

# Characteristic Cases of Snake Bite in Sanjiwani Hospital

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## ABSTRACT

**Background:** Snake bites currently being one of the global burdens, especially in tropic and subtropic regions like Indonesia. Snake bites can cause local tissue damage, cell necrotic, hemorrhage, malfunction of muscle, hypotension, and destruction of red blood cells. Based on the report for snake bites in South-East Asian, most of the victims were farmers. Gianyar district has 39.210 of their people working as a farmer. The aim of this research is to determine the characteristic cases of snake bites in Gianyar District Hospital in 2021. **Method:** The research is a descriptive cross-sectional. A total of 55 samples were used in this research. Sample information (sex, age) and clinical features (Paralysis, Nausea-Vomiting, Bleeding, Cell Necrotic, and Edema) were collected secondary by medical records, then analyzed and presented in a narrative. **Results:** The incidence mostly occurs in male patients (65,5%) and in the range of age 31-60 years old (60%). The snake that caused the incidence was mostly from the Viperidae family (63,6%). The Clinical features found in the samples: Paralysis (30,9%), Nausea-Vomiting (5,5%), Bleeding (14,5%), Cell Necrotic (0%), and Edema (60%). The Incidence Rate of this research is 10,5 cases per 100.000 population, Cause-Specific Death Rate is 0 cases per 100.000 population and the Case Fatality Rate is 0%. **Conclusion:** Snake bite is a major burden in Indonesia but only a few people have the knowledge of the early management of snake bite. Primary Health Care should educate the local community about snake bite early management to prevent further complications.

**Keywords:** Indonesia; Snake Bite; South-East Asian; Tropic region; *Viperidae* family

## INTRODUCTION

Snake bites currently being one of the global burdens, especially in tropic and subtropic regions like Indonesia. This issue is mainly because the geographical location in Indonesia is a good habitat for snakes to live and breed. Snake bites can cause damage to local tissue, cell necrotic, internal hemorrhage, muscle disfunction, edema, hypotension, and destruction of a red blood cell. Fast and adequate treatment is needed to prevent further complications and prevent mortality. It is important to identify the species of the snake to give the best treatment and prevent irreversible damage. [1]-[3]

Based on a report by World Health Organization (WHO) there are 5,4 million people got bitten by snakes every year, 2,7 million among them caused by venomous snakes, and approximately 81.000-138.000 deaths were reported every year because of snake bites. There were also many reports on amputation and disability cases because of snake bites every year. For the last 3 years, the American Association of Poison Control Centers report that 6.000 snake bites incident, 2.000 of them were venomous, and 5-15 deaths were reported. Most of the deaths happen in the elderly, children, or late treated cases. There were three families of venomous snakes in South East Asian: *Elapidae*, *Viperidae*, and *Colubridae*. According to WHO most snake bite cases in Indonesia is from species *Trimeresurus albolabris*, *Bungarus candidus*, *spitting cobras*, *Calloselasma rhodostoma*, *Daboia siamensis* dan *Acanthophis spp.* [4],[5]

The Characteristic of snake bite victims especially in South East Asia is reported mostly from farmers, followed by students and housewives, with a mortality rate of 0,5% – 58%.

Snake bites usually occur in males more than females, with the cite that most occur in the lower limb. The incidence of snake bites soared in the rainy season when agricultural activity is high (Fowler J. M., 2016). Indonesia is one of the tropical countries that have a high incidence of snake bites, moreover, the high number of workers that work in the agricultural sector so categorized as a high-risk population. In Indonesia, the case of venomous snake bite is between 12.000 – 214.000 cases with 2-11 death cases because of venomous snake bite. (Wintoko R. & Prameswari N. P., 2020). Bali is one of the provinces in Indonesia that have a huge agricultural land, approximately 407.534 hectares, and Gianyar District has 26.883 hectares of agricultural land. The number of farmers is also high in Bali, Central Bureau of Statistics said that by the year 2020 approximately there is 364.322 farmers in Bali and Gianyar district ranks 5<sup>th</sup> with 39.210 farmers. [6]-[8] Based on described above, it is important to know the characteristic of snake bite cases in Sanjiwani Hospital, Gianyar in 2021.

## MATERIAL AND METHODS

The method used in this research is a descriptive cross-sectional. The sample is snake bite victims treated at Sanjiwani Hospital in 2021 that meet the criteria for inclusion. Sample collected using Total Sampling methods. Variables used in this research are sex, age, Paralysis, Nausea-Vomiting, Bleeding, Cell Necrotic, and Edema. Sample information (sex, age), snake species, and clinical features (Paralysis, Nausea-Vomiting, Bleeding, Cell Necrotic, and Edema) were collected secondary by medical records.

Data were processed through editing, coding, processing, and cleaning using *Statistical Package for The Social Science* (SPSS) programs. The data is presented in the information form such as a narrative and table. The research also aims to know the morbidity and mortality rate of snake bite victims at Sanjiwani Hospital in 2021, this rate is calculated using formulas.

