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Clinical and epidemiological profile of monocled cobra bites (*Naja kaouthia*) at a tertiary hospital in Southeastern Bangladesh

Abstract

Background: Monocled cobra (*Naja kaouthia*) bites cause neurotoxic envenoming and local tissue injury in South and Southeast Asia. Evidence from vulnerable populations in southeastern Bangladesh, including camps for Forcibly Displaced Myanmar Nationals (FDMN), remains limited.

Methods: A prospective observational study included 53 monocled cobra bites managed at Cox's Bazar District Hospital, the teaching hospital of Cox's Bazar Medical College, from January 2018 through December 2025. The cohort included 52 envenomed bites and one dry bite. Demographic, epidemiological, clinical, treatment, and outcome data were summarized using frequencies, percentages, means, standard deviations, medians, and ranges.

Results: The mean age was 27.8 ± 13.8 years, the median was 29 years, and the age range was 5–60 years. Twenty-six patients (26/53, 49.1%) were aged 21–40 years. Thirty-five bites (66.0%) occurred during June–August and 39 (73.6%) during June–September. Fifty bites (94.3%) occurred between 06:00 and 17:59. The three leading bite-location categories—Ukhia, Pekua, and FDMN camps—accounted for 25 cases (47.2%). Lower-limb bites occurred in 30 patients (56.6%), and 29 (54.7%) first consulted a traditional healer. Early pain and swelling each occurred in 52 patients (98.1%), and neurological manifestations developed 1–7 hours after the bite. Acute local necrosis developed in 39 patients (73.6%); 13 had persistent local sequelae, of whom five required skin grafting. Antivenom was administered to 52 patients; 5/52 (9.6%) required a second dose and 3/52 (5.8%) developed mild acute reactions. Four patients required mechanical ventilation. No deaths occurred (0/53).

Conclusion: Monocled cobra bites in this cohort were concentrated during monsoon months and daylight hours and produced rapid neurotoxicity with substantial local tissue morbidity. The descriptive findings support timely referral, access to antivenom and ventilatory support, and prevention focused on high-risk locations and activities; they do not establish treatment effectiveness.

Keywords: monocled cobra, *Naja kaouthia*, snakebite, antivenom, neurotoxicity, necrosis, Bangladesh

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Introduction

The monocled cobra (*Naja kaouthia*) is a medically important elapid snake in South and Southeast Asia. In Bangladesh, confirmed bites can cause rapidly evolving neurotoxicity, including ptosis, bulbar weakness, respiratory paralysis, and local tissue injury.[1] Earlier hospital-based studies from Chittagong and Cox's Bazar documented the regional burden and clinical spectrum of snakebite.[2,3] Rural and hilly environments, agricultural exposure, monsoon conditions, delayed referral, and traditional pre-hospital practices may influence presentation and outcome.[1,3,4]

Recent analysis of a 16-year hospital dataset and ecological modelling in southeastern Bangladesh highlights the regional burden of cobra bites and their association with the rainy season.[5] Evidence from specific vulnerable populations remains limited, particularly in and around camps for Forcibly Displaced Myanmar Nationals (FDMN) and nearby hilly subdistricts. This study describes the demographic, epidemiological, clinical, treatment, and outcome profile of monocled cobra bites managed at a tertiary referral hospital in Cox's Bazar.

Methods

Study design and setting

This prospective observational study was conducted at Cox's Bazar District Hospital, the teaching hospital of Cox's Bazar Medical College and a tertiary referral center for Cox's Bazar district and adjacent hilly areas of Bandarban. The study period extended from January 2018 through December 2025.

Case ascertainment and eligibility

The analytic cohort comprised 53 bites attributed to monocled cobra, including 52 envenomed bites and one dry bite. Species identification was based on direct examination of a live or dead snake brought to the hospital in 33 cases (62.3%), photographs in 14 (26.4%), and patient or witness descriptions in six (11.3%). These categories were mutually exclusive; no patient was counted more than once. The identification approach considered the characteristic monocle-like hood marking or a reliable history of hood-spreading behavior with a compatible clinical syndrome.[1] Bites attributed to other snake species, records with insufficient data, and cases without consent were excluded. Dry bite was not an exclusion criterion.

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Data collection and definitions

Treating physicians used a standardized case record form to collect demographic characteristics; residency/population group; bite location, month, time of day, activity, and anatomical site; pre-hospital care; onset and pattern of local and neurological manifestations; antivenom exposure and dose; adjunctive treatment; respiratory support; laboratory and ECG findings; local sequelae; skin grafting; hospital stay; and survival. All 53 patients were awake when bitten. Time-of-day categories were 06:00–11:59, 12:00–17:59, 18:00–23:59, and 00:00–05:59.

