

India Pioneers Initiative for Prevention and Control of Snakebite Envenoming: Syncing with the Global Goal

Ajit Dadaji Shewale^{1*}, Tushar Nale¹, Simmi Tiwari¹ & Aastha Singh¹

¹ National Centre for Disease Control (NCDC), Delhi



*Corresponding author

Dr. Ajit Dadaji Shewale

Joint Director, centre for One Health

National Centre for Disease Control (NCDC)

ajitshewalencdc@gmail.com

Abstract

Snake bite envenoming is a significant public health problem globally and in southeast Asia. India is major contributor to global burden in terms of morbidity and mortality. Accordingly, it is envisaged by global organizations to reduce the deaths by half by 2030. Anti-Snake Venom (ASV) has been provided free of charge in government facilities and surveillance of snake bites is also undertaken by public health surveillance systems. To further strengthen these initiatives, recently National Centre for Disease (NCDC) Ministry of Health and Family Welfare (GoI) has included the activities on prevention and control of snake bites for capacity building of medical officers on management of Snake bites, community awareness, and coordination with relevant stakeholders. Further to achieve the global target of halving the death rate by 2030, the National Action Plan for Prevention and Control of Snakebite in India is drafted by the National Centre for Disease (NCDC) in consultation with relevant stakeholders. It provides guidance to states to prepare a comprehensive state action plan for reducing death due to snake bites among the human and livestock populations. This article highlights the summary of action undertaken and envisaged as part of NAPSE for information to stakeholders.

Keywords: Envenoming, Snake bite, Action plan, NCDC

Introduction

Worldwide, snakebite envenoming (SBE) kills between 81 000 and 138 000 people annually, putting over 5.8 billion people at risk. SBE is a major public health problem in the South-East Asia Region, which constitutes the world's most densely populated regions. It is an occupational, environmental, and domestic health hazard, particularly affecting farmers, fishermen and working children, and leads to thousands of deaths and permanent disabilities including blindness and amputation as well as post-traumatic stress disorder.^(1,2)

Despite the global burden and impact, SBE has failed to attract requisite public health policy inclusion and investment for driving sustainable efforts to reduce the medical and societal burden. This is largely due to the demographics of the affected populations and their lack of political voice. Consequently, there is a paucity of health programmes addressing the issue of snakebite envenoming at national, regional and global level. The enormous impact of SBE can be substantially reduced with safe and effective therapeutics. However, a disproportionate number of young people and children in disadvantaged rural areas continue to die from snakebite envenoming due to a lack of awareness, knowledge, and access to appropriate antivenoms.⁽³⁾

In 2018, WHO listed SBE as a priority neglected tropical disease (NTD) after intense advocacy by concerned stakeholders, including the Global Snakebite Initiative, Health Action International and 20 member

countries.⁽⁴⁾ WHO global strategy for prevention and control of snakebite envenoming was launched in 2019, with the goal for all patients to have better overall care so that the numbers of deaths and cases of disability are reduced by 50% before 2030. Rather than perceiving SBE risk as a standalone issue, the SBE-WG considers that efforts to combat SBE need to be incorporated within national and regional health plans and aligned with global commitments to achieving universal health coverage and the Sustainable Development Goals (SDG).^(5,6)

In this context, the Regional Action Plan for prevention and control of snakebite envenoming in South-East Asia 2022–2030 was developed through a consultative process with Member States, experts and partners.^(7,8) The Regional Action Plan is intended to guide Member States, WHO, donors and partners to work together in a systematic and progressive manner to address issues and challenges and to strengthen health-system and programmatic components to accelerate prevention and control of snakebite envenoming in the South-East Asia Region.⁽⁹⁾

Snakebite Envenoming from Indian Perspective: The Journey so far

Within the South East Asia (SEA) region, Bangladesh, India, Nepal, Pakistan, and Sri Lanka together constitute nearly 70% of global snakebite mortality. It is estimated by independent studies that about 58,000 deaths occur of an estimated 3–4 million snakebites