**RESULT**

**Sample Characteristic**

This research was conducted in Sanjiwani Hospital, and the sample is snake bite victims treated at Sanjiwani Hospital in 2021. A total of 55 samples were collected secondary by medical records during this research. The characteristic of the sample collected in this research is sex and age. The result is that 36 (65,5%) samples were male and 19 (33,5%) were female. Most of the sample age is 31-60 years old (60%), followed by ≤30 years old (18,2%) and >60 years old (21,8%). The characteristic distribution is served in Table 1.

**TABLE 1:** Characteristics of the Snake Bite Victims at Sanjiwani Hospital in 2021.

Characteristic	Frequency (%)
<b>Sex</b>	
Male	36 (65,5)
Female	19 (33,5)
<b>Age</b>	
≤30 Years old	10 (18,2)
31-60 Years old	33 (60)
>60 Years old	12 (21,8)

**Snake Species**

Based on collected data, snake bite victims in Sanjiwani Hospital are mostly caused by the *Viperidae* family (63,6%), followed by the *Elapidae* family (18,2%), *Hydrophidae* (7,3%), and the rest 10,9% of the sample does not know what species that bite them. The distribution of snake species that caused the snake bite incident is presented in Table 2.

**TABLE 2:** Snake Species Distribution.

Snake Species	Frequency (%)
<i>Elapidae</i>	10 (18,2)
<i>Viperidae</i>	35 (63,6)
<i>Hydrophidae</i>	4 (7,3)
Unknown	6 (10,9)

**Clinical Features**

This study aims to know the distribution of clinical features of snake bite victims (paralysis, nausea vomiting, bleeding, cell necrotic, and edema). The clinical features distribution was shown in Table 3. The result is described as follows: 17 (30,9%) of the sample presented with paralysis and the rest 38 (69,1%) of the sample does not present it. Only 3 (5,5%) of the sample complain about nausea-vomiting, the rest 52 (94,5%) sample does not complain about it. The result for bleeding is 8 (14,5%) samples complain of bleeding at the site of the bite, while the rest 47 (85,5%) samples did not complain about it. All 55 (100%) of the sample did not present with cell necrotic after the incident. There 33 (60%) samples complain of edema at the site of the bite, and 22 (40%) samples did not complain of it.

**TABLE 3:** Clinical Features Distribution.

Clinical Features	Frequency (%)
Paralysis	17 (30,3)
Nausea-vomiting	3 (5,5)
Bleeding	8 (14,5)
Cell Necrotic	0 (0)
Edema	33 (60)

**Mortality and Morbidity Rate**

During this research, 55 samples were collected at Sanjiwani Hospital in 2021. No mortalities were recorded from all of the samples. Based on that result, the Incidence Rate, Cause-Specific Death Rate (CSDR), and Case Fatality Rate (CFR) were calculated using the formula. The Incidence rate was 10,5 cases per 100.000 population. Because there were no mortalities in this research, the Cause-Specific Death Rate (CSDR) was 0 cases per 100.000 population and Case Fatality Rate (CFR) was 0%.

**DISCUSSION**

**Sample Characteristic**

Snakebite incident occurs more in the male sample than female. This result is similar to other studies from Patel, Jena, and Masroori that show more male samples than a female with the proportion (73,9%), (65,1%) dan (84%).<sup>[9]-[11]</sup> Based on the literature, snake bite incident occurs more in the male because male usually spend more time outdoors, while female usually does the homework. But the ratio can be reversed in the country where females do more outdoor activities.<sup>[12]</sup> Most of the sample age is 31-60 years old (60%), followed by ≤30 years old (18,2%) and >60 years old (21,8%). Other studies from Cesaretli and Patel found (54,9%) of the sample was aged <30 years old and (67,7%) of the sample was aged <35 years old.<sup>[9],[13]</sup>

A person at productive age is at having more risk to get bitten by a snake, because at a productive age usually go outside the house more often. Central Bureau of Statistics reports that Gianyar has 39.210 farmers and (94,2%) of them are aged >35 years old.<sup>[9],[14]</sup>

**Snake Species**

Most of the sample (63,6%) was bitten by a snake from the *Viperidae* family, followed by *Elapidae* (18,2%), Unknown Snake (10,9%), and *Hydrophidae* (7,3%). A study from Kurniawan that study the snake species and habitat on the island of Java, Indonesia reports that *Trimeresurus Insularis* from the *Viperidae* family was the most species found in the wild.<sup>[15]</sup> According to World Health Organization (WHO), there are lots of snake species in Indonesia such as *Bungarus Candidus*, *Naja Sputatrix*, *Naja Sumatrana* from the *Elapidae* family, and *Calloselasma Rodhostoma*, *Trimeresurus Albolabris*, *Daboia Siamensis* from *Viperidae* family.<sup>[16]</sup>

**Clinical Features**

This study found that only 17 (30,9%) of the sample presented with paralysis. This result is similar to a study from Cesaretli that found only (1,9%) of the sample present with paralysis.<sup>[13]</sup> Based on the pathophysiology of snake venom, there are some snakes that produce venom which is neurotoxic, that can cause paresthesia, paralysis, and cell necrotic. This effect is caused by components called pre-synaptic Phospholipase A2 Neurotoxin that cause muscle contraction and post-synaptic neurotoxin that blockade the nicotinic acetylcholine receptors.

