

REVIEW ARTICLE

The Quick Overview of Snakebite Research in the Indonesian Language with the Open Knowledge Map

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Abstrak: *The aim of this study was to provide a concise overview of existing research and publications related to snakebite in Indonesia, specifically those published in Indonesian-language journals. Using the Open Knowledge Map (OKM) tool, a mapping analysis and data visualization were conducted to identify research gaps and describe the current knowledge landscape. A search query was formulated in the Indonesian language (“Gigitan Ular”) to assess academic interest and publication trends. The search identified six thematic clusters associated with the keyword, comprising a total of 28 articles. After removing 8 duplicates, 20 unique articles were screened for relevance. Of these, 13 met the inclusion criteria, while 7 were excluded due to irrelevance—specifically, studies involving non-human subjects or conducted outside Indonesia (e.g., Malaysia). The thematic analysis revealed that published studies mostly focused on six key areas: compartment syndrome, pre-hospital snakebite management, education about snakebite, characteristics of snakebite patients, ethnomedicine for snakebite, and disseminated intravascular coagulation (DIC) following snakebite. These topics reflect a wide range of clinical, educational, and sociocultural dimensions of snakebite management in the Indonesian context. However, the findings also highlight that snakebite remains an under-researched topic in Indonesian-language scientific literature. One limitation of this study is that the OKM platform accommodates a limited number of indexed articles, which may restrict the comprehensiveness of the analysis. Nonetheless, this study offers a rapid and structured synthesis of snakebite-related literature in Indonesia and underscores the need for greater scholarly focus on this neglected public health issue.*

Keywords: *Occupation medicine; Open knowledge maps; Publication; Snakebite*

BACKGROUND

Snakebite is a life-threatening medical emergency and a public health threat. A venomous snake bite can cause an acute medical emergency involving severe

paralysis which can prevent breathing, causing a bleeding disorder that can lead to fatal bleeding. A snakebite can result in serious local tissue damage, irreversible renal failure, and even amputation of a limb

(1,2). Children may suffer more severe effects and may experience effects more quickly than adults due to their smaller body mass (3). Snakebites are often encountered by rural residents in tropical and subtropical countries with high rainfall and humid climates.

In contrast to many other serious health conditions, there are highly effective treatments. Most deaths and serious consequences from snakebites are completely preventable by making safe and effective antivenom more widely available and accessible (4). A high-quality snake antivenom is the most effective treatment for preventing or reversing most of the venomous effects of a snakebite (5,6). They are included in the WHO List of Essential Medicines and should be part of any primary health care package where snakebites occur (7,8).

The true burden of snakebite has not been accurately measured using empirical studies, resulting in a considerable focus on epidemiological knowledge in this field (7,9,10). The epidemiology of snakebites in the Southeast Asian region has not been well explored, and the available data, which are almost entirely dependent on hospital returns to ministries of health, are likely to be incorrect and hence misleading (11). One explanation is that many snakebite victims receive treatment from traditional healers rather than hospitals (11). This lack of empirical data has led to the neglect of snakebite on the global health agenda, and a lack of interest in snakebite research, antivenom development, and financing (12). Research related to snakebites in Indonesia is still rare, even though attention is needed to prevent morbidity and mortality due to snakebites. Because, judging from the

habitat of snakes, Indonesia has many species of snakes that make it possible for humans to be bitten (11,13). On the other hand, the majority of Indonesia's population are farmers and workers in plantations, agriculture, and water, who are residents who have a high risk of snakebites.

In addition, Indonesia only has one type of anti-snake venom which is the main therapy for snakebite patients (14,15). This condition allows high mortality due to snakebites. As part of the Southeast Asia region, Indonesia was reported to have 12,739-214,883 snakebite incidences in 2007, resulting in up to 11,581 deaths (16). In 2017, there were around 135,000 snakebite incidences in Indonesia (17).

Based on this background, the researcher is interested in researching to know a quick overview of research or publications related to snakebites in Indonesia and published in the Indonesian Journal.

METHOD

This research method is literature-based research using Open knowledge maps (OKM) which is an innovative tool for literature search. OKM divides a collection of publications into groups or clusters which allows researchers to identify themes in the literature and focus on the papers that are most relevant to the bulk of the research. Get an overview of research topics: knowledge maps give an instant overview of a topic by showing key areas at a glance and documents related to each field. This makes it possible to easily identify relevant information. OKM makes a group of similar documents together. This makes it easier to identify relevant content when we are looking for ambiguous terms, or when we

want to identify content from a single discipline within a multidisciplinary field.