A dry bite was defined as a confirmed bite without clinical evidence requiring antivenom, consistent with regional snakebite-management guidance.[6] CPK was classified as raised when it exceeded the hospital laboratory's age- and sex-appropriate upper reference limit; the reported 123–2457 IU/L range refers to the full cohort. Sinus tachycardia was recorded when ECG showed sinus rhythm with a heart rate above the age appropriate reference threshold. Acute local necrosis, persistent post-management local sequelae, and skin grafting were treated as separate outcomes; the five patients receiving skin grafts were a subset of the 13 with persistent local sequelae.

Statistical analysis

Data were entered in Microsoft Excel and analyzed using SPSS version 25. Categorical variables are reported as counts and percentages, rounded to one decimal place. Age was summarized directly from individual ages available for all 53 patients, using the arithmetic mean, sample standard deviation, median, and range. Age groups were used only to describe the frequency distribution; grouped-age estimates were not used.

Ethics

Ethical clearance was obtained from the Institutional Review Board of Cox's Bazar Medical College Hospital. Informed consent was obtained from patients or close family members. The clinical photographs reproduced in this manuscript do not show facial identifiers.

Results

Patient characteristics

Fifty-three patients were enrolled prospectively. There were 28 males (52.8%) and 25 females (47.2%). The mean age was 27.8 ± 13.8 years, the median was 29 years, and the range was 5–60 years. Nearly half of the patients (26/53, 49.1%) were aged 21–40 years (Table 1).

Table 1 Selected demographic and epidemiological characteristics (n=53)

Characteristic	n	%
Male	28	52.8%
Female	25	47.2%
Age 21–40 years	26	49.1%
First contact with a traditional healer	29	54.7%
Lower-limb bite	30	56.6%
Upper-limb bite	23	43.4%
Awake at time of bite	53	100.0%
Bite between 06:00 and 17:59	50	94.3%
Age 1–10 years	6	11.3%
Age 11–20 years	12	22.6%
Age 21–30 years	13	24.5%
Age 31–40 years	13	24.5%
Age 41–50 years	6	11.3%
Age 51–60 years	3	5.7%

Age summary calculated from individual patient ages: mean 27.8 ± 13.8 years; median 29 years; range 5–60 years.

Temporal and geographical distribution

The annual distribution was 6, 7, 2, 3, 4, 7, 9, and 15 cases from 2018 through 2025, respectively (total n=53). Bites occurred throughout the year but were concentrated during the monsoon months. June–August accounted for 35 cases (66.0%), while June–September accounted for 39 (73.6%); August had the highest monthly count (14 cases) (Figure 1).

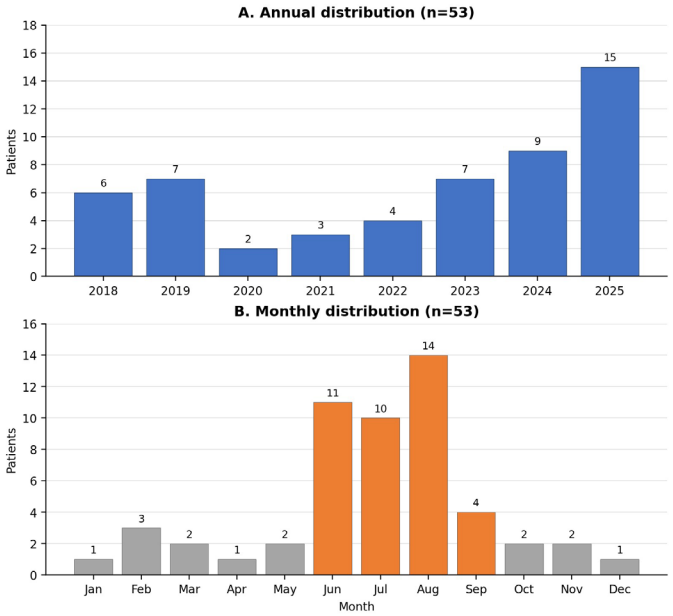


Figure 1 Temporal distribution of monocled cobra bites. (A) Annual counts, 2018–2025. (B) Monthly counts; June–September is highlighted.