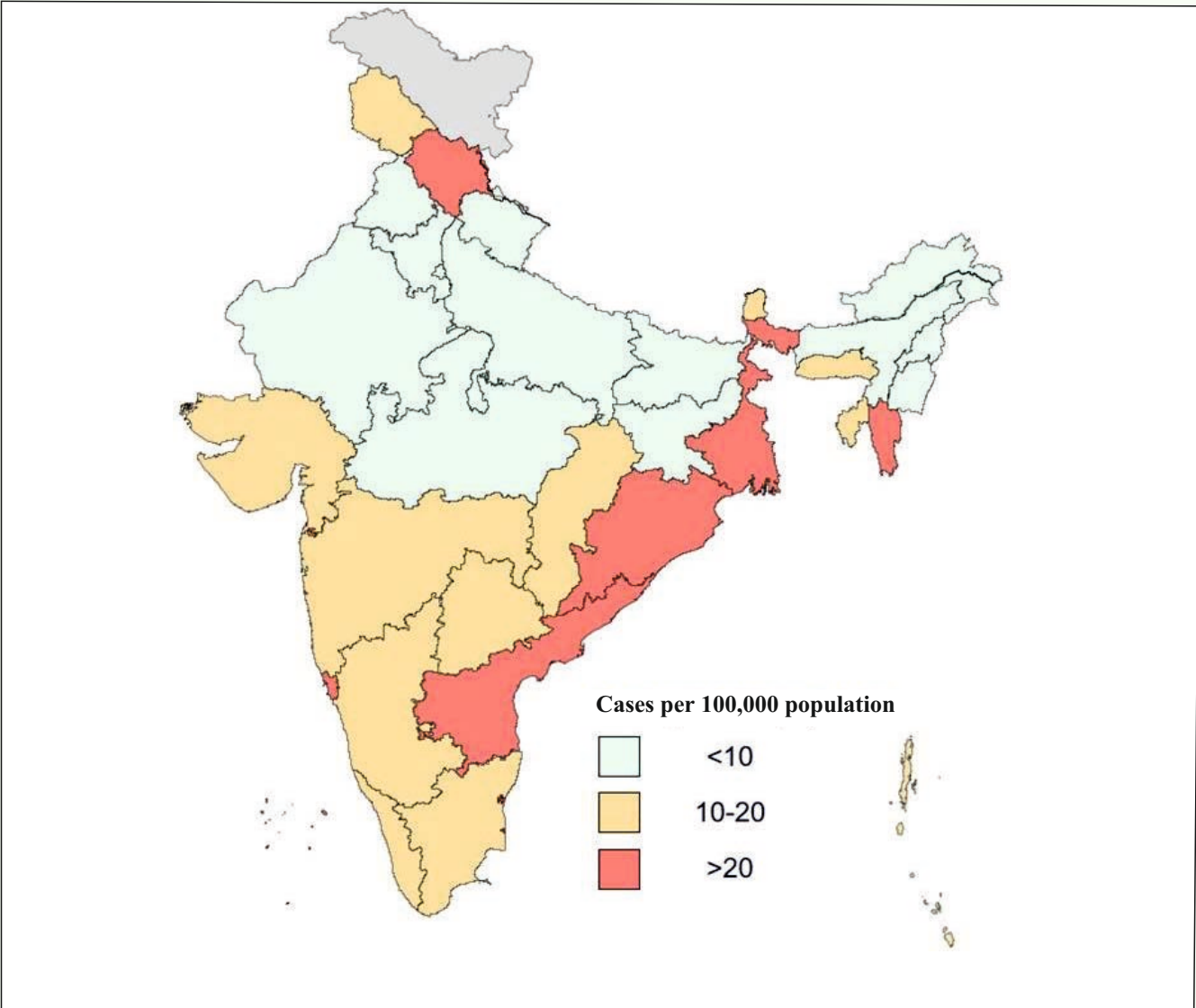


Figure 1: Average annual incidence rate of snakebites in India, 2016-2020.

