

# Clinical and epidemiologic profile of venomous snakebites in Chongqing Wuling mountainous area, western China

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**Background:** In China, venomous snakebites are an important medical emergency and cause of hospital admission, but few studies have looked at the clinical and epidemiologic profile of human snakebite victims.

**Methods:** We conducted a retrospective study of 440 snakebite cases encountered at a single hospital in the Chongqing Wuling mountainous area of western China from July 2004 to August 2018. Data were collected from the electronic medical record system.

**Results:** The majority of bite victims were male (58.4%), 41–60 y of age (37.9%) and the bites occurred during the daytime (51.1%) in July–September (62.5%). The lower limbs were the most vulnerable sites to snakebites (73.9%). The most common local toxicity consisted of pain (86.1%), oedema (78.4%) and bleeding (35.9%). Of the systemic toxicities, haematuria (14.3%) and ophthalmoplegia (9.5%) were common. The majority (86.4%) of individuals presented to the hospital within 6 h.

**Conclusions:** This study describes the clinical and epidemiologic profile of venomous snakebites in the Chongqing Wuling mountainous area of western China. Multicentre prospective studies were needed in the entire country of China.

**Keywords:** clinical features, epidemiologic profile, venomous snakebites, western China

## Introduction

Venomous snakebites cause >100 000 deaths every year worldwide, causing heavy burdens and physical disabilities in many survivors.<sup>1–3</sup> In China, there are 60 species of venomous snakes distributed in different parts of the country and >100 000 snake bites occur each year.<sup>4</sup> The Chongqing Wuling mountainous area is located in western China and consists of seven districts. *Gloydus halys* (Halys pit viper), *Deinagkistrodon acutus* (Chinese moccasin), *Trimeresurus stejnegeri* (Chinese green tree viper) and *Protobothrops mucrosquamatus* (Chinese habu) are the major venomous snake species seen in this area.<sup>5</sup> In this study we retrospectively analysed the epidemiological and clinical profile of 440 patients over a 14-y period in the Second Affiliated Hospital of Chongqing Medical University and Pengshui Branch Hospital of the Second Affiliated Hospital of Chongqing Medical University.

## Materials and methods

A retrospective study was performed in 2004–2018 at the Second Affiliated Hospital of Chongqing Medical University and

Pengshui Branch Hospital of the Second Affiliated Hospital of Chongqing Medical University. The Institutional Ethics Committee of the Second Affiliated Hospital of Chongqing Medical University approved the research project. Patients were included if they had an unequivocal history of snakebite between July 2004 and August 2018 in the electronic medical record system (EMRS). Clinical and epidemiological profiles were collected by a single reviewer. Clinical features included both local toxicity at the site of the bite and systemic toxicity. Local toxicity consisted of pain, oedema, bleeding, cellulitis, compartment syndrome, abscess formation and gangrene. Systemic toxicity included haematological toxicity or/and neurotoxicity.

According to the regulations of our hospital, based on World Health Organization guidelines, all patients bitten by a venomous snake are given the first dose of antivenom (Shanghai Serum Bio-technology Co., Shanghai, China) within 15 min of reaching the hospital. Antivenom was given repeatedly according to the patients' signs. Local routine treatment was administered, including early ligation, suction and blocking therapy. Summary statistics of continuous variables are expressed as median (interquartile range [IQR]) and categorical or ordinal

variables are expressed as frequency (percentage). The data were recorded and analysed using SPSS software, version 22 (IBM, Armonk, NY, USA).

## Results

A total of 440 patients with venomous snakebites were identified during the study period. A total of 257 (58.4%) cases were male and 183 (41.6%) were female, with 225 (51.1%) bites occurring during the daytime (08:00–19:59) and 215 (48.9%) at night (20:00–07:59). Most patients were in the 41–60 y age group (167 [37.9%]) and >60 y of age (147 [33.4%]), compared with 79 (17.9%) patients in the 20–40 y age group and 47 (10.8%) in the <20 y age group (Figure 1). Most of the bites (62.5%) occurred in the months of July–September (Figure 2).

The location of the snakebite varied, with 325 (73.9%) on the lower limb, 80 (18.2%) on the upper limb, 22 (5.0%) on the trunk and 13 (2.9%) on the head and neck (Figure 3). Pain occurred in 379 (86.1%) patients, oedema in 345 (78.4%), bleeding in 158 (35.9%), cellulitis in 40 (9.1%), compartment syndrome in 3 (0.7%) and gangrene in 1 (0.2%). Of the systemic haematological toxicity manifestations, haematuria occurred in 63 (14.3%) patients: 47 (10.7%) with bleeding gums, 34 (7.7%) with haemoptysis and 3 (0.7%) with disseminated intravascular coagulation (DIC). The neurotoxicity manifestations included ophthalmoplegia in 42 (9.5%) patients, blurred vision in 35 (7.9%), vertigo in 20 (4.5%) and respiratory distress in 2 (0.5%).