Morning bites accounted for 31 cases (58.5%), afternoon bites for 19 (35.8%), evening bites for 2 (3.8%), and late-night/early-morning bites for 1 (1.9%). Thus, 50/53 (94.3%) bites occurred from 06:00 to 17:59 and 3/53 (5.7%) from 18:00 to 05:59. Ukhia (9), Pekua (9), and FDMN camps (7) were the three leading bite-location categories and together accounted for 25 cases (47.2%). Bite location and population/residency were analyzed as distinct variables: four bites occurred in Myanmar, whereas five patients were Myanmar nationals; seven bites occurred in FDMN camps, whereas eight patients were FDMN residents (Figure 2).

Population group, activity, and bite site

Population/residency groups comprised 35 local residents (66.0%), 8 FDMN residents (15.1%), 5 Myanmar nationals (9.4%), and 5 tribal or other ethnic-minority residents (9.4%). These categories describe residency/population status rather than ethnicity alone.

At the time of bite, 14 patients (26.4%) were farming, 8 (15.1%) were collecting dry leaves, 8 (15.1%) were collecting straw, 7 (13.2%) were collecting firewood, and 16 (30.2%) were engaged in other activities. All bites involved the limbs: 30 (56.6%) affected the lower limbs and 23 (43.4%) the upper limbs. Twentynine lower-limb bites were below the knee and one above it; 21 upper-limb bites were below the elbow and two above it (Figure 3).

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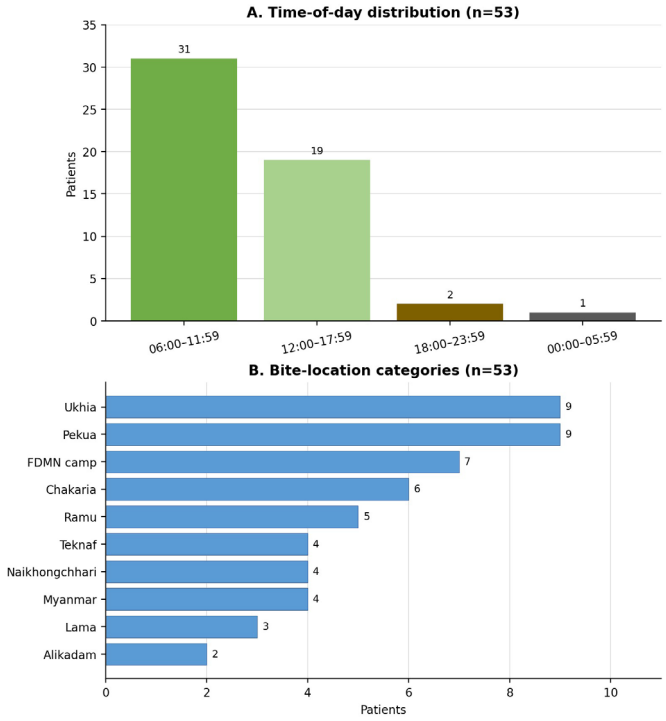


Figure 2 Distribution by time of day and bite-location category (n=53).

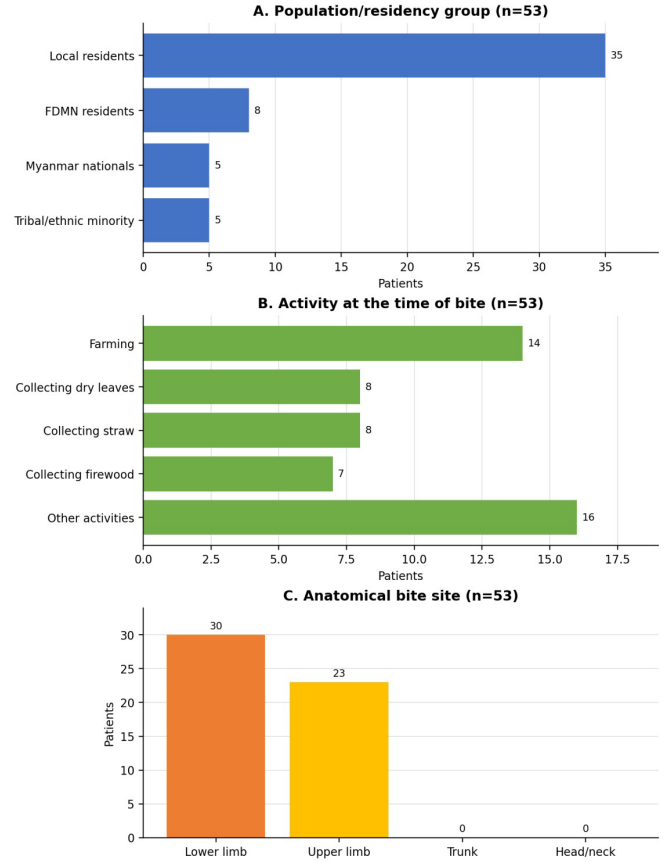


Figure 3. Distribution by population/residency group, activity at the time of bite, and anatomical bite site (n=53).