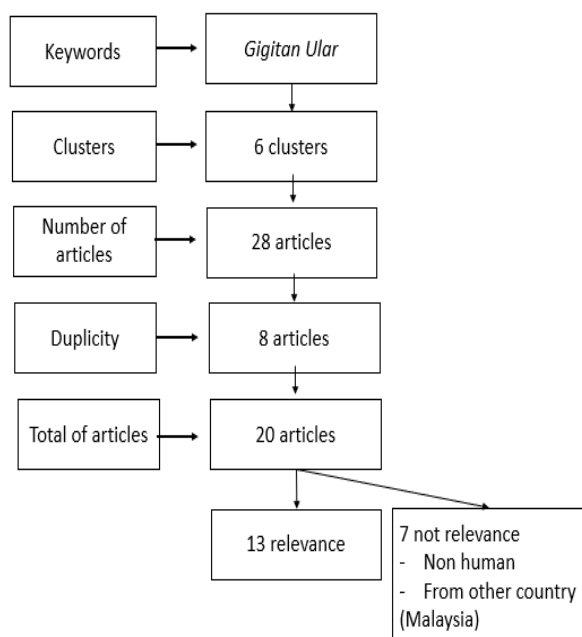


Figure 1. Flowchart of Browsing Process through OKM

The keyword, that we used in our data searching via the open-knowledge maps web, is "snakebite" in the Indonesian language "*Gigitan ular*" intending to call the publication about snakebite in the Indonesian language. We wrote down the keywords in Indonesian, then came out with a map in the form of clusters. In each circle, if we click on it, the publication titles in that circle/cluster will be displayed. Initially, the analysis identifies six clusters based on the keyword. From these clusters, a total of 28 articles are gathered. After checking for duplications, 8 duplicate articles were removed, leaving 20 articles. Further screening was conducted based on relevance, resulting in 13 relevant articles, while 7 articles were deemed irrelevant

because they were related to non-human subjects or originated from another country (Malaysia). This process ensures that only relevant and unique data is considered for the study.

A literature search was carried out on July 1, 2023, and then all articles that were relevant to the research objectives were extracted. Extraction results are displayed in tabular form and explained in narrative form.

RESULT

The terms "Gigitan ular" was used in the author's research on Openknowledge Maps. The search's keywords were restricted to Indonesian terms in order to swiftly find papers about snakebites that were authored in the Indonesian language. Our study found 6 circles or clusters of publications related to snakebites in the Indonesian language (Figure 1). The size of the circle indicates the size or number of studies in the cluster. Each circle contains the title of the related article.

The synthesized articles reveal key themes such as victim profiles, plant-based treatments, public beliefs, and complications like compartment syndrome and DIC, which are grouped into several discussion points and illustrated in Figure 2.

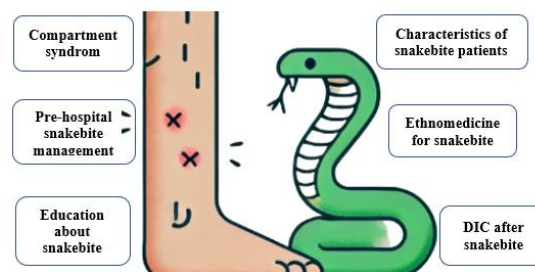


Figure 2. Key Themes of the Publications

Tabel 1. Extraction of the Relevance Articles

No	Authors	Study Type	Objective	Results of study
1	Felisitas Farica Sutantoyo, Erik Jaya Gunawan (18)	Review	To evaluate the role of anticholinesterase in the management of snakebite patients with neurotoxic symptoms.	Anticholinesterase use: Can improve condition in certain neurotoxic snakebite cases.
2	Komang Budhi Pradnya Wibawa et.all (19)	Cross-sectional	To determine the description of patients who are victims of snake bites in General Hospital Sanglah.	• Total patients: 50 • Age range: 5–77 years (average 38.06 ± 17.0 years) • Occupations: - Students: 32% - Farmers: 26% - Housewives: 14% • Sex: 64% male • Treatment: All received anti-venom • Comorbidities: None • Bite location: 74% on the leg
3	Muthmainnah (20).	Quasi experiment (pre test and post test)	To increase the community's knowledge and abilities in first aid for snake bites	• Participants: 40 • Outcome: Significant improvement in knowledge and skills ($P = 0.002 < 0.05$). • Effective methods: Small group discussions and demonstrations. • Impact: Enhanced first aid ability for snakebite emergencies.
4	Melli PW, Fikriyanti F, Halimuuddin H (21)	Cross-sectional	To assess the knowledge about snakebite treatment among nurses in Aceh Barat Regency	• The results showed that 39 (51.3%) nurses had good knowledge about snakebite treatment.
5	Sari MK (22)	Community service	To provide first aid in cases of snakebite and understand how to prevent it.	• Education through lectures, discussions, and demonstrations effectively increased students' understanding of first aid for snakebites.
6	Rachmania D, Ludyanti LN. (23)	Community service	To increase knowledge and abilities community in first aid for bites snake	• Participants: 40 respondents • Outcome: Significant improvement in knowledge and skills • Impact: Improved community ability to provide first aid for snakebites.

