International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 14 Issue 02, February -2024,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

ADDRESSING SNAKE ENVENOMATION: INSIGHTS INTO ANTI-VENOM TREATMENTS AND HERBAL ANTIDOTES

Manish[1], Dheeraj[2]
[1, 2]M.Sc., Department of Zoology, Shri Guru Gobind Singh College, Chandigarh
Email id: [1]manishbidhan898@gmail.com

DOI:euro.ijreas.11456.22134

Abstract

Effective management measures are needed to address the global health problem posed by snake envenomation. This abstract looks at two basic strategies: traditional herbal antidotes from traditional medicinal methods and conventional anti-venom therapy. Traditional anti-venoms, created by scientific investigation, counteract venom poisons; yet, they have drawbacks such as unfavourable reactions and accessibility. Herbal remedies, on the other hand, are derived from traditional botanical knowledge and present a promising alternative therapy that requires scientific validation before being widely applied. In order to reduce snakebite morbidity and death, effective management necessitates collaboration between healthcare professionals, scientists, traditional healers, and communities in order to improve treatments, increase accessibility, and investigate complementary therapies.

Keywords: Herbal Antidote, Anti-Venom, Snake Bite, and Snake Venom venomation by snakes

1. INTRODUCTION

Around the world, snake envenomation is a serious and frequently fatal medical emergency, especially in areas where venomous snakes are endemic. The intricacy of snake venoms and the variety of snake species present significant obstacles for healthcare systems and call for a multipronged approach to management and treatment. To address this issue, scientific research has led to the development of conventional anti-venom treatments, which provide focused interventions to neutralize venomous substances. Nonetheless, the availability,

cost-effectiveness, and unfavourable effects linked to anti-venom treatments highlight the necessity of ongoing innovation and investigation for substitute therapeutic approaches. Drawing on indigenous botanical knowledge and holistic healing traditions, traditional healing methods have long depended on herbal antidotes to mitigate venom toxicity in many cultures. In order to better understand the field of managing snake envenomation, this study will look at traditional anti-venom therapies as well as herbal counter-measures. It will also discuss the advantages and disadvantages of each approach and how it might be incorporated into modern healthcare systems. Healthcare practitioners, politicians, and researchers can work together to develop more accessible and effective techniques for treating snake envenomation and lowering related morbidity and mortality by developing a thorough understanding of various therapeutic modalities.

Many parts of the world face a severe public health crisis due to the morbidity and fatality rate linked with snakebites, especially in rural communities with limited access to medical care. According to reports, between 35,000 and 50,000 people perish from snake bites each year; there are 52 poisonous snake species in India; most bites result in death. Najanaja spectacled cobra, Ophiophagushannah king cobra Each year, numerous snake species, including Daboia, russelli, Russell's viper, Bangaruscaeruleu, common krait, and Echiscarinatum saw-scaled viper Bawaskar, are found in India, particularly in rural regions. It is possible that even more occurrences go unreported. More effective first aid and medically supervised antivenom treatments can significantly lower the death rate from snake bites. In addition to having negative effects, venom creation takes a long time, money, and proper storage conditions. For these reasons, it's critical to look for synthetic or natural venom inhibitors that can supplement or replace the effects of anti-venoms. Although there is currently insufficient knowledge on this topic, herbal remedies might be an alternative. In order to minimize the socio-medical problem of snake bite in tropical nations, particularly in India, scholars might benefit from an entire reservoir of references and knowledge on the subject provided by this review of snake bite, venom, anti-venom, and herbal antidotes.

1.1.Herbal Remedies

International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 14 Issue 02, February -2024,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

Herbal antidotes are natural medications produced from plants that are used to heal snakebites and reverse the symptoms of snake envenomation. They are sometimes referred to as herbal remedies or traditional medicines. Traditional healers and indigenous societies have traditionally used herbal antidotes as a primary or supplemental treatment for snakebites in a variety of civilizations across the world. These herbal medicines typically include plant extracts, leaves, roots, and other botanical substances that are thought to have anti-venom toxic, anti-inflammatory, analgesic, and therapeutic effects. Herbal remedies for snakebites continue to be a significant part of traditional medical practices in many regions, despite the fact that the scientific evidence for their effectiveness is weak and varies based on the particular remedy and situation. In addition to traditional therapies like antivenom therapy, research endeavors are still underway to investigate the possible medicinal advantages of herbal antidotes and incorporate them into all-encompassing snakebite management plans. Though their safety, effectiveness, and proper dosage may not always be well-established or standardized, it is imperative to use caution and consult a physician before using herbal antidotes.