Clinical presentation

Early symptoms appeared 35 minutes to 2.5 hours after the bite. Pain at the bite site and local swelling each occurred in 52 patients (98.1%), vomiting in 48 (90.6%), and one patient had neither pain nor swelling. Neurological manifestations developed 1–7 hours after the bite. Ptosis occurred in 48 patients (90.6%), nasal voice/bulbar weakness in 45 (84.9%), neck weakness (broken-neck sign) in 34 (64.2%), and dyspnea or respiratory distress in 32 (60.4%).

Acute local tissue necrosis developed in 39 patients (73.6%), typically over 3–5 days. Thirteen patients (24.5%) had persistent post-management local sequelae. Five of these 13 patients required skin grafting (9.4% of the full cohort) (Table 2 & Figure 4).

Table 2 Clinical manifestations and local outcomes (n=53)

Feature	n	%	Reported onset/time frame
Pain at bite site	52	98.1%	35 min–2.5 h (early symptoms)
Local swelling	52	98.1%	35 min–2.5 h (early symptoms)
Vomiting	48	90.6%	35 min–2.5 h (early symptoms)
Ptosis	48	90.6%	1–7 h (neurological onset)
Nasal voice/bulbar weakness	45	84.9%	1–7 h
Broken-neck sign	34	64.2%	1–7 h
Dyspnea/respiratory distress	32	60.4%	1–7 h
Acute local tissue necrosis	39	73.6%	3–5 days
Persistent local sequelae	13	24.5%	Post-management
Skin grafting	5	9.4%	Subset of 13 sequelae cases

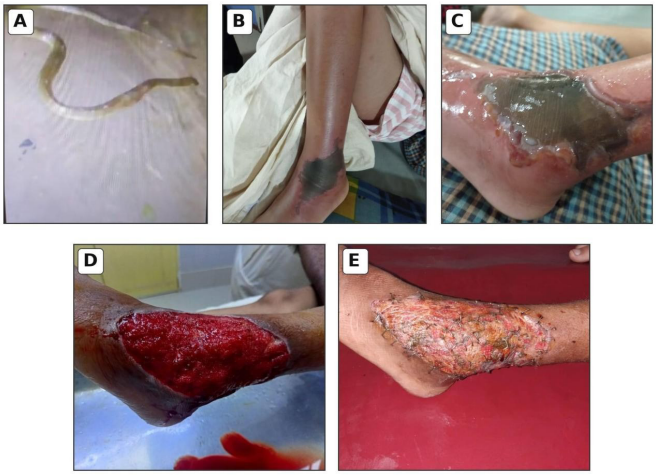


Figure 4 Clinical images. (A) Snake presented for identification. (B E) Examples of local tissue injury, necrosis, wound progression, and post-procedural healing.

Treatment, investigations, and outcomes

Antivenom was administered to 52 patients; the single patient with a dry bite did not receive antivenom. Six patients received antivenom at an Upazila Health Complex and 46 at the district hospital. The bite-toantivenom interval had a mean ± SD of 3.0 ± 4.4 hours and a range of 1–34 hours. Forty-seven recipients received one dose and five received two doses; the second-dose rate was 5/52 (9.6%). Three of 52 recipients (5.8%) developed mild acute antivenom reactions.

All 52 antivenom recipients received polyvalent antivenom manufactured by Incepta Vaccine Limited, Dhaka, Bangladesh. The initial dose comprised 10 vials × 10 mL (100 mL antivenom), diluted with 100 mL normal saline and administered by intravenous infusion over 50 minutes. Five patients received a second dose because of

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persistent or worsening neurological signs 1–2 hours after completion of the initial infusion, consistent with the repeat-dose criteria in the Bangladesh Learner's Guide for Management of Snakebite .[7]. The second dose used the same number of vials, dilution, and infusion duration.

