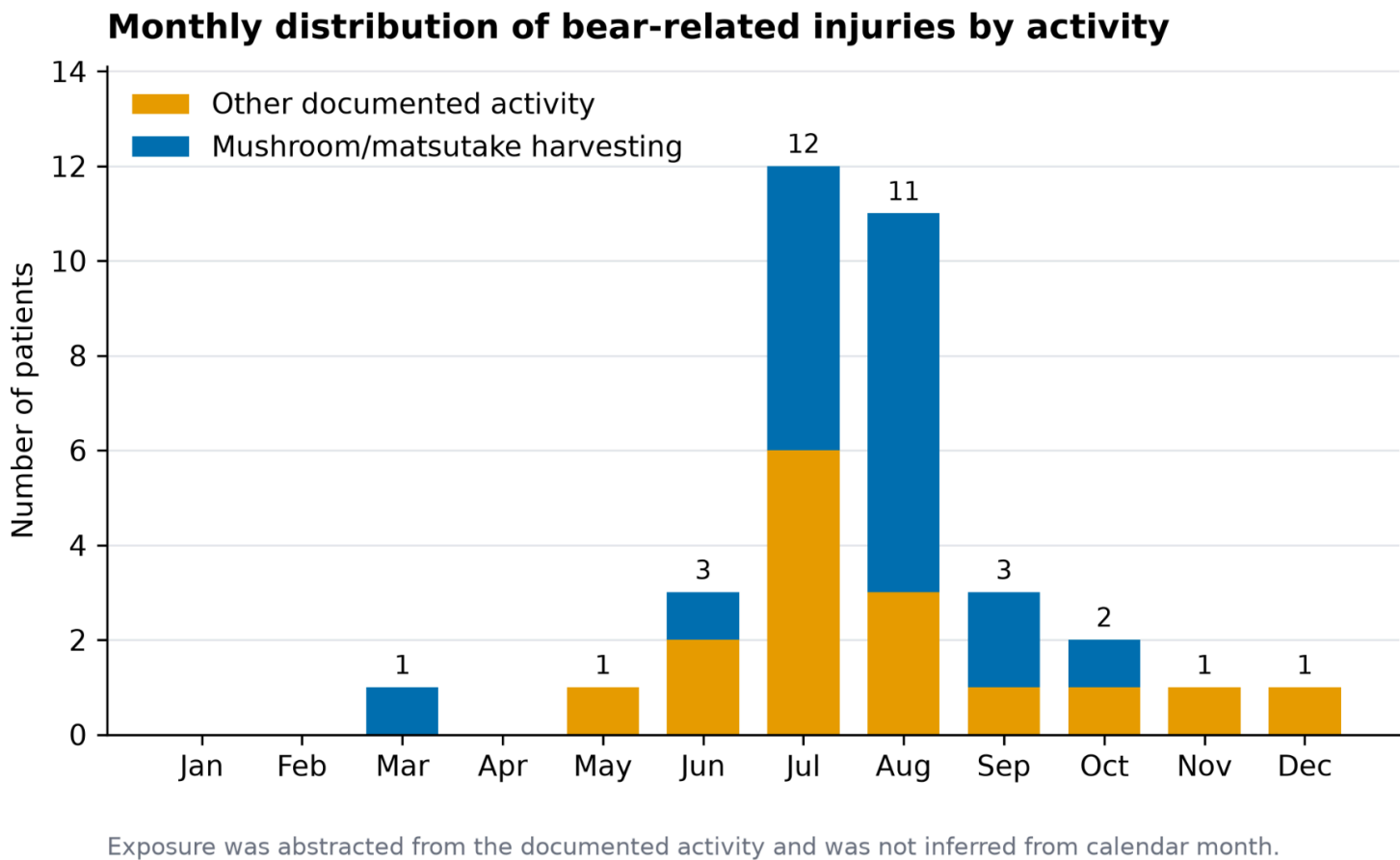


Figure 1

Monthly distribution by recorded harvesting exposure

Bars show patient counts by month and documented activity at attack. Mushroom/matsutake exposure was abstracted from the medical record and was not inferred from calendar month. July included 12 cases and August 11. No inferential test of seasonality was performed. Axes: x, month of injury; y, number of patients.