1.2.The Envenomation

When venom from poisonous animals—such as spiders, snakes, scorpions, or some insects—enters the body through a bite or sting, it is known as envenomation. Its consequences, which depend on venom type, quantity, species, and individual response, vary from modest local reactions to severe systemic poisoning and even death. Though they can vary, frequent symptoms include organ failure, discomfort, swelling, numbness, nausea, breathing difficulties, and paralysis. It is essential to have appropriate antivenom administration, supportive care, and systemic effect monitoring as soon as possible. Precautions like wearing protective gear and getting medical attention right away are part of prevention. Envenomation continues to be a major worldwide health issue that requires improved treatment access, education, and prevention methods to reduce morbidity and mortality, especially in endemic areas.

2. LITERATURE REVIEW

Williams et al. (2019) stress how urgently new approaches to snakebite diagnosis and treatment are needed. Their research emphasizes the difficulties caused by the scarcity of diagnostic instruments and the variation in snake venom composition, calling for creative solutions to enhance patient outcomes and lower the death rates related to snake envenomation.

Panda and Kumari (2019) look at the anti-ophidian qualities of herbal medicinal plants in order to investigate an alternative approach to snakebite treatment. Their study examines the potential of herbal treatments as adjunctive therapy for envenomation caused by snakebite, offering a comprehensive course of care that combines conventional medical procedures with alternative forms of healing.

Deshpande et.al. (2022) examination of modern indigenous therapeutic procedures includes insights into traditional Indian snake envenomation remedies. Their research explores the historical and cultural background of traditional Indian methods for managing snakebite, emphasizing the value of maintaining and incorporating traditional knowledge systems into contemporary healthcare frameworks.

Vanuopadath et al. (2023) clarify the drawbacks of the available treatment options and push for improvements in antivenom development. In order to address the changing obstacles given by snake envenomation and enhance patient care results, their research emphasizes the necessity of teamwork and innovative research methods.

3. SNAKE BITE

A snake bite is an injury from which the animal bites, usually leaving puncture wounds from the fangs and occasionally envenomation. Though the vast majority of snake species are non-venomous and usually use constriction to kill their food, 15% of the 3000 known species of snakes are believed to be venomous, and they are said to be found on every continent save Antarctica.

3.1.Frequency Of Snake Bite

The incidence of snakebite varies greatly based on factors such as climate, human population density, geographic location, and the existence of poisonous snake species. Snakebite rates are

typically higher in areas where endemic populations of snakes coexist with their natural environments.

For instance, because of the prevalence of poisonous snakes and agricultural practices that put people in touch with snake habitats, snake bites are rather common in rural tropical and subtropical countries including sub-Saharan Africa, South Asia, Southeast Asia, and portions of Latin America.

The World Health Organization (WHO) estimates that every year, between 1.8 and 2.7 million people worldwide are bitten by snakes, leading to between 81,000 and 138,000 fatalities as well as long-term disability for many of the survivors. Due to underreporting and a lack of rigorous data collection in many impacted regions, these figures are estimates and are subject to change.

The prevalence of snake bites and their effects on public health are still being precisely estimated by epidemiological research, surveillance programs, and community-based reporting systems. In addition, lowering the frequency and severity of snake bites requires education, preventative techniques, quick access to medical care, and the availability of anti-venom.

