Journal of Wildlife and Ecology (2022). 6(1):22-31

Review Open Access

# Study of snakes bites and dry bites-a review

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**SUMMARY**

Venomous snake bites can induce a variety of symptoms, ranging from low symptoms to severe symptoms. A “dry bite” happens when a venomous snake bites as well as the sufferers show no indications of envenomation. This is responsible for a considerable number of venomous snake bites all around the world. The occurrence of "dry bites" is commonly recorded in some research on venomous snake bites, but solely as a statistical figure with little emphasis on its relevance. Dry bites are not exclusive to any single species of venomous snake and may be present in bites of every venomous snake, but with different level of occurrence. Though this was not unusual in toxicological practice, our knowledge of the issue has grown. This article has attempted to give imminent into the occurrence, pathomechanics and etiology of this distinctive therapeutic mystery.

**Keywords:** Snake, Envenomation, Dry bites, Viperidae

**Citation:** Altaf, M. 2022. Study of snakes bites and dry bites-a review Journal of Wildlife and Ecology. 6: 22-31.
**Received:** January, 2022**; Accepted**: February, 2022

## INTRODUCTION

Venomous snake bite is a dangerous and life-threatening medical dilemma that affects people all around the world, not just in the tropics. In a single year, almost five million populace are bitten by venomous snakes, with nearly 100,000 of them dying (Adukauskienė *et al.*, 2011). In India, a nationwide mortality survey found that 46,000 individuals died as a result of snake bites in 2005 (Mohapatra *et al.*, 2011).

Venomous snake bites can cause a range of symptoms, from moderate local symptoms to severe systemic poisoning symptoms such multi-organ failure, neuroparalysis, coagulopathy, shock as well as death. A "dry bite" occurs when a deadly snake bites as well as the victims show no local, systemic, or laboratory signs of “envenomation”. This is responsible for a significant number of bites of venomous snake all around the world (Silveira, 1995; Russell *et al.*, 1997). In any study on venomous snake bites, the incidence of "dry bites" is frequently reported, but only as a statistical figure with no emphasis on its significance. Dry bites are not distinctive to any single venomous snake species and can be found in all kinds of bites of venomous snake, though with varied degrees of frequency. The aim of this research is to highlight the occurrence of "dry bite" by species of venomous snakes as well as to

outline the reasons and causes for this unexpected and fortunate escape for venomous snake bite sufferers.

## SNAKE BITE

Only one tenth of the 3000 snake species identified around the world are hazardous to humans. The Viperidae family of poisonous snakes is divided into three subfamilies: pit vipers (crotalinae), viperine vipers, and viperine vipers (viperinae). They have long, moveable fangs. Their pupils are oval in shape vertically. A single row of ventral plates runs from caudal to anus. For prey location, these snakes feature a heat detecting pit in the form of a little dip on the side of the head. This family of snakes has short, fixed fangs that include venom channels. Their bodies are encircled by tricolour bands (black, red, and yellow/white), and they have no laurel shields. Hydrophiladae these species have flattened tail (Kiran and Senthilnathan, 2003). Snake venom is classified as hemotoxic, neurotoxic, necrotoxic, cardiotoxic, and nephrotoxic based on the predominant effects that vary by family. The appearance of these symptoms determines the level of intoxication: no intoxication (dry bite), mild intoxication (local edoema and pain), moderate intoxication (pain, edoema spreading out of the bite zone, and systemic signs), and severe intoxication (pain, edoema spreading out of the bite zone, and systemic signs). This is a critical issue because people frequently make serious mistakes when providing first aid (Adukauskienė *et al.*, 2011).

Snakebite epidemiology is still incomplete, owing to a lack of statistical information, despite being a serious public health problem in many nations. This is exacerbated by the fact that the majority of victims are from rural areas, where medical services are few. Snakebites are believed to number in the millions each year, with about 100,000 of them resulting in serious consequences. The occurrence follows a unique seasonal pattern, with higher rates in the summer and during rainy seasons, when reptiles emerge from their hiding places. In Pakistan, India, and Bangladesh, snake bite epidemics have been reported as a result of floods, when human and snake populations are crowded together. Snakebite affects people of all ages; with the majority of cases (90 percent) hitting people aged 11 to 50, with males being affected double as compared to females. The majority of bites happen between early morning and midnight, as well as many of them happen in fields because most people can't see the snake due to tall grass and crops. Fortunately, not every bite causes complete envenomation, and more than half of those who are bitten survive without significant poisoning. The death rate can be significant if enough venom is injected during the bite to produce serious poisoning (Kiran and Senthilnathan, 2003).