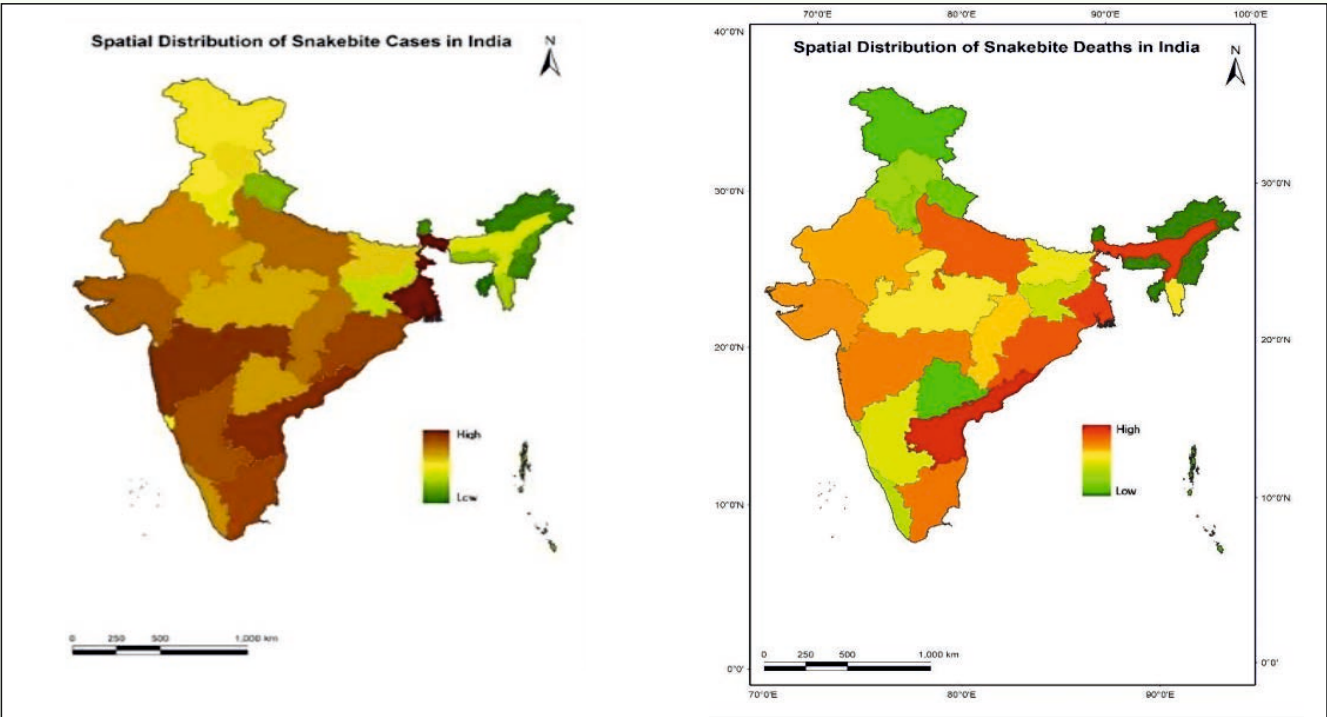


Figure 2: Snakebite cases and deaths as per CBHI data, 2016-2020.

annually in India which accounts for half of all snakebite deaths globally. Only a small proportion of snake bite victims across the country report to the clinics and hospitals and thus the actual burden of snake bite remains grossly underreported.⁽²⁾

People living in densely populated low altitude agricultural areas in the states of Bihar, Jharkhand, Madhya Pradesh, Odisha, Uttar Pradesh, Andhra Pradesh, Telangana, Rajasthan and Gujarat accounts for 70% of deaths particularly during the rainy season when encounters between snakes and humans are more frequent at home and outdoors areas.

Public Health Initiatives in India

Ministry of Health and Family Welfare (MoHFW), Government of India (GoI) published a National Snakebite Management Protocol in 2009 (updated in 2017) for clinicians for management of snakebite cases. Other interventions are also being taken by state health departments in medical sector such as capacity building by training of health professionals and paramedics on initial management, referral and life support skills.⁽¹⁰⁾

SBE is a medical emergency and earlier the treatment is available to the victim, higher are the chances of complete recovery. To ensure safe and effective treatment is available and affordable to all, States and UTs have been directed to include Anti Snake Venom Serum (ASVS) in the list of essential drugs and procurement of these drugs is supported under National Health Mission (NHM), also procurement is undertaken in a decentralized manner i.e. State/district/local purchase and majority of states are procuring it through State drug procurement department.

