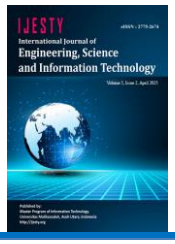
International Journal of Engineering, Science and Information Technology
Volume 5 No. 2 (2025) pp. 23-27
ISSN 2775-2674 (online)
Website: http://ijesty.org/index.php/ijesty
DOI: https://doi.org/10.52088/ijesty.v5i2.774
Research Paper, Short Communication, Review, Technical Paper



Integration of Ethnopharmacology and One Health Approach for Rabies Control in Kualin, East Nusa Province

Muntasir*, Muhajirin Dean, Tadeus Andreas Lada Regaletha, Bernadeta Stien Julian Nabuasa, Chatrin Jansye Lenggu, Videl Apsi Oematan

Department of Pharmacy, Faculty of Medicine and Veterinary Medicine, Universitas Nusa Cendana, Kupang, Indonesia

**Corresponding author Email: muntasir@staf.undana.ac.id*

The manuscript was received on 10 June 2024, revised on 1 September 2024, and accepted on 27 January 2025, date of publication 1 April 2025

Abstract

The ethnopharmacological approach and One Health framework offer a novel perspective with significant potential in controlling rabies cases in East Nusa (NTT), Indonesia. Traditional medicines rooted in local knowledge can complement existing prevention and treatment strategies. This descriptive study involved 20 respondents to explore local practices related to rabies treatment. The findings indicate that integrating ethnopharmacological insights with the One Health approach can contribute significantly to rabies control, particularly in Kualin Subdistrict, South Central Timor Regency, NTT. The study identified local practices, analyzed their integration with modern medical interventions, and educated the community about rabies prevention. These results highlight the importance of incorporating ethnopharmacological knowledge into public health programs while promoting cross-sectoral collaboration in human, animal, and environmental Health. Further research is needed to evaluate the efficacy of medicinal plants used by the community. Additionally, developing community-based educational programs and strengthening collaborations between the government, non-governmental organizations, and local communities are crucial for creating effective and sustainable strategies for rabies control in NTT.

Keywords: *Ethnopharmacology, One Health, Rabies, Vaccination, Traditional Medicine*.

1. Introduction

Rabies is a zoonotic disease transmitted from animals to humans caused by the lyssavirus. This virus attacks the central nervous system and is almost 100% fatal once clinical symptoms appear. The infection is transmitted through the saliva of ra-bies-transmitting animals (RTA) such as dogs, bats, cats, and monkeys, typically via bites, scratches, or direct contact with mucous membranes (eyes, mouth, or open wounds) [1]. Rabies poses a serious public health threat, especially in areas with high dog populations.

This disease targets the central nervous system, with dogs being the primary carriers. However, cats and monkeys also contribute to its transmission. The incubation period is typically 2–3 months but can vary from one week to one year, depending on the exposure site's distance from the brain. Approximately 40% of those bitten by suspected rabid animals are children under 15 years old [2].

In South Central Timor Regency (SCTR), East Nusa Province (ENTP), rabies cases have risen significantly, with 1,823 RTA bite cases reported as of November 2023, resulting in 11 deaths (source). This alarming trend underscores the need for holistic approaches to address the disease. The One Health approach integrates human, animal, and environmental Health and is highly relevant in this context. This study explores how ethnopharmacological practices may contribute to rabies prevention and control.

According to the Ministry of Health (Kemenkes), in 2020, approximately 98% of RTA bite cases in Indonesia were reported, with over 82,000 cases and a 40% fatality rate. In 2021, cases decreased by approximately 30.71% to 57,257 RTA bite cases. However, in 2022, the cases surged to 104,229, with 102 deaths. By early 2023, from January to April, cases declined to 31,113 RTA bite cases and 11 deaths nationwide [3].

One Health is an approach that designs and implements programs, policies, legislation, and research across human Health, animal health, agriculture, and environmental sectors, emphasizing communication and collaboration to improve public health outcomes [4]. Ethnopharmacological studies offer insights into how local communities use traditional medicine for initial rabies treatment.

Ethnopharmacology is a branch of pharmacology that examines traditional medicines, mainly plant-based remedies, employed by indigenous or local communities. Previous research on rabies management has predominantly focused on medical and epidemiological aspects, often neglecting local knowledge about medicinal plants within the One Health framework. While many countries have initiated rabies prevention programs, ethnopharmacological studies involving communities in rabies management remain limited.

This study explores the integration of ethnopharmacology and the One Health approach in rabies control in the Kualin Subdistrict. Specifically, it identifies traditional treatment practices used by local communities for rabies, analyzes how they can be integrated with modern medical interventions, and educates the community on rabies prevention and alternative treatments. Focusing on these aspects, the study aims to contribute significantly to more effective rabies prevention and management strategies in Kualin. This approach strengthens public health efforts and promotes multisectoral collaboration, which is essential for comprehensively addressing zoonotic health challenges.