## HISTORY OF DRY BITES

An old man was bitten by his pet “South American rattlesnake” in UK in 1892 (Fayrer, 1892). The occurrence of one puncture of fang mark was confirmed during the medical examination, (Fry, 2018). Fang marks and had no systemic or local envenoming symptoms were classified as asymptomatic bites from 1950s to 1960s (Parrish *et al.*, 1966). The term ‘dry bites’ was first time used in early 1980s, (Russell, 1980). Parrish (1959) documented dry snake bites in *Bothrops* spp. and *Crotalus* spp. in Brazil, Reid *et al.* (1963) also examined dry bites in *Calloselasma* spp. in South

East-Asia Countries. Parrish *et al.* (1966) and (Parrish, 1966) also confirmed that dry bites also noted in *Micrurus* spp. and *Agkistrodon* spp.in USA. Later, Phillips and Warrell (1985) in *Daboia siamensis,* Kitchens and Van Mierop (1987) in *Micrurus* spp., (Kouyoumdjian and Polizelli, 1989) in *Bothrops* spp., Curry *et al.* (1989) in *Crotalus* spp., Tanen *et al.* (2001) in *Crotalus* spp., Kularatne (2002) in *Bungarus caeruleus*, Gold *et al.* (2002) in *Crotalus* spp., Bawaskar and Bawaskar (2004) in *Bungarus caeruleus*, *Naja naja*, Dart (2004) in *Oxyuranus* spp., Bucaretchi *et al.* (2006) in *Micrurus* spp., Köse (2007) in *Macrovipera lebetinus*, Ariaratnam *et al.* (2008) in *Bungarus caeruleus*, (Kularatne *et al.*, 2009) in *Naja naja*, White (2010) in *Pseudonaja* spp., Nicoleti *et al.* (2010) in *Bothrops* spp., Kularatne *et al.* (2011b) in *Echis* spp., Kularatne *et al.* (2011a) in *Daboia russelii*, Spano *et al.* (2013) in *Crotalus* spp., Hifumi *et al.* (2015) in *Protobothrops flavoviridis*, Silva *et al.* (2016) in *Bungarus caeruleus*, WHO (2016) in *Echis* spp., *Daboia russelii, Calloselasma* spp., Roth *et al.* (2016) in *Agkistrodon* spp., Bawaskar and Bawaskar (2019), Monzavi *et al.* (2019) in *Echis* spp. and Khan *et al.* (2020) in *Bungarus caeruleus* documented the dry bites in snakes of different countries of worlds (Table 1).

**Table: Dry bites in snakes.**

| Sr. | Identified species | Country | Dry Bite incidence (%) | Diagnosis of dry bite | Reference |
|---|---|---|---|---|---|
| 1. | *Bungarus caeruleus* | India | 11% | No local symptoms of ailments | (Bawaskar and Bawaskar, 2004) |
| | | Sri Lanka | 10% | Presence of fang marks | (Kularatne, 2002) |
| | | | 4.5% | No signs of envenoming | (Ariaratnam *et al.*, 2008) |
| | | | 24% | No symptoms | (Silva *et al.*, 2016) |
| | | --- | Rare | Presence of fang marks | (Khan *et al.*, 2020) |
| 2. | *Naja naja* | India | 3% | No systemic signs of ailments | (Bawaskar and Bawaskar, 2004) |
| | | Sri Lanka | 20% | No local symptoms of ailments | (Kularatne *et al.*, 2009) |
| 3. | *Echis* spp. | India | 1.75% | Presence of fang marks | (Bawaskar and Bawaskar, 2019) |
| | | Sri Lanka | 8% | No lab abnormalities | (Kularatne *et al.*, 2011b) |
| | | South East-Asia Countries | 5-50% | Do not signs of envenoming | (WHO, 2016; Monzavi *et al.*, 2019) |
| 4. | *Daboia russelii* | India | 1.75% | No lab abnormalities | (Bawaskar and Bawaskar, 2019) |
| | | Sri Lanka | 5% | No signs of ailments | (Kularatne *et al.*, 2011a) |
| | | South | 5-50% | No signs of ailments | (WHO, 2016) |