Neostigmine with atropine was administered to 38 patients (71.7%). Twenty-eight patients (52.8%) received supplemental oxygen; this count included the four patients (7.5%) who required mechanical ventilation. The duration of mechanical ventilation was 1–4 hours. The remaining 25 patients required neither supplemental oxygen nor mechanical ventilation.

CPK was above the hospital laboratory reference limit in 18 patients (34.0%), while 35 (66.0%) were not elevated; values for the full cohort ranged from 123 to 2457 IU/L. ECG showed sinus tachycardia in 36 patients (67.9%) and a normal rhythm in 17 (32.1%). Hospital stay ranged from 3 to 14 days. All 53 patients survived; no deaths occurred (0/53) (Table 3).

Table 3 Treatment, investigations, and outcomes

Domain	Measure	Result	Denominator / note
Antivenom	Received antivenom	52	52 envenomed bites
Antivenom	No antivenom	1	Dry bite
Treatment site	UHC / district hospital	6 / 46	Antivenom recipients
Timing	Bite-to-antivenom time	3.0 ± 4.4 h	Range 1–34 h
Dose	One / two doses	47 / 5	Second dose: 5/52 (9.6%)
Reaction	Mild acute antivenom reaction	3	3/52 (5.8%)
Adjunct	Neostigmine + atropine	38	38/53 (71.7%)
Respiratory support	Supplemental oxygen	28	Includes 4 ventilated patients
Respiratory support	Mechanical ventilation	4	Duration 1–4 h
Laboratory	Raised CPK	18	Reference-limit based; full range 123–2457 IU/L
ECG	Sinus tachycardia / normal	36 / 17	Age-appropriate threshold
Hospital stay	Range	3–14 days	No mean reported
Outcome	Survived / died	53 / 0	0/53 deaths
Local outcome	Persistent sequelae	13	5 required skin grafting

UHC, Upazila Health Complex; CPK, creatine phosphokinase; ECG, electrocardiogram

Discussion

This eight-year series describes the epidemiological pattern and clinical burden of monocled cobra bites in a referral hospital serving southeastern Bangladesh. The mean age was 27.8 years, and approximately half of the cohort was aged 21–40 years, indicating substantial exposure among working-age adults alongside children and older patients.

The monsoon concentration is consistent with recent regional evidence linking cobra bites with rainyseason conditions in southeastern Bangladesh.[5] Predominantly daytime bites in this cohort are compatible with the rural activities reported, although earlier Chittagong series emphasized early-morning and evening exposure.[1–3] These patterns support prevention tailored to local activities and seasons.

The representation of FDMN residents and bites in camps supports inclusion of displaced communities in prevention and referral planning. Bite location and population/residency were analyzed separately because cross-border bites and differences between residence and exposure location can complicate geographical interpretation.

Rapid neurotoxicity and substantial tissue injury were consistent with the recognized clinical spectrum of monocled cobra envenoming.[1,6–8] A recent Thai cohort involving several cobra species also documented frequent local and neurological effects, with neurological manifestations and intubation more common after monocled cobra bites than after spitting cobra bites.[9] Differences in case ascertainment, species composition, and referral patterns limit direct comparison of rates. Acute necrosis, persistent local morbidity, and the need for skin grafting should be distinguished when assessing the burden of injury.

Antivenom and respiratory support remain central to management when clinically indicated.[6,7,10] Repeat dosing in this series followed persistent or worsening neurological signs after initial treatment. The Thai cohort also emphasizes the importance of supportive care and management of complications, including wound infection.[9]

All patients survived, but an uncontrolled descriptive series cannot establish treatment effectiveness. The zero mortality observation should be interpreted in the context of the cohort size, referral setting, and supportive-care capacity, as fatal snakebite cases have previously been reported in the region.[11]

Recent venom and antivenom studies demonstrate variation in cross-reactivity and neutralization across cobra venoms and antivenom products.[12] A systematic review identifies gaps in preclinical evidence and geographical coverage in Asia.[13] A Bangladesh study demonstrated geographical and age-related variation in cobra venom composition and reactivity with a commercial antivenom.[14] Experimental work in Myanmar also demonstrated neutralization of selected toxic activities of *N. kaouthia* and *N. mandalayensis* venoms by BPI cobra antivenom.[15] These preclinical findings support locally relevant product evaluation but do not establish the clinical effectiveness of the antivenom used in our cohort.

Limitations

This was a single-center descriptive study with a modest sample and no comparator group. Species identification was not uniformly supported by examination of a snake specimen or venom antigen

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testing. Misclassification is particularly possible in the six cases identified from patient or witness descriptions; photographic identification also provides less certainty than direct examination of a suitable specimen. Some timing and product-documentation variables were incomplete. These limitations restrict causal inference and generalizability.