To comprehensively address the issues posed by any priority disease so as to initiate any policy-level interventions, it is important to know the accurate burden of the disease is available. To address this, Indian Council of Medical Research (ICMR) is undertaking Nationwide study to assess the accurate burden of snakebite envenoming and have also constituted a “National Task Force for Research on Snakebite in India”.⁽¹¹⁾

Recently, a national consultation was held for developing a dedicated National Action plan for Prevention and Control of Snakebite Envenoming (NAP-SE) in July 2022. This NAP-SE echoes the global voice of reducing the deaths due to snakebite envenoming by half and envisages all strategic components, roles and responsibilities of concerned stakeholders.⁽¹²⁾

Mission Steering Group (MSG) of NHM has approved the inclusion of activities for prevention and control of snake bites at district and state level under existing

components of NHM. It includes activities i.e., training of medical officer/health workers, surveillance of snake bite cases & deaths, monitoring of health facilities for preparedness of Snake bite management, meetings for advocacy with various government and non-government stakeholders, raising community awareness on prevention of Snake bites and intersectoral coordination. The National Centre for Disease Control, MOHFW is the nodal agency for implementation of the above activities.

The major initiatives proposed to be undertaken as part of current action plan for mitigating the challenges of Snakebite envenoming in India are as under:

- a) Strengthening of Surveillance of Snakebite through Integrated Health Information Platform (IHIP)
- b) Capacity building of medical professionals
- c) Development of Regional venom centres based on prevalent snake species to assure quality Anti Snake Venom across all regions
- d) Addressing the legislative issues of anti-snake venom collection
- e) Digital Mapping and Monitoring of facilities with availability of anti-snake venom for ensuring prompt and effective management of snakebite cases.
- f) Community outreach activities to spread awareness about snakebite prevention and management.

As part of strengthening of surveillance for snakebite envenoming, efforts are underway through coordination with States under case bases reporting platform of IHIP. Line listed data of snake bite cases and deaths is expected to generate information on high-risk groups,

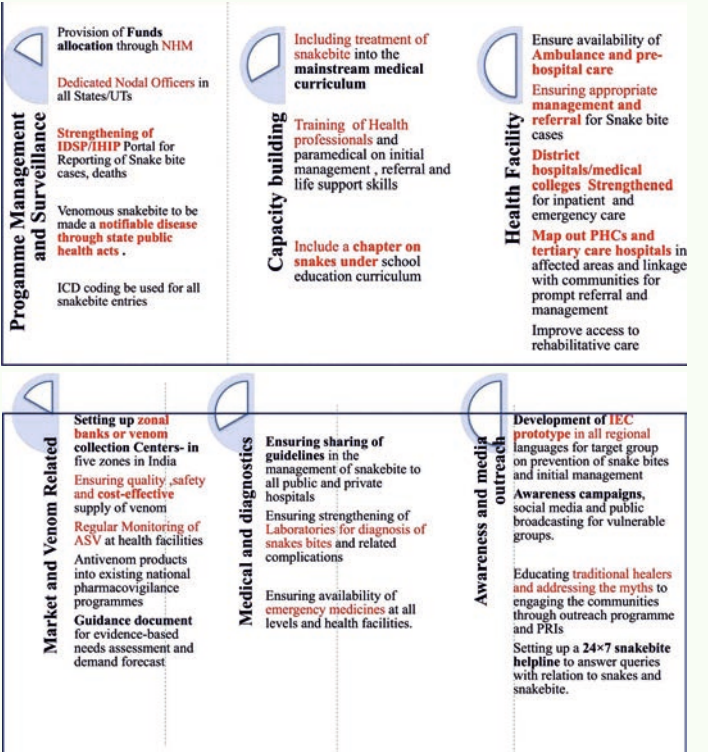


Figure 3: Major initiatives under NAP-SE

Table 1: Key Strategic Components included in National Action Plan for Prevention and Control of Snakebite Envenoming