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|---|---|---|---|---|---|
| | | East-Asia Countries | | | |
| 5. | *Daboia siamensis* | Myanmar | 27%- 38% | No signs of ailments | (Phillips and Warrell, 1985; Warrell, 1991) |
| 6. | *Hypnale* spp. | Sri Lanka | 5% | No local symptoms | (Kularatne *et al.*, 2011a) |
| 7. | *Calloselasma* spp. | South East-Asia Countries | 5-50% | Do not result in any symptoms or signs of envenoming | (WHO, 2016) |
| | | | 50% | No signs of ailments | (Reid *et al.*, 1963) |
| 8. | *Macrovipera lebetinus* | Turkey | 19% | No signs of ailments | (Köse, 2007) |
| | | Iran | --- | No signs of ailments | (Monzavi *et al.*, 2019) |
| 9. | *Pseudonaja* spp. | Australia | 20%-22% | No signs of ailments | (Tibbalis, 1992; Mead and Jelinek, 1996; White, 2010) |
| 10. | *Protobothrops kaulbacki* | Brazil | 30%-42% | No signs of ailments | (Silveira, 1995) |
| 11. | *Protobothrops flavoviridis* | Japan | 20% | Fang marks | (Hifumi *et al.*, 2015) |
| 12. | *Pseudechis* spp. | Australia | 20%-22% | No signs of ailments | (Tibbalis, 1992; Mead and Jelinek, 1996) |
| 13. | *Notechis* spp. | Australia | 20%-22% | No signs of ailments | (Tibbalis, 1992; Mead and Jelinek, 1996) |
| 14. | *Bothrops* spp. | Brazil | 2%-32.5% | No clinical evidence of envenoming | (Parrish, 1959; Kouyoumdjian and Polizelli, 1989; Milani Júnior *et al.*, 1997; Nicoleti *et al.*, 2010) |
| 15. | *Crotalus* spp. | Brazil | 12%-42% | No signs of ailments | (Parrish, 1959; Silveira, 1995; De Rezende *et al.*, 1998) |
| | | USA | 3%- 10% | No lab abnormalities | (Curry *et al.*, 1989; Tanen *et al.*, 2001; Spano *et al.*, 2013) |
| | | --- | 25% | No lab abnormalities | (Gold *et al.*, 2002) |
| 16. | *Crotalus durissus* | UK | ---- | Presence of fang marks | (Fayrer, 1892) |

| | | | | | |
|---|---|---|---|---|---|
| 17. | *Micrurus* spp. | Brazil | 9% | No evidence of local envenoming | (Bucaretchi *et al.*, 2006) |
| | | USA | 13%-27% | Presence of fang marks | (Parrish, 1966; Kitchens and Van Mierop, 1987; Walter *et al.*, 2010) |
| 18. | *Agkistrodon* spp. | USA | 4%-27% | Presence of fang marks | (Parrish, 1966; Parrish *et al.*, 1966; Roth *et al.*, 2016) |
| 19. | *Sistrurus* spp. | USA | 27% | Presence of fang marks | (Parrish, 1966) |
| 20. | *Oxyuranus* spp. | --- | 5% | Presence of fang marks | (Dart, 2004) |

DIAGNOSIS OF DRY BITES

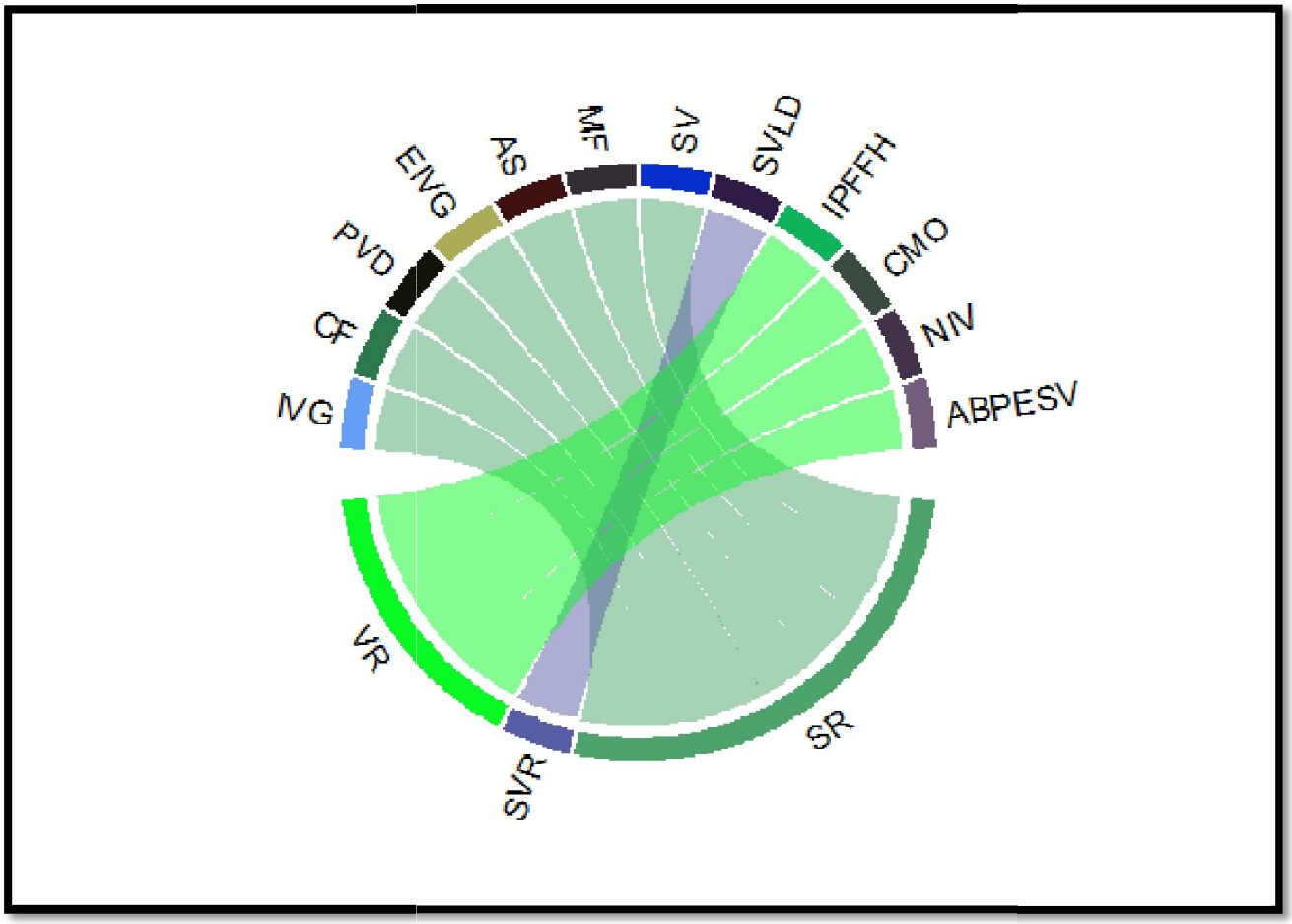
It might be difficult to diagnose snakebite envenoming. It bases on the type of species of venomous snakes in the region, which techniques and tests are able to help assessment, and how diagnosis. Snakebite is often diagnosed using just a mixture of patient's condition and a symptomatic method, with guideline recommendations and tests assessing serum biochemistry, renal function and coagulopathy (Naik, 2017). After confirming that the bite was from a "venomous snake" and that no "envenoming" noted (Pucca *et al.*, 2020).

