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CLINICAL AND EPIDEMIOLOGICAL PROFILE OF SNAKEBITE PATIENTS PRESENTING TO A TERTIARY REFERRAL EMERGENCY DEPARTMENT IN EAST JAVA, INDONESIA

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ABSTRACT

Background. Indonesia carries one of the highest snakebite burdens in Southeast Asia, yet national epidemiological data are scarce and derive almost entirely from isolated hospital reports. This study aims to describes the clinical and epidemiological profile of snakebite patients presenting to the emergency department (ED).
Research Method. A descriptive observational study was conducted on all 82 snakebite patients who presented between January and December 2025, identified by total sampling from the ED register and medical records of Dr. Saiful Anwar General Hospital, Malang. The variables evaluated included demographic characteristics, reported snake type, clinical manifestations classified using standard envenoming criteria, emergency department disposition, and short-term outcomes.
Findings. Bites attributed by patients to green snakes, consistent with *Trimeresurus* species, accounted for 46 cases (56.1%). Majority patients presented without symptoms or with mild local manifestations only (29 asymptomatic, 35.4%; 33 mild local, 40.2%), whereas severe local and systemic envenoming occurred in 11 (13.4%) and 7 (8.5%) patients respectively. Sixty-one patients (74.4%) were discharged after ED observation, for a median of 5.10 hours (interquartile range 3.55–6.60), and 21 (25.6%) were admitted, of whom 12 (57.1%) received antivenom. The median length of stay was 3 days (interquartile range 3–4). Readmission within 48 hours occurred in 4 discharged patients (6.6%) and one death was recorded (1.2%).
Conclusion. The profile is dominated by green pit viper bites of low initial severity, a pattern for which the nationally available polyvalent antivenom offers no coverage.

Keywords: Antivenom, Clinical Profile, Epidemiology, Snakebite, Tertiary Hospital.

BACKGROUND

Snakebite envenoming was reinstated by the World Health Organization as a category A neglected tropical disease in 2017, with an estimated 1.8 to 2.7 million envenomings and as many as 138,000 deaths each year, the majority in South and Southeast Asia [1,2]. Within the Association of Southeast Asian Nations, Indonesia is considered to carry one of the largest burdens, yet it is also among the countries with the least systematic data: there is no national snakebite registry, no routine national surveillance, and published

Indonesian evidence consists largely of single-centre series separated by years or decades [3,4].

This scarcity has practical consequences. Antivenom procurement, distribution and clinical guidance all depend on knowing which species cause bites, how severe those bites are at presentation and where patients seek care. The only antivenom produced in Indonesia, Serum Anti Bisa Ular (SABU), is polyvalent against Naja sputatrix, Bungarus fasciatus and Calloselasma rhodostoma, and has been shown not to neutralise the venom of Trimeresurus species [5,6]. Whether that coverage matches the species mix actually presenting to Indonesian emergency departments has rarely been documented.

Dr. Saiful Anwar General Hospital (RSSA) Malang is the tertiary referral centre for the southern part of East Java and receives snakebite cases both directly and by referral. This study aims to evaluate the contemporary clinical and epidemiological profile of snakebite patients over one calendar year to bridge existing regional data gaps. Beyond providing essential baseline data for healthcare service planning and future surveillance, this study offers critical academic insights into the clinical mismatch between prevailing snake species and current antivenom coverage, serving as a reference for future toxicology and emergency care research.

RESEARCH METHOD

A descriptive observational study was conducted using data from all patients presenting with snakebite to the emergency department of Dr. Saiful Anwar General Hospital between 1 January and 31 December 2025. Cases were identified from the emergency department register and the hospital information system, and total sampling was applied so that every patient meeting the criteria was included, yielding a total sample size of 82 patients. Patients were included when snakebite was established clinically or by history and a complete, retrievable medical record was available. Patients with incomplete records, those dead on arrival and those who discharged against medical advice were excluded.

The variables described were age, sex, snake type as reported by the patient according to colour (green versus non-green a pragmatic category because green pit vipers (*Trimeresurus* spp.) are widely distributed in Java and are recognised by their colour) [12], clinical manifestation at presentation classified as no symptoms, mild local, severe local or systemic envenoming, emergency department disposition (discharge after observation versus admission) [7]. Additionally, hospital operational and clinical outcomes were

extracted from the electronic health records using a structured case report form, which included the duration of emergency department observation among discharged patients, antivenom administration, length of stay among admitted patients, unplanned readmission within 48 hours of discharge, and 48-hour survival [8,9].