Human Health Sector	Ensuring Provision of Anti Snake Venom at all Health facilities - Financial assistance to states from Centre through earmarking funds for Anti Snake Venom procurement in National Free Drugs Initiative scheme - Trained manpower concerning appropriate snake bite management and inoculation of ASV. - Monitoring of ASV demand and supply positions to avoid stock out positions. - Provision of adequate cold chain facilities to store ASV stocks at appropriate levels. - Mechanism for recording and reporting of Adverse Event Following Immunization (AEFI) for Snake bite victims Strengthening surveillance of Snake bite cases and deaths in Humans - Notification of snake bite victims through Web portal - Strengthening the periodic reporting system about snakebites through IDSP and IHIP. - Resource mapping – mapping the facilities (State/ District wise) for management and treatment of Snake bite victims and mapping of laboratories for diagnosis of snake's bites and related complications To strengthen the emergency care services at District Hospitals/ CHCs including services for Ambulance. - Availability of ambulance services for snake bite cases - Availability of laboratory test required for diagnosis of Snake bite such as – 20 minutes Whole blood clotting test, peak flow meter, urine analysis, Prothrombin time, platelet count, clot retraction time, Liver and kidney function test, serum amylase etc. - Availability of beds with machine-supported ventilation unit - Availability of emergency medicines - Appropriate management and referral for Snake bite cases Institutionalization of Regional Venom Centre's - Region-specific venom centres to incorporate research on regional venoms of the Big 4 and other venomous species of that area/zone. - Facilities for biochemical, proteomic, genomic, taxonomic and toxicological studies of different snake species and venoms of India. Public-Private Partnership - Engagement with professional organizations such as IMA, IAP, Public professional bodies, NGOs for undertaking activities related to snake bite, research, organization of Continued Medical Education programmes and plenary sessions on scientific updates on Snake bites. Inter-sectoral Coordination - Active involvement of vaccine manufacturers, wildlife sector, tribal and rural population, KVKS, PRI and community engagements. Joint Training/Sensitization workshop of District level Medical/ Veterinary Department on snake bite and joint gap analysis for formulation of Action Plan for Prevention and Management of Snake bite.
Agriculture /Animal Health Sector	Prevention of snake bites in livestock - Identification of the risk areas near to domestic animal settlements/villages/grazing areas. Creation of some type of natural barriers to avoid direct contact between domestic animals and snakes. - Provision of polyvalent ASV at Veterinary Hospitals and Dispensaries with proper storage facility and training.

Wildlife Sector

Education awareness

- Dedicated campaign in high risk areas near forests for generating community awareness on prevention of Snake bites.

Antivenom distribution

- Work in coordination with health sector at PHC/CHC level to ensure accessibility of antivenom to remote rural areas.
- Training to provide the first aid during the snake bite where the primary health facility is negligible.

Strengthening of the key stakeholders

- The engagement of local communities to develop effective management strategies.
- Community members can also be involved in reporting snake sightings, providing first aid, and helping to transport patients to medical facilities.

Systematic research and monitoring

- Research on the snakes to generate information that will eventually help to analyses the behavior pattern (e.g. radio telemetry) and habitat of particular snake species thereby minimizing the snakebite envenoming.

Snake venom collection and snake relocation

- Coordination and Collaboration with research and medical research institutes to collect snake venom. It will help reduce the risk of snake bite envenoming and maintain the production of sufficient antivenom in the country.

The wildlife sector can also be involved in snake handling, relocation, and reporting snake sightings; due



Picture 1: Range restricted venomous snakes in India

clustering of bites, health facility linkages for snake bite victims etc. For undertaking the activities of Snake bite prevention and control dedicated state/district nodal officers are being appointed.

For generating mass awareness on Snake bite prevention, IEC materials are being prepared at National and State level and through local /regional languages using various communication channel of



Saw-Scaled Viper (*Echis carinatus*)
(Photo credit: Dr. Gajendra Singh)



Common krait (*Bungarus caeruleus*)
(Photo credit: Gnaneswar Ch)



Russell's viper (*Daboia russelii*)
(Photo credit: Gnaneswar Ch)



Spectacled cobra (*Naja naja*)
(Photo credit: Gnaneswar Ch)

Picture 2: Big four venomous snake of India



Picture 3: Meeting with stakeholders of NGOs & Institutes for discussion on draft “National Action Plan for Snakebite Envenoming” India (NAPSE) on 22 March, 2023 at WHO India Office

Print and Audio/Video materials efforts are undertaken by respective governments for involvement of community on these issues especially in highly affected districts/States.

Recently, all states have been asked to prepare the state level action plan for prevention and control of Snakebite envenoming including mapping of referral facilities for timely management of snake bite cases, availability of Dialysis and ventilator for management of complicated cases. To ensure the availability of effective ASV against all venomous species in India, it is being envisaged under this action plan Regional Venom centres/banking centres may be established in suitable institutes in respective regions.