These components are usually found in *Elapidae* snakes, but some reports found some *Viperidae* snakes can produce neurotoxin components. [17] Only 3 (5,5%) of the sample present with nausea-vomiting. Studies by Masroori and Cesaretli found a similar result with the proportion of the sample that presented with nausea-vomiting (9,9%) and (6,6%), but Jena found that most of the sample presented with nausea-vomiting (88,3%). [10],[11],[13]

In the literature, components of snake venom such as PLA2, a serine protease, and metalloproteinase caused an indirect effect that if lots of venoms were injected during the bite, it causes pain in the abdomen, then it triggers nausea-vomiting. [18] From the result, it is found that 8 (14,5%) of the sample present with bleeding. The study by Masroori and Cesaretli found that only (8,5%) and (28,5%) of the sample were present with bleeding. Another study by Jena and Sriapha found a different result. In their study, they found most of the sample presented with bleeding, in the proportion of (60,4%) and (59,1%). [10],[11],[13],[19] Based on the literature, Zinc Metalloproteinase contained in snake venom is responsible for a spontaneous bleeding incident after a venomous snake bite, also this component is said to have a role in inhibiting platelet aggregation, induced apoptosis, and hemorrhagic effect. Bleeding after a snake bite is also associated with Venom-Induced Consumption Coagulopathy (VICC), which is marked by a low level of fibrinogen that causes coagulopathy. [20],[21]

In this study, there was no sample that presented with cell necrotic (0%). Studies by Lin and Alcoba found only (29,6%) and (5%) of the sample that presented with cell necrotic. [22],[23] Most snake venom contains hydro lithic enzymes such as Metallo Proteinase, PLA2, and 3-Finger Toxin that are responsible for cell necrotic. These components cause the destruction of local tissue by inducing Neutrophil Extracellular Traps (NETs), that blockade the blood flow and fill the site of the bite with venom, which later on increases the cytotoxicity. [21] Most of the sample (60%) presented with edema. These findings are also similar to other studies from Masroori, Cesaretli, and Jena that found the proportion of the sample presented with edema is (85,5%), (42,8%) dan (59,8%). [10],[11],[13]

Inflammation process can be caused by some activities of snake venom's components. PLA2 is said to have a role in increased capillary permeability and is followed by cellular infiltration, while Metalloproteinase increases the pro-inflammatory cytokines. It is also said that snake venom can stimulate the activation of the cell mast that causes a release of the histamine, then increase the vascular permeability and vasodilatation, and later on cause extravasation. [24]

#### Mortality and Morbidity Rate

The Incidence rate of snake bites at Sanjiwani Hospital in 2021 is 10,5 cases per 100.000 population. Hossain and Chippaux also found a similar rate which is 10,98 cases per 100.000 population and 6,34 cases per 100.000 population. But a study by Sharma in 2004 found the Incidence Rate is 604 cases per 100.000 population. [12],[25],[26] Cause-Specific Death Rate (CSDR) in this study is 0 cases per 100.000 population. Nicholas, in 2019 analyzed that globally there was 0,81 death because of snake bite per 100.000 population. Reports from WHO say that in East Africa there were 1,2 deaths per 100.000 population every year. [6],[27] Because there was no death recorded in this research, Case Fatality Rate (CFR) in this study is (0%). According to WHO, a study in Ghana found the Case Fatality rate is (1,3%), and another study by Chippaux in America found the CFR is (0,6%).

But the study by Sharma in 2004 found a high Case Fatality Rate in the amount of (27%). [6],[25],[26]

#### LIMITATION

This study collects data retrospectively from medical records, so the author cannot observe the sample directly. Because the data were collected from medical records, the clinical features of the sample were subjective to the general practitioners that examine them in the emergency room (ER). This study was conducted only in 1 hospital, so it is needed to do research in many hospitals with a bigger amount of samples.

#### CONCLUSION

Most of the samples were males. The group age that being the victim of snake bites was 31-60 years old. The snake species that was responsible most for the snake bite incident at Sanjiwani Hospital in 2021 was from the *Viperidae* family, followed by the *Elapidae* family and the *Hydrophidae* family. Most of the samples did not present with paralysis, nausea-vomiting, and bleeding, but most of the samples presented with edema. No samples were presented with cell necrotic. The Incidence Rate in this study is 10,5 cases per 100.000 population. Because there was no death recorded in this study, the Cause-Specific Death Rate (CSDR) is 0 cases per 100.000 population and the Case Fatality Death Rate (CFR) is (0%).

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#### DECLARATIONS

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