Conclusion

Monocled cobra bites in southeastern Bangladesh were concentrated during monsoon months and daylight hours and commonly produced rapid neurotoxicity and local tissue necrosis. The findings support prompt referral, reliable access to antivenom and respiratory support, prevention during high-risk rural activities, and focused community education in Ukhia, Pekua, FDMN camps, and other affected locations. The absence of deaths in this cohort is an outcome observation, not proof of treatment effectiveness.

Recommendations

i. Focus community education on safer rural work practices during the monsoon, protective footwear and gloves, and immediate referral after a bite, including in FDMN camps and other affected communities.

ii. Maintain access to appropriate antivenom, staff trained to manage acute reactions, and effective referral pathways for airway management and ventilation.

iii. Strengthen standardized case recording, including patient-level ages, species-identification methods, treatment timing, antivenom dosing, and local outcomes.

Acknowledgements

None.

Conflicts of interest

The authors declare that there are no conflicts of interest.

References

1. Faiz MA, Ahsan MF, Ghose A, et al. Bites by the monocled cobra, *Naja kaouthia*, in Chittagong Division, Bangladesh: epidemiology, clinical features of envenoming and management of 70 identified cases. *Am J Trop Med Hyg.* 2017;96(4):876–884.
2. Faiz MA, Rahman MR, Hussain A, et al. A hospital-based study of snake bite in Chittagong Medical College. *J Bangladesh Coll Phys Surg.* 1995;13:3–8.
3. Faiz MA, Chowdhury SK, Hussain I. Snake bite in Chittagong and Cox's Bazar: a hospital-based study. *Bangladesh J Med.* 1997;8:52–57.
4. Kuch U. Snake bite envenoming in Bangladesh and the challenge of biodiversity. In: Yunus EB, editor. Hundred Years of Tropical Medicine. Chittagong: Bangladesh Association for the Advancement of Tropical Medicine and The Royal Society of Tropical Medicine and Hygiene; 2007. p. 23–28.
5. Chowdhury MAW, Müller J, Ghose A, et al. Combining species distribution models and big datasets may provide finer assessments of snakebite impacts. *PLoS Negl Trop Dis*. 2024;18(5):e0012161.
6. World Health Organization, Regional Office for South-East Asia. Guidelines for the management of snakebites. 2nd ed. New Delhi: WHO Regional Office for South-East Asia; 2016.
7. Non Communicable Disease Control Programme, Directorate General of Health Services, Ministry of Health & Family Welfare, Bangladesh. Learner's Guide for Management of Snakebite. 2020–2021. p. 20.v
8. Bakar MA, Amin MR. Clinical manifestations of snake bite and outcome of therapy. *Bangladesh Med J (Khulna)*. 2000;33(1):15–19.
9. Tansuwannarat P, Tongpoo A, Phongsawad S, et al. A retrospective cohort study of cobra envenomation: clinical characteristics, treatments, and outcomes. T*oxins*. 2023;15(7):468.
10. Faiz MA, Rashid R, Palit R, et al. Cobra bite successfully managed with antivenom and manual artificial respiration. *J Bangladesh Coll Phys Surg.* 1998;16:70–74.
11. Faiz MA, Rashid R, Gafur MA, et al. Observation of 10 fatal cases following snake bite in Chittagong, 1993–1998. *Bangladesh J Med.* 1999;10:30–33.
12. Deka A, Bhatia S, Santra V, et al. Multilevel comparison of Indian Naja venoms and their cross-reactivity with Indian polyvalent antivenoms. *Toxins.* 2023;15(4):258.
13. Soopairin S, Patikorn C, Taychakhoonavudh S. Antivenom preclinical efficacy testing against Asian snakes and their availability in Asia: a systematic review. *PLoS One*. 2023;18(7):e0288723.
14. Chowdhury MAW, Müller J, Al Haidar IK, et al. Interspecific and intraspecific variability in venom composition of *Naja naja* and *Naja kaouthia* (Reptilia: Elapidae) populations from different habitats in Bangladesh. *J Proteomics*. 2026;322:105544.
15. Win MN, Yee KT, Htwe KM, et al. Biochemical and biological characterization of the venoms of *Naja kaouthia* and *Naja mandalayensis* from Myanmar and neutralization effects of BPI cobra antivenom. *Toxicon X*. 2024;22:100196.