It is essential to decide whether the snake responsible for the dry bite was venomous in order to validate dry bite diagnosis. In circumstances where the snake has been "photographed" or "killed" and brought to the hospital, an expert herpetologist may be able to identify it (Gutiérrez *et al.*, 2017; Naik, 2017). This may rule out bites from species of "non-venomous snakes", even those that, due to biomimicry, look a lot like their venomous counterparts. One or two wounds of puncture left by a "fangs" might also suggest a venomous snake bite, as these markings are generally distinguishable from those left by "non-venomous snakes", which tend to consist of several puncture holes grouped in a semi-circle. While noted the "offending snake" as a non-venomous species eliminates the risk of envenomation and a dry bite, it's important to remember that "non-venomous" does not mean "harmless." Venomous and non-venomous snake bite wounds can be infected by the snake's mouth flora, resulting in non-venom-related disease and discomfort (WHO, 2016). Bites of snake can produce behaviors that are misinterpreted for poisoning signs at first, e.g. the bitten person may panic, resulting in syncope, breathing problems, vomiting, as well as other symptoms and clinical signs that can also be seen in situations of systemic envenoming (Gutiérrez *et al.*, 2017).

FACTORS OF DRY BITES

There are the following factors for dry bites (Figure 1); (1) infection in venom gland (Giannotti *et al.*, 2013), (2) problems in venom duct, (3) calcification of fang, (4) empty or insufficient venom in gland,(5) aged snake (Klauber, 1982; Kardong, 1986;

De Rezende *et al.*, 1998), (6) mechanical failure (Naik, 2017), (7) save venom (Hayes *et al.*, 2002), (8) snake and victim long distance (Chiszar *et al.*, 1981), (9) incomplete penetration of fangs due to fear of human (Klauber, 1982), (10) covering material obstacles (Herbert and Hayes, 2009), (11) natural immunity of victims (Zamith-Miranda *et al.*, 2018), and (12) antibodies present due to previously exposed snake venom (Figure 1) (Chippaux and Theakston, 1987).




**Figures 1: Reasons of venomous snake dry bites; SR (snake related), SVR (snake and victim related), HR (victim related), IVG (Infection in venom gland), CF (Calcification of fang), PVD (Problems in venom duct),EIVG (Empty or insufficient venom in gland), AS (Aged snake), MF (Mechanical failure), SV (Save venom), SVLD (Snake and victim long distance), IPFFH (Incomplete penetration of fangs due to fear of human),CMO (Covering material obstacles), NIV (Natural immunity of victims) and ABPESV (Antibodies present due to previously exposed snake venom).**

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***Competing interests**:* Author has declared that no competing interests exist.
***Funding**:* Author has no source of funding for this work.
***Authors' contributions:*** Altaf has designed this project, collected data and written this article.