2. Methods

This study employed a descriptive approach. Data were collected through interviews with respondents and local communities. Observations were conducted to examine the use of traditional plants for treatment in the field. Document analysis involved reviewing government policies related to rabies management and epidemiological data. The study was carried out descriptively to understand cross-sector collaboration in implementing the One Health approach.

3. Results and Discussion

The descriptive results of the study indicate variations in respondent characteristics based on demographic data. The majority of respondents were aged 20–39 years (55%), followed by those aged 40–59 years (35%) and over 60 years (10%). In terms of gender, most respondents were male (75%), while females accounted for only 25%. Regarding occupation, the majority of respondents were farmers (45%), followed by teachers (30%), employees (15%), civil servants (5%), and housewives (5%). Educational levels also varied, with 15% being university graduates (S1), 25% PGSD graduates, 25% high school graduates, 25% junior high school graduates, 5% diploma (D3) holders, and 5% elementary school graduates. These findings provide an overview of the demographic and socio-economic profiles of the respondents, which can help understand the local context and the relevance of the approaches used in this study.

The findings indicate that the vaccination coverage for dogs in the TTS Regency has only reached 17%, significantly below the ideal target of 70% required to achieve herd immunity [5][6]. The government has implemented mass vaccination programs and educational campaigns with support from Australia, which donated 100,000 vaccine doses [7]. However, implementing these programs faces several challenges, including budget constraints and limited human resources, which remain significant obstacles. Additionally, some residents continue to rely on traditional remedies as an initial treatment for animal bites despite the lack of scientific evidence supporting their efficacy.

3.1. Traditional Medical Practices Used by the Local Community in Managing Rabies

This study aims to identify traditional medical practices employed by the local community in Kualin District to address rabies. The primary focus of this research is to collect and understand various treatment methods applied by the local population. These practices include medicinal plants, traditional remedies, and specific rituals believed to prevent or treat rabies symptoms. Through this identification process, the study documents local knowledge preserved over generations and provides insights into the community's interaction with this disease.

Ethnopharmacology, which explores medicinal plants and traditional healing practices within communities, is relevant to rabies management. In East Nusa (NTT), communities possess extensive knowledge regarding using medicinal plants to treat various illnesses, including rabies. Commonly used plants include soursop leaves (Annona muricata), known for their antiviral properties and effectiveness against infections; turmeric (Curcuma longa), valued for its anti-inflammatory and antiseptic properties and its role in enhancing immunity; ginger (Zingiber officinale), utilized to alleviate infection symptoms and boost the immune system; and tobacco, which is also employed in traditional medicine. The use of these medicinal plants is often accompanied by rituals or local beliefs that are thought to enhance the efficacy of treatments, as perceived by the community. While traditional medicine cannot replace vaccination and medical treatment, it can be a helpful alternative, especially in areas with limited access to healthcare services [8].

The local knowledge of the Kualin District community regarding the use of medicinal plants in managing rabies is a heritage passed down through personal experience, oral tradition, and cultural influences. This knowledge is often transmitted across generations through stories, rituals, and daily practices. For instance, turmeric is used as an antiseptic to treat wounds caused by animal bites, which is believed to prevent infection and accelerate wound healing. Additionally, the community utilizes various other plants, such as the bark of guava trees, banyan leaves, and red tobacco leaves. The processing of these plants typically involves traditional methods, such as pounding or boiling, before they are applied as treatment. This demonstrates that conventional medicine serves as an alternative medical approach and a profound reflection of local wisdom [9].

The integration of ethnopharmacological knowledge into public health programs is crucial. By understanding these local practices, authorities can design more effective rabies prevention and management strategies. Furthermore, collaboration among the government, non-governmental organizations, and the community should be strengthened to achieve the shared goal of controlling rabies in NTT [10].

3.2. The Utilization of Medicinal Plants by the Local Community to Address Rabies Cases in Animals Using the One Health Approach

The local community has used medicinal plants to address animal rabies cases in Kualin District, South Central Timor Regency, East Nusa Province. This approach aligns with the One Health concept, which integrates human, animal, and environmental Health. Interview results indicate that the community's most commonly used medicinal plant is turmeric (Curcuma domestica Val.). Turmeric is known for

its various properties, including its antiseptic and anti-inflammatory effects, which are believed to aid in treating wounds caused by animal bites, particularly from dogs. Although the community believes turmeric can prevent infections and accelerate wound healing, more substantial scientific evidence is needed to support these claims.