4. IDENTIFICATION OF POISONOUS AND NON-POISONOUS

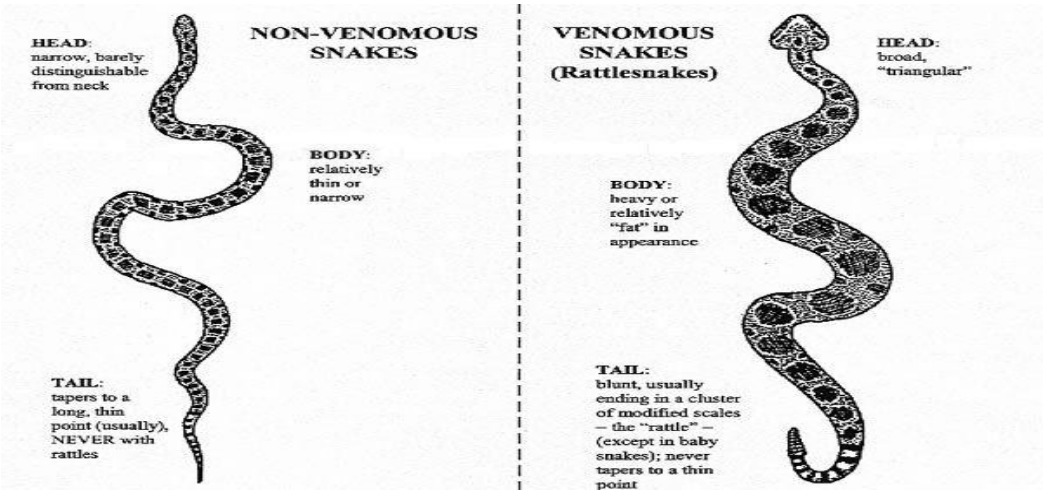

Figure 1:Poisonous And Non-Poisonous

For both personal safety and wildlife conservation efforts, knowing which snakes are toxic and non-poisonous can be extremely important. Here are some broad principles that aid in

differentiating between the two:

- **Poisonous Snakes:**

- **Venomous Head Shape:**While non-venomous snakes usually have heads that are equal in breadth to their bodies, many venomous snakes have heads that are triangular in shape and separate from their bodies.
- **Vertical Pupils:**While non-venomous snakes often have circular pupils, some venomous snakes, including pit vipers, have vertical pupils that resemble a cat's eye.
- **Pit Organs:** Non-venomous snakes lack the unique heat-sensing pits that pit vipers, such as rattlesnakes, copperheads, and water moccasins, have between their eyes and nostrils.
- **Color and Patterns:** Many venomous snake species have vivid colors and distinctive patterns that act as warning indicators, though coloration and patterns can vary widely among snake species. To stay safe, certain non-poisonous snakes, nevertheless, imitate the appearance of venomous species.
- **Tail Shape:** Non-venomous snakes usually have tapering tails, but some venomous snakes have tails that end in a rattle (rattlesnakes) or have other specific characteristics.

- **Non-Poisonous Snakes:**

- **Round Pupils:**Most non-venomous snakes have round understudies as opposed to vertical ones.
- **Non-Triangular Head Shape:**Non-venomous snakes ordinarily have heads that are not fundamentally more extensive than their bodies, coming up short on the three-sided shape tracked down in numerous venomous species.
- **Harmless Behavior:**Non-venomous snakes by and large show non-forceful way of behaving and may endeavor to escape when drawn closer, while a few venomous snakes might show guarded ways of behaving, for example, winding and murmuring.
- **Lack of Venom Delivery Mechanisms:**Non-venomous snakes need particular venom conveyance components, for example, empty teeth or venom glands tracked down in venomous species.

International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 14 Issue 02, February -2024,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

- **Common Species:**Finding out about normal snake species in your space can likewise assist with separating among venomous and non-venomous snakes. Counselingneighborhood field guides or untamed life specialists can give important data.

