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## Venomous snakes and envenomation in Palestine

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**Abstract**

Venomous snakes found in Palestine, include Palestine saw scaled viper (*Echis coloratus*), Palestine viper (*Vipera palestinae*), Desert Black Cobra (*Walterinnesia aegyptia*) and Palestine Mole Viper (*Atractaspis engaddensis*) snakes. It has been estimated that 100–150 people per year receive venomous bites in Palestine, and about 2-3 of those people die. Specific, antivenins are available against only anti-*Vipera palaestinae* species, while against others namely, *Echis coloratus*, *Walterinnesia aegyptia*, and *Atractaspis engaddensis*. Asiatic or European preparations are used. A polyspecific antivenin against the above mentioned three species is crucially needed

**Keywords:** Venomous Snakes, Envenomation, Palestine.

**1. Introduction**

The snake fauna of Palestine contains species in common with northern Africa, Europe, and Central Asia; towards the east, there is infiltration of species characteristic of tropical Asia. In the Middle East, vipers cause most of the snake bites. Cobras and other elapids occur, but are rare or restricted in range, and inflict few bites<sup>[1, 2, 3]</sup>. *Vipera palaestinae* is the most common venomous snake in the Middle East. It is responsible for most envenomations in humans and domestic animals in Israel<sup>[3]</sup>. The snake is endemic to Palestine, can be found in all country parts except the desert, and has adapted to life in agricultural and suburban areas. Envenomations were reported in people, domestic animals including dogs, cats, horses, sheep, goats, chickens, rabbits, pigeons and cows.<sup>[4, 5]</sup>

All medically important snakes possess one or more pairs of fangs in the upper jaw. These penetrate the skin of their victims and conduct venom through a groove or closed channel into the tissues. Venomous snakes belong to four families Atractaspididae, Elapidae, Viperidae and Hydrophidae. Colubridae, the largest family of snakes, was considered harmless, but an increasing number of species (>40) are now recognized to be capable of envenoming humans, in some cases fatally<sup>[2, 3]</sup>. The Palestinian viper (*Vipera palaestinae*) is the most common venomous snake in the Middle East. It is responsible for most envenomations in humans and domestic animals in Palestine<sup>[4, 5, 6]</sup>. The snake is endemic to Palestine, can be found in all country parts except the desert, and has adapted to life in agricultural and suburban areas. Envenomations were reported in people, domestic animals like dogs, cats, horses, cow, sheep, rabbits, chickens and goats.

Epidemiology of snake bites and resulting envenomations are an important public health and veterinary problems in many countries of the World. According to the WHO factsheet, the exact number of snake bites is unknown an estimated 5 million people are bitten each year with up to 2.5 million envenoming. At least 100 000 people die as a result of snake bites each year, and around three times as many amputations and other permanent disabilities are caused by snakebites annually. Bites by venomous snakes can cause paralysis that may prevent breathing; bleeding disorders that can lead to a fatal hemorrhage; irreversible kidney failure and tissue damage that can cause permanent disability and which may result in limb amputation.<sup>[7]</sup>

The Global Burden of Snakebite report estimates that, worldwide, at least 421,000 envenomings and 20,000 deaths from snakebite occur every year; the actual numbers, they suggest, could be as high as 1.8 million envenomings and 94,000 deaths. Their estimates also indicate that the highest burden of snakebite envenomings and death occurs in South and Southeast Asia and in sub-Saharan Africa and that India is the country with the highest annual number of envenomings (81,000) and deaths (nearly 11,000)<sup>[8]</sup>.

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The Global Burden of Snakebite report estimates of a number of snakebite envenomings and deaths percentage in Palestine in the year 2008, were, 11 cases of snakebites and, the death rate was 30% [8].

According to Health Annual Report, issued by the Palestinian Ministry of health (MOH), in the year 2015, there were 54 cases of snakebites and visited the MOH, hospital emergency rooms [9].

## 2. Methodology

A Combination of literature survey and multiple interviews with officials from the Palestinian Ministry of health were used for gathering information on snakebites cases admitted to the emergency rooms of the Palestinian governmental health care clinics and hospitals, and diagnosed with snakebite envenomation since the year 2008 till 2015 were included in the study. We designed semi-structured interviews, with a number of questions concern with the clinical symptoms present upon admission to the emergency room, and the first aid provided prior to arriving at the emergency room, and the second part of the question was

concern with first aid treatment protocol followed in dealing with snakebite cases. We interviewed 22 key informants during this survey between September 2016 and January 2017.

According to the Palestinian economy portal, the Palestinian Ministry of Health (MOH) pays around five million New Israeli Shekel (NIS), around 1.350 million US\$ every year to Israel to procure the antivenom for the *Vipera Palaestinae*, found in Palestine. This antivenom is produced in Israeli laboratories. Each snake-bitten person costs the MOH around 24,500 shekels or around 6600 US\$ at the very least as a price for the antivenom [10].