Numerical variables are presented as mean with standard deviation or as median with interquartile range (IQR) according to distribution, assessed with the Kolmogorov-Smirnov and Shapiro-Wilk tests, and categorical variables as frequency and percentage. No inferential comparison is reported, because the objective of this report is descriptive; the analytical evaluation of observation duration and outcomes in this cohort is reported separately [7]. Analyses were performed with IBM SPSS Statistics version 25.

The study was approved by the Health Research Ethics Committee of General Hospital Dr. Saiful Anwar Malang number 400/164/K.3/102.7/2025 by date 30 June 2025. The requirement for informed consent was waived because the study used routinely collected medical record data, and all records were anonymised before analysis.

FINDINGS

Eighty-two patients were included. Their demographic and clinical characteristics are presented in Table 1. The cohort was predominantly male, with 65 male patients (79.3%) and 17 female patients (20.7%). The median age was 43.5 years (IQR 22.5-56.3), with a range from 3 to 83 years, so that the majority of cases occurred in the economically active age group, although both paediatric and elderly patients were represented.

Table 1. Demographic and Clinical Characteristics of Snakebite Patients (n=82)

Characteristic	n (%) or median (IQR)
Age (years), median (IQR)	43.5 (22.5-56.3)
Age (years), range	3-83
Sex	
Male	65 (79.3)
Female	17 (20.7)
Reported snake type	
Green (consistent with Trimeresurus spp.)	46 (56.1)
Non-green	36 (43.9)
Clinical manifestation at presentation	
No symptoms	29 (35.4)
Mild local	33 (40.2)
Severe local	11 (13.4)
Systemic	7 (8.5)
Not classifiable	2 (2.4)

IQR: interquartile range

Snake type as reported by patients was green in 46 cases (56.1%) and non-green in 36 cases (43.9%). Clinical severity at presentation was low in most patients: 29 patients (35.4%) had no symptoms at all and 33 (40.2%) had mild local manifestations only, together accounting for three quarters of the cohort, while 11 patients (13.4%) presented with severe local envenoming and 7 (8.5%) with systemic envenoming. Two records (2.4%) carried an invalid severity code and could not be classified.

Emergency department disposition and outcomes are summarised in Table 2. Sixty-one patients (74.4%) were discharged after a period of observation in the emergency department and 21 (25.6%) were admitted. Among discharged patients the median observation time was 5.10 hours (IQR 3.55-6.60), with a mean of 5.58 (SD 2.92) hours and a range from 0.94 to 18.37 hours; since the seventy-fifth percentile was 6.60 hours, at least three quarters of discharged patients left the department within eight hours of arrival.

Antivenom was administered to 12 of the 21 admitted patients (57.1%), corresponding to 14.6% of the whole cohort; no discharged patient received antivenom. The median length of stay among admitted patients was 3 days (IQR 3-4), with a mean of 4.14 (SD 2.73) days and a range from 1 to 11 days. Unplanned readmission within 48 hours occurred in 4 of the 61 discharged patients (6.6%). One death was recorded in the whole cohort (1.2%), in a patient who reported a green snake bite; all other patients were alive at 48 hours.

Table 2. Emergency Department Disposition, Treatment and Short-Term Outcomes (n=82)

Variable	n (%) or median (IQR)
Disposition	
Discharged after ED observation	61 (74.4)
Admitted	21 (25.6)
ED observation time, discharged patients (hours), median (IQR)	5.10 (3.55-6.60)
ED observation time, range (hours)	0.94-18.37
Antivenom (SABU) administered, admitted patients	12 of 21 (57.1)
Antivenom administered, whole cohort	12 (14.6)
Length of stay, admitted patients (days), median (IQR)	3 (3-4)
Length of stay, range (days)	1-11
Readmission within 48 hours, discharged patients	4 of 61 (6.6)
Death, whole cohort	1 (1.2)

DISCUSSIONS

The male predominance in our study (79.3%) is similar to that reported in Eastern India [8], Turkey [10], a North Indian ICU series (70.9% male) [15] and, almost identically, the Bandung series (79%) [16], where outdoor and agricultural work increases exposure. The Korean national ED series reported a smaller male proportion (54.9%) and an older

mean age of 58.5 years (9), which may reflect a different exposure pattern from the working-age predominance seen here.

Snake identification in the Bandung series was also based on colour, and the authors inferred that green-coloured snakes in Indonesia are most likely green pit vipers (*Trimeresurus albolabris*) [16], which supports the pragmatic green versus non-green category used in our study. That study did not report the proportion of green snake bites, so the species mix cannot be compared directly. However, bites by species outside the SABU indication were also common in Bandung (39 of 63 patients; 62%) [16], in line with our finding of a mismatch between species mix and antivenom coverage.