Early treatment of venomous snakebites is critical. In our study, 38 (8.7%) patients arrived to the hospital 0–2 h after the bite, 205 (46.6%) in 2–4 h, 137 (31.1%) in 4–6 h and 60 (13.6%) in >6 h. The length of hospitalization was <24 h in 53 (12.1%) patients, 1–3 d in 170 (38.6%), 4–7 d in 146 (33.2%) and >1 week in 71 (16.1%).

## Discussion

Venomous snakebites are well-known medical emergencies in many countries.<sup>6–8</sup> The true epidemiological characteristic is unknown because of inadequate reporting. In our study, 440 patients were involved and the majority of victims were male. Most of the bites occurred in patients 41–60 y of age and during the months of July–September. Our findings differs from those in other countries such as India, Japan and Panama.<sup>9–11</sup> This may be because individuals in these countries are more involved

in agricultural production and outdoor activities. Low mortality was seen in our study compared with other studies, because 86.4% of the victims reached the hospital within 6 h.<sup>12,13</sup>

In our study, the lower limbs were the site most vulnerable to snakebites, as most accidents occurred during agricultural production or walking on mountain roads. Upper limb bites are also common and lead to more serious sequelae. The incidence of local toxicity from venomous snakebites is higher and the most common symptoms are pain and oedema. In our study, the incidence of DIC was low,<sup>14</sup> probably due to different types of venomous snakes and timely arrival at the hospital after injury. The most common feature of neurotoxicity was ophthalmoplegia. Once respiratory failure occurs and ventilator-assisted breathing is required, the mortality rate increases dramatically.<sup>15</sup>

Antivenom is very important for patients with symptomatic snake bites.<sup>16</sup> However, biopharmaceutical manufacturers producing antivenom are rare in China, which may lead to insufficient drugs for venomous snakebite treatment.

This study focused on the clinical and epidemiologic profile of venomous snakebites in western China, but our study has several limitations, including the use of retrospective descriptive data that was from a single centre in one district of China. Thus it may not represent the current situation in other districts of

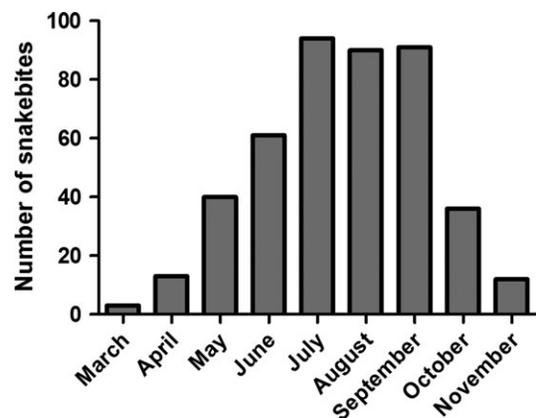


Figure 2. Seasonal variation of snakebites.

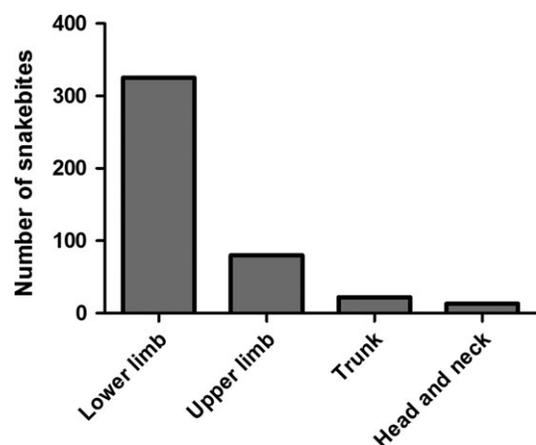


Figure 3. Site of snakebites.

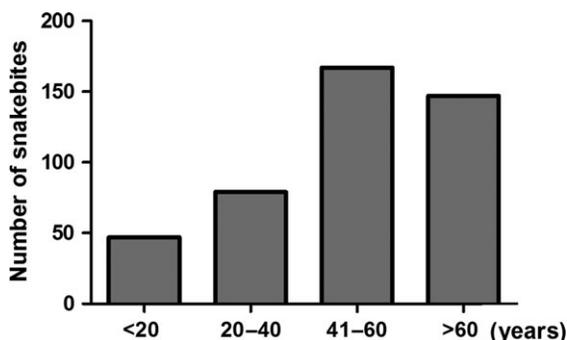


Figure 1. Age distribution of snakebite victims.

China. In addition, because of the limitations of the EMRS, our data did not include the species of snakes that were involved in these incidents. More data are needed for statistical analysis.

## Conclusions

Venomous snakebites remain an important public health problem in China. This study describes the clinical and epidemiologic profile of venomous snakebites in the Chongqing Wuling mountainous area of western China. Multicentre prospective studies are needed for the entire country of China.

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**Authors' contributions:** HC designed the study, gathered data and assisted with manuscript preparation. XC and HH assisted with data analysis and manuscript preparation. XC and HC performed data analysis and wrote the manuscript. All authors read and approved the final manuscript.

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