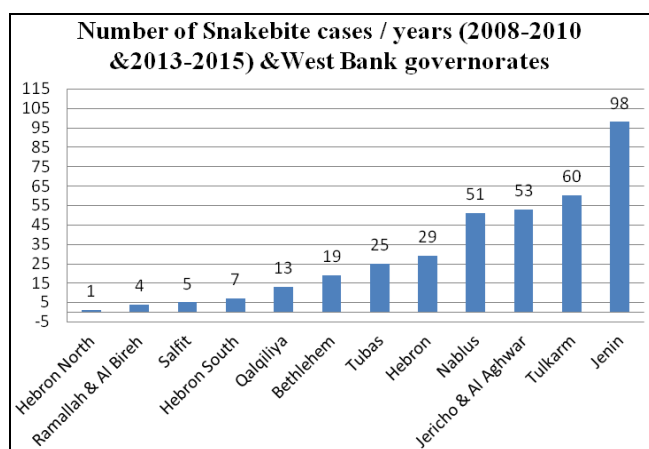
## 3. Results and Discussion

The most common victims of the snakebites in Palestine are Agricultural workers, children, and domestic animals. Children often suffer more severe effects than adults, due to their smaller body mass. In general, most of the human and domestic animals snakebites envenomations in Palestine reported between May and October months.

**Table 1:** Number of Snakebites cases vs years in the West Bank governorates-Palestine [9].

West Bank Governorates	Snakebite cases/Years						Total
	2008	2009	2010	2013	2014	2015	
Hebron South	0	2	2	0	2	1	7
Hebron	16	6	4	0	3	0	29
Hebron North	0	0	0	0	0	1	1
Bethlehem	4	5	6	3	0	1	19
Ramallah & Al Bireh	0	1	0	0	1	2	4
Jericho & Al Aghwar	8	10	7	3	13	12	53
Nablus	13	11	8	6	8	5	51
Salfit	2	2	0	1	0	0	5
Tulkarm	26	6	0	2	17	9	60
Qalqiliya	4	4	1	0	0	4	13
Tubas	0	1	3	2	5	14	25
Jenin	30	26	23	6	8	5	98
Total	103	74	54	23	57	54	365

The number of snakebite cases for the years (2008-2010 & 2013-2015) counted 365 cases and their distribution over years and governorates, as shown above, indicates that there were some sorts of fluctuation in the number of cases every year in each governorate



**Fig 1**

The highest number of snakebites is Jenin governorate with 98 cases or (27%) as shown in Figure 1. This phenomenon could be explained as a result of Jenin governorate geographical location and subsequent climate, including hot

summer with high level of humidity; in addition to the location of nature conservation means, like nature reserves and forest along with the intensive agricultural activities, with water sources and wet soil, that usually offer snakes good shelters and may increase their population increment success. Based on a previous study conducted in Palestine and concern with the herpetofauna [1], it is expected that *Vipera Palaestinae* is the species that bites people and animal there, The second governorate with a high number of snakebites is Tulkarm with 60 cases (16%) as shown in Figure 1. This governorate characteristic is almost the same like Jenin, so the previous explanation could fit here also.

The third governorate with a high number of snakebites is Jericho and Al Aghwar with 53 cases, (15%). This phenomenon could be explained as a result of Jericho and Al Aghwar governorate geographical location 400 m below sea level and subsequent climate, including hot spring summer seasons with high level of humidity; along with the intensive agricultural activities, with water sources and wet soil, which usually offer snakes good shelters and may increase their population increment success. In addition to that, the four venomous snake Species in Palestine are reported to inhabit this governorate which increases the probability of the number of snakebites in this governorate.

The fourth governorate with a high number of snakebites is Nablus with 51 cases (14%). This phenomenon could be explained as a result of Nablus governorate geographical

location to the south of Jenin, and to the east of Tulkarm governorates. Due to this location, different terrain type and landscapes are noticed, mountains and valleys along with some plains, and water sources could be the reason behind this high number of snakebite in this governorate.

The fifth governorate with a high number of snakebites is Hebron with 29 cases (8%), then followed by Tubas with 25 cases, (7%), then Bethlehem with 19 cases, (7%), then followed by Qalqiliya with 13 cases, (4%). The lowest number of snake bite cases found in Hebron North (Halhul) governorate. The number of snakebites in these governorates is due either to their geographical location; terrain type and landscape, or to the land use patterns, agricultural lands, forest, nature reserves etc.

As for the snakebites management practices, our results showed that different undefined treatment protocols are used for snakebite envenomation in different governmental health care institutions. These protocols include antibiotics, antihistamines, steroids and general antivenom. The dosing and timing are controversial and may vary in different medical institutions distributed in different governorates. As for domestic animal snakebites management, absolutely there is no snakebites management protocol or even emergency interventions to rescue the animals in case of snakebite envenomations. Animals usually found did then the owners recognized that their animals dead because of the snakebite.

As for the preventive control of snake bites in Palestine, our study found that there is no list of precautions or list of don'ts or any public awareness campaign to avoid snake bites published by relevant entities neither governmental entities nor private sector health care enterprises

#### 4. Conclusion

In conclusion, we found that (*Vipera palaestinae*), a member of the viper family, is the most common venomous snake in Palestine responsible for most envenomations in humans and domestic animals. This fact could be explained as a result of wide range distribution of this Species in Palestine and surrounding countries. Risk factors for mortality include the first months of the summer season (May, June, and July), low patient body weight, limb envenomation, systemic clinical signs and coagulation disorders. Treatment protocol, practiced in the emergency rooms of governmental health care clinics and hospitals, should be further investigated and updated, while the antivenom should be considered as case specific for each snake species bites. Further investigation of snakebites in Palestinian domestic animals is needed.

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