Severity at presentation differed across settings. In Bandung, grade 2 to 4 envenoming accounted for 84% of patients [6], higher than the 22% with severe local or systemic envenoming in our cohort, although the studies used different grading systems and Bandung included only records with complete data. In the Korean national ED database, severity was defined indirectly from disposition, and 38.9% of patients were discharged from the ED (mild) [9], compared with 74.4% in our cohort, which may reflect the different severity definition. The North Indian ICU series included only ICU admissions, with 95.35% presenting with neuroparalytic envenoming and 97.67% requiring mechanical ventilation (15), reflecting its ICU-only setting.

The case fatality of 1.2% (1 of 82) is higher than the in-hospital mortality of the Korean national ED series (2 deaths among 12,521 patients; 0.02%) (9), but lower than that of the North Indian ICU series (2.3%; 2 of 86) [15]. Two deaths occurred among the 56 antivenom-treated patients in Bandung (16). Higher mortality has been described in subgroups with risk factors for poor outcome, such as treatment delay beyond 24 hours (18% versus 5%) and acute kidney injury (21% versus 3%) in an Indian series summarised in a recent review [17]. The presence of paediatric patients supports the need for community-level education on first aid and prevention, as shown by an educational intervention among Indonesian farmers (18).

This one-year profile describes a snakebite population that is young to middle aged, overwhelmingly male, and dominated by bites attributed to green snakes that present with little or no envenoming. The male predominance of 79.3% and the working-age median of 43.5 years are consistent with series from India, Korea and Turkey, in which agricultural and outdoor occupational exposure drives the epidemiology [8-10]. The presence of patients as

young as 3 and as old as 83 years nonetheless indicates that exposure is not confined to occupational settings, and paediatric bites in particular carry a distinct risk profile [1].

The most policy-relevant finding is the species mix. More than half of the bites were attributed to green snakes, a description consistent with Trimeresurus species, which are widely distributed in Java and cause predominantly local effects with haematological disturbance [12]. The antivenom available in Indonesia does not neutralise Trimeresurus venom, being raised against Naja sputatrix, Bungarus fasciatus and Calloselasma rhodostoma [5,6]. The practical implication is that for the largest single group in this cohort, management is necessarily supportive and observational, with serial assessment of local progression and of coagulation parameters rather than specific neutralisation. The proportion of patients receiving antivenom in this cohort, 14.6% overall, should be read in that light rather than as under-treatment.

Three quarters of patients presented with no symptoms or mild local findings only. A high proportion of minimally symptomatic presentations, including dry bites, is well documented and has two operational consequences. First, most emergency department work in snakebite is observation and risk stratification rather than antivenom administration. Second, because envenoming may declare itself only after several hours, the low initial severity of the majority cannot be equated with a benign course, and the observation period becomes the principal safety mechanism [13,14]. In this cohort at least three quarters of discharged patients left the department within eight hours, and readmission within 48 hours occurred in 6.6%; the relationship between these two observations is analysed in a companion report [7].

Case fatality in this cohort was 1.2%, which is at the lower end of reported hospital series and is consistent with a case mix dominated by viperid bites of low initial severity managed in a tertiary centre with intensive care capability [9,15]. Low case fatality in a referral setting should not, however, be extrapolated to the community, since patients who die before reaching hospital and those managed by traditional healers are not captured in hospital-based data (4).

The limitations of this study follow from its design. It is a single-centre, retrospective description, and the case mix of a tertiary referral hospital does not represent the full spectrum of snakebite in the community. Snake identification relied on patient report of colour rather than on specimen examination or syndromic confirmation, so species attribution is approximate and green versus non-green should be regarded as a pragmatic

clinical category rather than a taxonomic one. Two records carried invalid severity codes and could not be classified. Finally, outcome ascertainment was limited to 48 hours and to events known to the study centre, so late complications and re-presentations elsewhere may be underestimated.

CONCLUSION

Snakebite presentations to this East Java referral emergency department were dominated by working-age men bitten by snakes described as green, presenting with no or mild envenoming, managed mainly by observation and discharged within a few hours, with low short-term mortality. The mismatch between the species mix presenting to the emergency department and the coverage of the nationally available antivenom is the clearest signal for policy, and supports both the development of a national snakebite registry and the strengthening of syndromic, observation-based protocols in centres receiving these patients.

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Conflict of Interest The authors declare no conflict of interest.

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