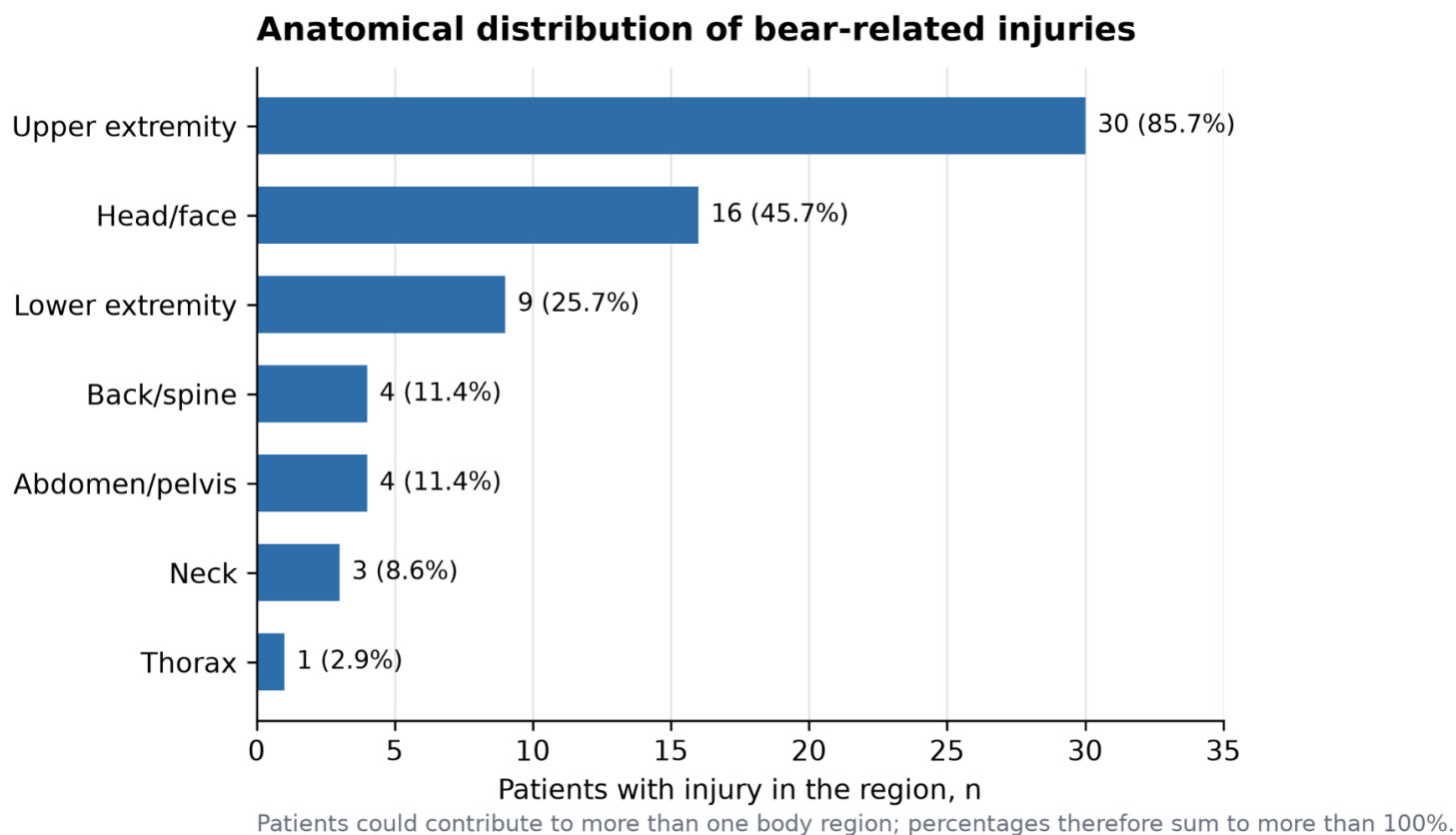


**Figure 2**

**Anatomical distribution of bear-related injuries**

Bars show the number and percentage of the 35 patients with injury in each anatomical region. Patients could sustain injuries to more than one region; therefore, regional percentages may exceed 100%. Twenty-one patients (60.0%) had injuries involving at least two regions. Axes: x, patients with injury in the region; y, anatomical region.