In addition to turmeric, the community in Kualin District uses various other plants in traditional medicine to manage rabies. These include guava tree bark, banyan leaves, tarum leaves (in the Dawan language), red tobacco leaves, a combination of tobacco leaves and corn cobs, young corn, and guava bark. These medicinal plants are processed using various traditional methods. For example, guava tree bark is peeled, ground into a fine paste, and applied to the wound caused by a dog bite. Banyan leaves are ground into a fine paste, mixed with chicken faeces, and then applied to the wound. Corn cobs are burned and doused with water, and the resulting liquid is used to rinse the wound. Red tobacco leaves are mashed into a paste and directly applied to the affected area.

As an initial response to rabies exposure, the first step taken by the community after being bitten by a rabies-transmitting animal is to wash the wound with soap and running water for 15 minutes. Afterwards, the patient is advised to immediately visit the nearest healthcare facility for an anti-rabies vaccine and serum. However, while awaiting medical treatment, some individuals in Kualin use turmeric as a traditional remedy for their wounds.

It is important to note that while traditional medicine can provide temporary relief, medical interventions are essential to prevent the progression of rabies. According to the East Nusa Provincial Health Department, vaccination is crucial in rabies prevention in this region. Educating the community about the importance of immunization, managing pet animals, and ensuring access to modern medical care is vital to reducing the risk of rabies transmission [11][12]. The traditional medical practices performed by the Kualin community reflect local wisdom in addressing this disease. However, collaboration between conventional methods and medical interventions remains necessary to ensure effective rabies management in the future.

3.3. Integration of Traditional Healing Practices with Modern Medical Interventions

This study analyses the potential integration between traditional methods and modern medical approaches. The evaluation focuses on assessing the effectiveness of conventional practices in the context of rabies treatment and exploring how the two approaches—traditional and contemporary—can complement each other. For example, specific herbal remedies could be combined with vaccination or medical treatments to improve patient health outcomes. This analysis also considers the combined methods' safety, effectiveness, and community acceptance.

Interview results reveal that the community in Kualin District utilizes several medicinal plants as part of traditional treatments for rabies. One of the most commonly used plants is turmeric (Curcuma domestica Val.), known for its antiseptic and anti-inflammatory properties. Turmeric is applied to wounds caused by dog bites, which is believed to prevent infections and accelerate wound healing. Additionally, the community uses guava bark, which is peeled, ground into a fine paste, and applied to injured areas. Banyan leaves are ground, mixed with chicken faeces, and applied to wounds. Corn cobs are burned and doused with water, and the resulting liquid is used to rinse affected areas. Red tobacco leaves are mashed into a paste and directly applied to wounds. The use of these medicinal plants not only serves as an alternative treatment but also raises awareness within the community about the importance of maintaining their pets' Health.

After receiving initial treatment following a dog bite, individuals typically proceed to healthcare facilities such as local health centres in Kualin District, the regional hospital in Soe, or hospitals in Kupang City. The first step taken by the community after being bitten by a rabies-transmitting animal is to wash the wound with soap and running water for 15 minutes. Afterwards, patients are advised to visit the nearest healthcare facility to obtain anti-rabies vaccines and serum. While traditional medicine can provide temporary relief, individuals must seek appropriate medical care.

According to the Indonesian Ministry of Health, integrating traditional medicine into the national healthcare system can enhance healthcare accessibility and benefit communities more [13]. The traditional healing practices observed in the Kualin community demonstrate local wisdom in managing rabies. However, it remains essential for the community to continue accessing accurate information and modern medical care to ensure effective rabies management. Education on the importance of vaccination and proper pet management must be enhanced to reduce the risk of disease transmission in the future.

3.4. Utilization of Medicinal Plants by the Local Community for Addressing Rabies Cases in Animals with the One Health Approach

The One Health approach focuses on human, animal, and environmental health interactions. In this context, medicinal plants such as turmeric and guava bark demonstrate significant potential in managing rabies cases. Turmeric, known for its antiseptic and anti-inflammatory properties, can treat wounds caused by dog bites. The process involves peeling the bark, grinding it into a fine paste, and applying it to the affected area. In addition to turmeric, the community also uses banyan leaves, which are ground into a fine paste, mixed with chicken faeces, and applied to wounds. Corn cobs are burned and doused with water, and the resulting liquid is used to rinse the wounded area. Red tobacco leaves are mashed into a paste and applied to the wound.

These traditional healing practices serve not only as an alternative form of treatment but also raise awareness within the community about the importance of maintaining their pets' Health. Although many community members do not fully understand medicinal plants' benefits and effective use, educational efforts regarding herbal medicine in traditional treatments can help enhance their knowledge. Research on local medicinal plants and their application in public health contexts is crucial for improving understanding and preventive practices against rabies in the region.

The use of medicinal plants by the local community in Kualin District to address rabies cases reflects local wisdom that should be complemented by modern medical knowledge. Through the One Health approach, the synergy between traditional healing and modern health practices can help reduce rabies incidence and improve the quality of life for the community. Therefore, education for the community and further research are needed to ensure that the use of medicinal plants is carried out safely and effectively [14][15][16].