5. GENERAL SYMPTOMS OF SNAKE BITE

General side effects of a snake bite can shift contingent upon elements, for example, the kind of snake, how much venom infused, and the singular's response to the venom. Notwithstanding, normal side effects might incorporate:

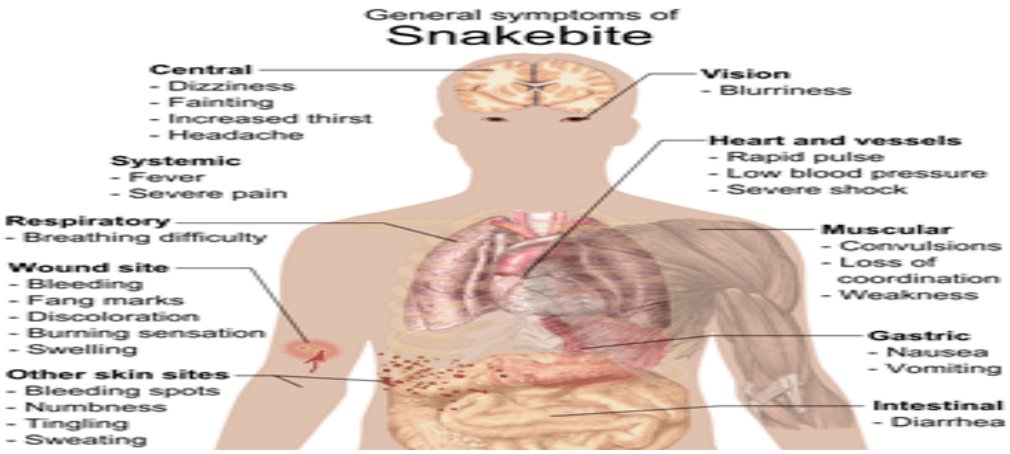

Figure 2:Symptoms of a Snake Bite in General

- **Puncture Wound:**A snake bite ordinarily abandons two cut blemishes on the skin, brought about by the snake's teeth.
- **Immediate Pain:**Torment at the site of the bite is frequently quick and can go from gentle to serious.
- **Swelling and Redness:**Enlarging and redness might happen around the bite region because of aggravation and tissue harm.
- **Bruising and Bleeding:**Swelling and draining may foster around the bite site because of harm to veins and tissues.
- **Nausea and Vomiting:**Some snake bites can cause queasiness and regurgitating as a component of the body's reaction to the venom.

International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 14 Issue 02, February -2024,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

- **Dizziness and Weakness:**Sensations of wooziness, shortcoming, and exhaustion might happen, especially on the off chance that the snake venom influences the cardiovascular or sensory system.
- **Difficulty Breathing:**In serious cases, snake venom can cause trouble breathing or respiratory misery, which requires prompt clinical consideration.
- **Tingling or Numbness:**Shivering sensations or deadness in the furthest points or around the bite region might happen because of the impacts of the venom on the sensory system.
- **Changes in Heart Rate and Blood Pressure:**Snake venom can influence pulse and circulatory strain, prompting sporadic pulses or variances in circulatory strain levels.
- **Paralysis or Muscle Weakness:**At times, snake venom can cause loss of motion or muscle shortcoming, especially assuming the venom focuses on the neuromuscular system.

6. SNAKE VENOM

Snake venom is a perplexing combination of proteins, catalysts, and poisons delivered by venomous snakes to immobilize prey or safeguard against dangers. Containing different parts like catalysts, neurotoxins, hemotoxins, cytotoxins, and cardiotoxins, snake venom differently affects the person in question, going from neighborhood agony and enlarging to serious systemic side effects like loss of motion, respiratory pain, and organ disappointment. The organization of snake venom shifts among species, impacting the particular clinical appearances of envenomation. Understanding snake venom is urgent for creating compelling antivenom medicines and adds to more extensive logical bits of knowledge into toxinology and the complexities of human physiology and pathology

6.1.Types of snake venom

Snake venom can be comprehensively classified into a few sorts in light of its dominating impacts on the casualty's body. These sorts incorporate:

International Journal of Research in Engineering and Applied Sciences(IJREAS)
Available online at http://euroasiapub.org/journals.php
Vol. 14 Issue 02, February -2024,
ISSN(O): 2249-3905, ISSN(P) : 2349-6525 | Impact Factor: 8.202| Thomson Reuters ID: L-5236-2015