Conclusion

It is evident that multisectoral collaboration and coordination will help in bringing together different stakeholders already working in field of snakebite control and management on one platform.

Further, Global organization working in the field of Snakebite envenoming are advocating for a dedicated National Programme in India to address the snakebite envenoming burden and to make snakebite envenoming a notifiable disease and efforts are underway for the same as part of the current action plan.

Measures like setting up of zonal banks or venom collection centres to cover regional differences in venom immunogenicity are envisaged. Further capacity building on breeding of snakes in captivity for venom collection to ensure venom supply at cost effective prices for ASV manufacturing and clinical research purposes will eventually improve the access to Anti-Snake Venom (ASV) at peripheral health facilities.

Current action Plan also envisages raising awareness among the community through media outreach programmes to the vulnerable groups. It also envisages setting up of a 24x7 toll free helpline to answer queries related to snakebite management are few of the key steps in mitigating the challenges of venomous snakebite in India.

In the view of above, it is expected that the recent interventions by MoHFW would definitely encourage the states and stakeholders to initiate concrete steps for effective actions against mortality and morbidity due to snakebite for reaching the global target of “halving the deaths from snakebite by 2030”.

Acknowledgment

We acknowledge NCDC, MoHFW for constant support.

Financial support & Sponsorship

None

Conflicts of Interest

No conflicts of Interest.

References

1. Gutierrez JM, Calvete JJ, Habib AG, Harrison RA, Williams DJ, Warrell DA. Snakebite envenoming. *Nat Rev Dis Primers*. 2017;3:17063.
2. Suraweera W, Warrell D, Whitaker R, Menon G, Rodrigues R, Fu SH, et al. Trends in snakebite deaths in India from 2000 to 2019 in a nationally representative mortality study. *Elife*. 2020;9:e54076.
3. Alirol E, Sharma SK, Bawaskar HS, Kuch U, Chappuis F. Snake bite in South Asia: A review. *PLoS Negl Trop Dis*. 2010;4:e603.
4. Minghui R, Malecela MN, Cooke E, Abela-Ridder B. WHO's Snakebite Envenoming Strategy for prevention and control. *Lancet Glob Health*. 2019;7:e837-8.
5. World Health Organization. Expert Committee on Biological Standardization. WHO Guidelines for the Production, Control and Regulation of Snake Antivenom Immunoglobulins. Available from: <https://www.who.int/publications/m/item/snake-antivenom-immunoglobulins-annex-5-trs-no-1004>. Accessed on December 28, 2022.
6. World Health Organization. Snakebite envenoming: A strategy for prevention and control. Geneva: WHO; 2019. p. 70.
7. Williams DJ, Faiz MA, Abela-Ridder B, Ainsworth S, Bulfone TC, Nickerson AD, et al. Strategy for a globally coordinated response to a priority neglected tropical disease: Snakebite envenoming. *PLoS Negl Trop Dis*. 2019;13(2):e0007059.
8. Gutierrez JM, Warrell DA, Williams DJ, Jensen S, Brown N, et al. The Need for Full Integration of Snakebite Envenoming within a Global Strategy to Combat the Neglected Tropical Diseases: The Way Forward. *PLoS Negl Trop Dis*. 2013;7(6):e2162. doi:10.1371/journal.pntd.0002162.
9. Gutierrez JM, Williams D, Fan HW, Warrell DA. Snakebite envenoming from a global perspective: Towards an integrated approach. *Toxicon*. 2010 Dec 15;56(7):1223-35. doi: 10.1016/j.toxicon.2009.11.020. Epub 2009 Nov 29. PMID: 19951718.

10. Standard Treatment Guidelines on the Management of Snake Bites. Ministry of Health & Family Welfare, Government of India; 2017. Available from: https://nhm.gov.in/images/pdf/guidelines/nrhm-guidelines/stg/Snakebite_Full.pdf. Accessed on December 28, 2022.

11. Chakma JK, Menon JC, Dhaliwal RS, Indian Council of Medical Research. White paper on venomous snakebite in India. Indian J Med Res. 2020;152:568-74.

12. Dr. Mansukh Mandaviya Chairs 7th Meeting of Mission Steering Group for NHM. Press Information Bureau. New Delhi; 2022. Available from: <https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1857490>. Accessed on June 10, 2022.