7	Maula Haqul Dafa, Slamet Suyanto (1)	Secondary data, literature review	To find out cases of snakebites in Indonesia	- Victim profile: Males and females, from children to the elderly. - Common locations: Gardens, houses, forests, mostly accidental bites. - Snake shows: 6 out of 21 victims bitten during performances (mishandling/carelessness). - Outcomes: Only 4 survivors; majority (17) died.
8	Herlina Agustin, Dadang Rahmat Hidayat, Dandi Supriadi (24)	Case study	To find out the anatomy of communication conflicts in handling snake bites	- Key findings: Strong presence of ego and primordialism. - Communication style: Use of counter-productive language and speech.
9	AA Gde Putra Semara Jaya, I Putu Agus Surya Panji (25)	Case Report	To present a snakebite victim with compartment syndrome	- Patient: 53-year-old male farmer - Condition: Snakebite with compartment syndrome - Treatment: ICU care, antivenom, supportive therapy, and complication monitoring - Outcome: Good recovery
10	Suci Febriani et.all (26)	Cross-sectional	To figure out the health facility's tertiary poisoning profile in Kota Yogyakarta.	Leading cause of poisoning: Snakebites (26 patients, 27%). Other causes: - Alcohol poisoning: 13 patients (13%) - Chlorine poisoning: 6 patients (6%) Common snake types: Paddy snakes, cobras, or unidentified species. Diagnosis method: Based on symptoms and signs when snake type is unknown.
11	Erwan Baharudin (27)	Literature study and interviews	To understand ethnomedicine practices and the availability of health facilities for snakebite cases in Bando Sukamaju Village, Tangerang.	Trust in local handlers: Villagers rely on traditional snakebite handlers. Use of coded language: Specific language codes are used in treatment. Preference reasons: - Strong local beliefs in traditional methods. - Hospitals are far away. - Fear of complications

DISCUSSION

We used OKM to learn about snakebite research published in Indonesian publications. OKM's goal is to create a large-scale open, interactive, and interconnected system of knowledge maps for all areas of research that anyone can benefit from. The current service at <http://openknowledgemaps.org> generates knowledge maps for each search phrase. It is built on open source web-based knowledge management software, which can generate knowledge maps from a number of sources such as text, metadata, and references. This tool displays the main areas of the field and allows us to expand on the most important publications in each area. Users can also read entire publications within the same interface if access is open.

The whole text of the twenty articles obtained was examined. researchers divided the publications into those that were related to snakebite and those that were not. The author defines relevance as irrelevant because of its substance. From the synthesized articles, six recurring themes emerged (Figure 2), including victim profiles, studies on medicinal plants for snakebite treatment, community beliefs, complications such as compartment syndrome and DIC, as well as thematic groupings that were organized into distinct discussion sections

1. Characteristics of snakebite patients

Komang Budi et al (19) found in their research that snakebite can affect children to the elderly (5-77 years). This is also the same as WHO writes that snakebite can affect all ages (28). However, the majority of people who are victims of snake bites are in the adult age group. Their study also found men

(64%) are more dominating than women in term of gender and students (32%) are the occupations that hold the top three spots, followed by farmers (26%) and housewives (14%) (19).

In term of gender, males were impacted more frequently than females, showing the risk associated with outdoor job hazards. Males employed in rubber tapping, construction workers, and farmers have been the most commonly afflicted. This matches the findings of another study in Kerala, which discovered 65.9% men and 34.1% females (29).

Yunanto, in his research, identified the characteristics of snakebite patients at two hospitals in Jember during the years 2017–2019, the perceptual characteristics of snakebite victims based on a sample size of 162 individuals. Farmers accounted for the highest proportion of victims (40.1%), followed by those not working (30.3%), civil servants (11.7%), and entrepreneurs (17.9%) (30). Meanwhile, according to the WHO, snakebite incidents predominantly occur among high-risk groups such as rural agricultural workers, herders, fishermen, hunters, working children, and those living in poorly constructed homes or lacking access to education and healthcare. The highest morbidity and mortality rates are found among young people, with children being particularly vulnerable to fatal outcomes. Furthermore, cultural barriers often hinder women from accessing medical care, making pregnant women especially susceptible to the risks of snakebite (28)

2. Ethnomedicine for snakebite

Kastawi (31) discovered that the descriptive analysis indicated that guinea pigs that received first aid for snake bites (given with

banana ares) lived longer than guinea pigs who did not. Specific anti-snake venom (ASV) is the gold standard treatment for snake envenomation, and studies have decisively demonstrated that death rates can be significant where patients do not quickly obtain access to them. The use of plant-based medicines to treat snakebites is a topic that requires careful consideration and evaluation. While some traditional and indigenous communities have long relied on plant-based remedies for various health issues, including snakebites, it's important to approach this topic with a balanced perspective:

Some plant-based remedies may have properties that can help alleviate certain symptoms of snakebites, such as pain, inflammation, or infection. However, the effectiveness of these remedies can vary widely, and not all plant-based treatments may be suitable or reliable. However, safety is a critical concern when it comes to treating snakebites. Relying solely on traditional remedies without access to proper medical care can be dangerous, especially in the case of venomous snakebites. Since in many cases, the most effective treatment for snakebites, particularly those from venomous snakes, is antivenom. Antivenom is a specific medication that can neutralize the effects of snake venom (32). Delaying or avoiding the use of antivenom in favor of plant-based remedies can be life-threatening.

3. Pre-hospital snakebite management

Baharudin (27) found that local snake handlers are trusted by the locals of Banten to treat snake bites using a specific language code. In addition to their beliefs, they decided to visit the handler since the hospital closest to Bando Village was rather far away. They preferred to do this out of fear that

anything unfavourable might happen if they visited the hospital.

4. Compartment syndrome after snakebite

As a result of our research, we found two articles from a case report (25,27) that discussed compartment syndrome in patients. Patients are managed in the intensive care unit with antivenom serum, supportive and symptomatic therapy for the development of the disease, and monitoring of compartment syndrome and complications. Evaluation of compartment syndrome and other complications showed good results.

Subcutaneous injection of snake venom results in gradual swelling that spreads via the lymphatic system and infrequently affects compartment pressures. However, some snakes can directly inject venom into deep muscular compartments with larger fangs, which is more likely to result in compartment syndromes. Since the delivery of venom into deep compartments is more likely in the hand and forearm, this is more evident there.

5. DIC after snakebite

Nia et al (33) reported a case of a child with compartment syndrome and DIC, where the patient was able to go home recovered after 3 weeks of treatment. Disseminated intravascular coagulation (DIC) is a systemic thrombohemorrhagic disorder that is a clinical condition secondary to the underlying disease. Snake venom produces fibrin by acting like thrombin on the fibrinogen molecules, claim Retzios et al (34) Normal fibrin formation creates stable fibrin polymers by condensing after removing both fibrinopeptides A and B from the fibrinogen, but venom creates an unstable fibrin polymer by removing only

fibrinopeptide A, making it susceptible to fibrinolysis and phagocytosis by the reticuloendothelial system. As a result, venom can result in a variety of coagulopathies, ranging in severity from DIC to more minor coagulation abnormalities such as defibrination and isolated thrombocytopenia (35).

6. Education about snakebite

A report (20) that has been published Small group discussions and demonstrations of treatment practises should be carried out in surrounding villages as part of education and training initiatives to increase community capacity to provide first aid for snake bites and prevent victims' condition from worsening before they are taken to hospital. The significance of snake safety training for everyone cannot be overstated, because when bitten by a snake, first aid care must be delivered promptly. Because most individuals are unable to distinguish between venomous and non-venomous snakes, all snake bites should be treated as venomous. Another reason why people should learn how to correctly deliver snake bite emergency first aid treatment is that there is still some confusion regarding how to do so. Many people used to assume that snake venom propagated through the blood and that taking the venom out of a snake bite was a good first-aid treatment. It is not the case.

7. Others information

Febriani (26) discovered that poisoning from snakebites was the most common cause of poisoning in the city of Yogyakarta, with most patients reporting that the type of snake was a paddy snake, cobra, or others that were not identified. If it is difficult to identify the precise type of snake, the symptoms and

signs caused by snakebites serve as the foundation for a diagnosis.

The results of research related to the causes of snakebites are performances or attraction with snakes as written by Daffa (1). Six of the twenty-one snakebites victims were as a result of the attraction (snake show), either when viewed by a large number of people or due to the victim's carelessness in handling snakes. Only four of the twenty-one victims survived, with the remainder dying (1).

LIMITATION

The limitation of our research is that not all articles can be included in OKM because only 100 articles are analyzed through this OKM. Even if they were written in Indonesian, a number of articles about snakebites are not available through OKM. Therefore, it is necessary to conduct research using other methods so that more articles can be analyzed. Nonetheless, our research can quickly provide an overview of the lack of research and publications related to this snakebite in Indonesian language. This method does not always provide optimal results, because it often only provides literature that has the same keywords, not literature that is related to the topic being researched.

CONCLUSION

From the results of our research using OKM, we only found 6 articles related to the theme of snake bites in humans, while 5 other published articles were the result of community service with training or outreach to the community regarding emergency or disaster cases. We conclude that not many researchers have conducted research and publications related to snakebites in Indonesian Language. For the theme of

snakebite to no longer be a marginalized disease, it takes the hard work of several parties including researchers, epidemiologists, health workers, health care facilities, and also the government.

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