Figure 3:Types of Snake Venom

1. **Neurotoxic Venom:**Neurotoxic venom principally focuses on the sensory system, upsetting nerve capability and prompting side effects like loss of motion, respiratory disappointment, and muscle shortcoming. Snakes with neurotoxic venom incorporate cobras, coral snakes, and a few types of ocean snakes.
2. **Hemotoxic Venom:**Hemotoxic venom influences the blood and cardiovascular system, causing side effects like drain, coagulopathy (unusual blood coagulating), tissue putrefaction, and organ harm. Numerous snakes and pit snakes, including rattlesnakes, copperheads, and cottonmouths, have hemotoxic venom.
3. **Cytotoxic Venom:**Cytotoxic venom harms cells and tissues at the site of the bite, prompting neighborhood impacts like agony, expanding, rankling, and tissue putrefaction. Numerous elapids, like a few types of cobras and kraits, produce cytotoxic venom.
4. **Cardiotoxic Venom:**Cardiotoxic venom influences the heart and cardiovascular system, prompting side effects like sporadic pulses, diminished heart yield, and cardiovascular breakdown. Certain snakes, including a few cobras and rattlesnakes, produce cardiotoxic parts in their venom.

5. **Proteolytic Venom:**Some snake venoms contain proteolytic chemicals that separate proteins, prompting tissue harm, aggravation, and enlarging at the site of the bite. The two elapids and snakes might deliver venoms with proteolytic properties.

6.2.Utility of snake venom

Snake venom, regardless of its deadly nature, fills a huge number of needs across different fields. In medication and pharmacology, its bioactive mixtures are significant for understanding physiological cycles and creating medicines for conditions like cardiovascular illnesses and neurological problems. Venom-inferred drugs have been utilized to treat hypertension and blood thickening problems, among others. Also, snake venom is vital for delivering antivenom, which recoveries lives by killing venom impacts in snakebite casualties. Biotechnological applications use venom parts for diagnostics, drug conveyance, and biomaterial improvement. Moreover, concentrating on snake venom helps biological exploration, illuminating protection endeavors and understanding hunter prey elements. Subsequently, while venom represents a danger, its properties offer huge advantages in different areas of science and medication.

7. ANTI-VENOM

Antivenom, otherwise called antivenin, is a significant clinical treatment used to kill the impacts of venom following snakebites and envenomation by other venomous animals like bugs, scorpions, and certain marine creatures. Antivenom is delivered by infusing little, non-deadly portions of venom into creatures like ponies or sheep. These creatures then produce antibodies against the venom, which are reaped from their blood and cleansed to make antivenom serum. When managed to an individual who has been chomped or stung by a venomous creature, antivenom works by restricting to and killing the venom poisons in the circulatory system, forestalling further harm and possibly saving the casualty's life. Ideal organization of antivenom is pivotal to limit the seriousness of side effects and further develop results in instances of envenomation. Be that as it may, antivenom is well defined for specific kinds of venom, so the right antivenom should be utilized in light of the types of

snake or venomous creature engaged with the bite or sting. In spite of its viability, antivenom can make side impacts and should be controlled under clinical watch.

7.1.Anti-venom types

Antivenom types change in view of the types of venomous creatures they target. A few normal kinds of antivenom incorporate:

1. **Polyvalent Antivenom:**This kind of antivenom is viable against venoms from various types of snakes or venomous animals inside a specific geological locale. Polyvalent antivenoms are many times utilized in regions where numerous types of venomous creatures exist together.
2. **MonospecificAntivenom:**Monospecificantivenom is intended for the venom of a solitary types of snake or venomous creature. These antivenoms are custom fitted to kill the poisons created by a specific animal categories and are utilized in locales where that species is pervasive.
3. **Species-Specific Antivenom:**This sort of antivenom is intended to focus on the venom of specific types of snake or venomous creature. It is profoundly unambiguous and might be utilized in circumstances where bites or envenomationsfrom particular animal groups represent a huge gamble.
4. **F(ab')2 Antivenom:**F(ab')2 antivenom is gotten from the part of antibodies known as F(ab')2, which are created by enzymatically severing entire immunoglobulins. This kind of antivenom may have diminished hazard of unfavorably susceptible responses contrasted with entire immunoglobulin-based antivenoms.
5. **F(ab) Antivenom:**F(ab) antivenom is one more sort got from the part of antibodies known as F(ab), which are delivered by papain processing of entire immunoglobulins. Like F(ab')2 antivenom, it might likewise have diminished hazard of unfavorably susceptible responses.