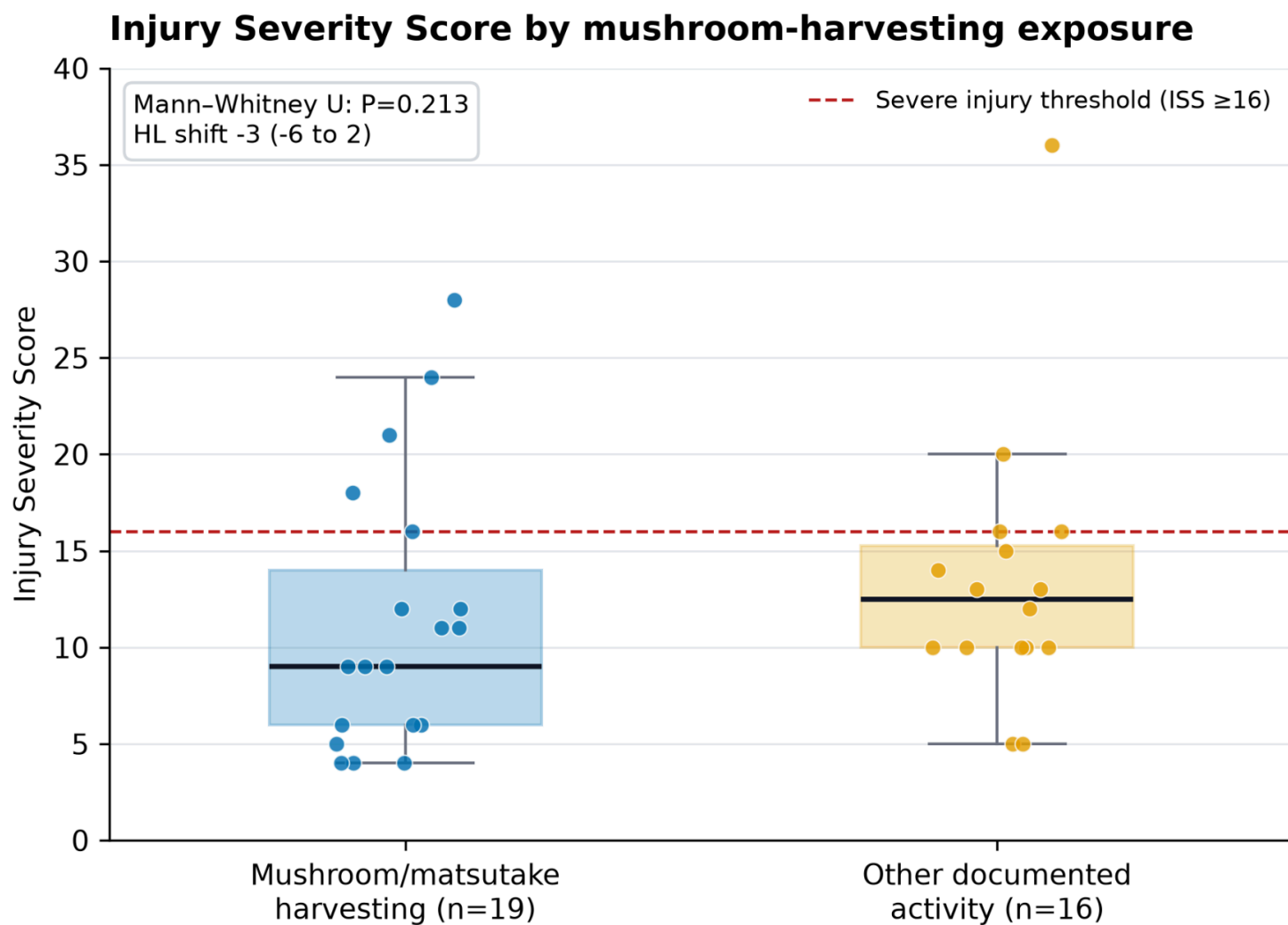


Figure 3

### Injury Severity Score by recorded harvesting exposure

Patient-level points are de-identified. Boxes indicate the interquartile range, horizontal lines the median, and whiskers the most extreme values within 1.5 times the interquartile range. The dashed horizontal line marks ISS  $\geq 16$ . The prespecified comparison used a two-sided Mann–Whitney U test with a tie-corrected asymptotic normal approximation ( $U = 114.0$ ;  $P = 0.213$ ); the Hodges–Lehmann shift was  $-3$  points (95% CI  $-6$  to  $2$ ), oriented as mushroom exposure minus other activity. Axes: x, documented activity group; y, Injury Severity Score. No significance stars were used.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [FigureS1.png](#)