7.2.Anti-venom producing centres in India

In India, a few establishments and associations are engaged with the creation and conveyance of antivenom for the treatment of snakebites. A portion of the conspicuous anti-venom delivering focuses in India incorporate:

1. **Central Research Institute (CRI) for Ayurveda, Hyderabad:**CRI Hyderabad is one of the main habitats for the creation of polyvalent anti-snake venom serum (ASVS) in India. It is an exploration organization under the Service of Ayurveda, Yoga and Naturopathy, Unani, Siddha, and Homeopathy (AYUSH).
2. **Haffkine Institute for Training, Research, and Testing, Mumbai:**Haffkine Foundation is a chief biomedical exploration establishment in Mumbai. It produces polyvalent ASVS and supplies it to different states in India.
3. **Institute of Immunohaematology (IIH), Mumbai:**IIH is associated with the creation of anti-snake venom and anti-scorpion venom sera. It is a piece of the Indian Council of Medical Research (ICMR) and contributes fundamentally to venom research and antivenom creation.
4. **Bharat Serums and Vaccines Limited, Mumbai:**Bharat Serums is a drug organization that produces anti-snake venom serum and conveys it across India and different nations.
5. **VINS Bioproducts Limited, Hyderabad:**VINS Bioproducts is a biotechnology organization spend significant time in the development of plasma-determined items, including anti-snake venom serum.

7.3.Anti-venom selection

Choosing the fitting anti-venom for snakebite treatment includes different variables to guarantee compelling administration and limit unfriendly responses. First and foremost, distinguishing the snake species dependable is critical, as various snakes produce venom with particular structures. Topographical area matters, as anti-venom accessibility differs by locale in light of common snake species. Understanding the venom type (neurotoxic, hemotoxic, cytotoxic) picks the proper anti-venom. Polyvalent anti-venom might cover numerous snake species, while monospecific anti-venom targets explicit ones. Patient factors like age, weight,

and sensitivities impact choice. Admittance to, still up in the air by medical care foundation and strategies, influences therapy. At long last, the seriousness of envenomation guides measurement and organization, underscoring the significance of brief and informed decision-production for ideal results in snakebite cases.

7.4.Limitations of anti-venom

While antivenom is a basic treatment for snakebite envenomation, it has intrinsic limits. Its species-particularity requires precise recognizable proof of the snake species for successful use. The restricted timeframe of realistic usability, particularly in asset restricted regions, presents difficulties in keeping up with its adequacy. The gamble of antagonistic responses, including extreme sensitivities, serum ailment, and hypersensitivity, can be hazardous, especially for people with known awarenesses. Fluctuation in power among clumps and makers requires standardized creation processes. Cost and openness issues might restrict its accessibility, especially in low-asset settings, affecting convenient treatment. Postponed beginning of activity might prompt the movement of side effects, accentuating the significance of early organization. Also, antivenom may not actually kill non-poisonous parts of snake venom, requiring reciprocal medicines for extensive consideration. Tending to these limits is significant for working on the security and viability of antivenom in the administration of snakebite envenomation.

8. CONCLUSION

All in all, tending to snake envenomation requires a diverse methodology that envelops both regular anti-venom medicines and herbal antidotes got from customary mending rehearses. While anti-venom treatments stay the foundation of snakebite the board, offering designated intercessions against venom poisons, they additionally present constraints like species-particularity, unfriendly responses, and openness issues. Herbal antidotes, established in native information systems, offer promising corresponding treatments that might support side effect help and advance mending. Nonetheless, the adequacy and wellbeing of herbal cures require further logical approval and standardization. Cooperative endeavors between

medical care professionals, researchers, conventional healers, and networks are fundamental for overcome any barrier between logical progressions and customary practices. By embracing development, inclusivity, and proof based practice, medical care systems can upgrade snakebite the board, decrease dismalness and mortality, and further develop the general prosperity of impacted people. At last, incorporating different treatment modalities guarantees a complete way to deal with tending to snake envenomation and meeting the assorted requirements of populaces around the world.

REFERENCES

1. Gómez-Betancur, I., Gogineni, V., Salazar-Ospina, A., & León, F. (2019). Perspective on the therapeutics of anti-snake venom. Molecules, 24(18), 3276.
2. Williams, H. F., Layfield, H. J., Vallance, T., Patel, K., Bicknell, A. B., Trim, S. A., &Vaiyapuri, S. (2019). The urgent need to develop novel strategies for the diagnosis and treatment of snakebites. Toxins, 11(6), 363.
3. Panda, S., & Kumari, L. (2019). Anti-ophidian properties of herbal medicinal plants: could it be a remedy for snake bite envenomation?. Current Drug Discovery Technologies, 16(4), 319-329.
4. Deshpande, A. M., Sastry, K. V., & Bhise, S. B. (2022). A contemporary exploration of traditional Indian snake envenomation therapies. Tropical Medicine and Infectious Disease, 7(6), 108.
5. Vanuopadath, M., Rajan, K., Alangode, A., Nair, S. S., & Nair, B. G. (2023). The need for next-generation antivenom for snakebite envenomation in india. Toxins, 15(8), 510.
6. Knudsen, C., Jürgensen, J. A., Føns, S., Haack, A. M., Friis, R. U., Dam, S. H., ...& Laustsen, A. H. (2021). Snakebite envenoming diagnosis and diagnostics. Frontiers in immunology, 12, 661457.
7. Dzenu, M. W., Agani, A., &Ayanore, M. (2023). Community and health system factors influencing snake envenomation management practices in three districts of Ghana: a qualitative inquiry from health stakeholders and snakebite victims. medRxiv, 2023-02.
8. Schurer, J. M., Dam, A., Mutuyimana, M. T., Runanira, D. M., Nduwayezu, R., &Amuguni, J. H. (2022). “At the hospital they do not treat venom from snakebites”: A

qualitative assessment of health seeking perspectives and experiences among snakebite victims in Rwanda. Toxicon: X, 14, 100100.

9. Omara, T., Kagoya, S., Openy, A., Omute, T., Ssebulime, S., Kiplagat, K. M., &Bongomin, O. (2020). Antivenin plants used for treatment of snakebites in Uganda: ethnobotanical reports and pharmacological evidences. Tropical Medicine and Health, 48, 1-16.
10. Chaaithanya, I. K., Abnave, D., Bawaskar, H., Pachalkar, U., Tarukar, S., Salvi, N., ...&Gajbhiye, R. K. (2021). Perceptions, awareness on snakebite envenoming among the tribal community and health care providers of Dahanu block, Palghar District in Maharashtra, India. Plos one, 16(8), e0255657.
11. Bala, A. A., Mohammed, M., Umar, S., Ungogo, M. A., Hassan, M. A. K., Abdussalam, U. S., ...& Chedi, B. A. (2023). Pre-clinical efficacy of African medicinal plants used in the treatment of snakebite envenoming: A systematic review. Toxicon, 107035.
12. Omara, T. (2020). Plants used in antivenom therapy in rural Kenya: ethnobotany and future perspectives. Journal of Toxicology, 2020.
13. Pandey, D. P., Subedi, G., Sapkota, S., Dangol, D. R., & Devkota, N. R. (2023). Attitudes, knowledge and practices of traditional snakebite healers in Nepal: implications for prevention and control of snakebite. Transactions of The Royal Society of Tropical Medicine and Hygiene, 117(3), 219-228.
14. Wafula, S. T., Namakula, L. N., Ninsiima, L. R., Ssekamatte, N. K., Walekhwa, A. W., Mugume, I. B., & Musoke, D. (2023). Barriers and opportunities for improving management of snakebites: Perspectives of healthcare workers in Northern Uganda. Plos one, 18(9), e0291032.
15. Yakin, J. A Review on New Approaches to Meet The Challenges of Human Envenoming by Snakebites.