3.5. Educating the Community on the Importance of Rabies Prevention and Available Alternative Treatments

Community education is a key component of this study, aimed at raising awareness about the risks of rabies and the preventive measures that can be taken. Through socialization programs, the community is provided with information on how to prevent rabies-transmitting animal (HPR) bites, the importance of pet vaccination, and alternative treatments that may be available through ethnopharmacology

practices. This education is expected to empower the community to take proactive measures to protect themselves and their pets from rabies while promoting overall Health.

The One Health approach emphasizes collaboration between human, animal, and environmental health sectors and plays a crucial role in rabies management. In East Nusa (NTT), several strategies have been implemented, including dog vaccination as a key measure in rabies prevention. Mass vaccination programs in several districts aim to vaccinate 70% of the dog population, although vaccination coverage currently remains low, around 17%. In addition, community education on the dangers of rabies, modes of transmission, and the importance of vaccination is also necessary to control the disease. Awareness campaigns have been conducted, but community participation still needs to increase. Environmental monitoring is also part of this approach, where maintaining the population of both wild and domestic animals is crucial, including handling stray dogs that may potentially carry rabies. Cooperation between the government, non-governmental organizations, and the community is essential for these health programs, and a multisectoral approach allows for the development of more comprehensive strategies for addressing rabies [17][18].

However, despite the positive outcomes of the One Health approach, challenges remain in its implementation. These challenges include limited resources, such as access to vaccines and adequate healthcare, particularly in remote areas, as well as financial constraints and limited human resources that hinder the implementation of vaccination programs. Additionally, the lack of community awareness regarding the dangers of rabies and the importance of vaccination is a significant obstacle. Continued education and more effective outreach on rabies prevention are needed to increase public awareness. Suboptimal coordination between sectors is also an issue which can hinder the implementation of integrated health programs [19].

The importance of community education and the application of the One Health approach in rabies management cannot be overlooked. By raising public awareness and strengthening sectoral collaboration, it is hoped that the incidence of rabies can be significantly reduced. The findings of this study align with those of Haseback et al., who recommend that countries with a high rabies burden should enhance the implementation of national rabies control, prevention, and monitoring strategies [20]. Within the One Health framework, key activities that need to be strengthened include dog vaccination, access to post-exposure prophylaxis (PEP), and enhancing rabies epidemiological surveillance capacity. Other studies, such as those by Lojkić et al., highlight that free and illegal animal movements have introduced rabies into previously rabies-free areas, particularly from endemic regions [21]. Therefore, strategies for animal vaccination, constant political and financial involvement, and increased awareness about the dangers of rabies are crucial in controlling this disease.

4. Conclusion

The ethnopharmacological study with a One Health approach provides new insights into managing rabies cases in the Kualin District, Timor Tengah Selatan (TTS) Regency. Strong collaboration among various stakeholders, including the government, non-governmental organizations, and the community, is crucial to achieving optimal vaccination targets and reducing the incidence of rabies. Further efforts are needed to raise public awareness about rabies prevention and strengthen vaccination programs to ensure more effective disease control.

Ethnopharmacology and the One Health approach hold significant potential in addressing rabies cases in East Nusa (NTT). Using traditional medicine based on local knowledge can complement rabies prevention and treatment strategies. Therefore, it is essential to integrate ethnopharmacological knowledge into public health programs and strengthen collaboration between human, animal, and environmental health sectors. Further research is needed to identify and test the effectiveness of medicinal plants used by the community in managing rabies. Additionally, developing educational programs that actively involve the community in disease prevention efforts is crucial. Collaboration between the government, non-governmental organizations, and the community must be strengthened to control rabies in NTT.

References

[1] A. Yamada, K. Makita, H. Kadowaki, N. Ito, M. Sugiyama, N. C. L. Kwan, and K. Sugiura, "A comparative review of prevention of rabies incursion between Japan and other rabies-free countries or regions," *Jpn. J. Infect. Dis.*, vol. 72, no. 4, pp. 203–210, 2019, doi: 10.7883/yoken.JJID.2018.431.

[2] Y. A. Amoako, P. El-Duah, A. A. Sylverken, M. Owusu, R. Yeboah, R. Gorman, T. Adade, J. Bonney, W. Tasiame, K. Nyarko-Jectey, T. Binger, V. M. Corman, C. Drosten, and R. O. Phillips, "Rabies is still a fatal but neglected disease: a case report," *J. Med. Case Rep.*, vol. 15, no. 1, pp. 1–6, 2021, doi: 10.1186/s13256-021-03164-y.

[3] T. Riyanto, "Aksi Bersama untuk Satu Tujuan, Satu Kesehatan untuk Semua 'All for 1, One Health for All' Hari Rabies Sedunia, 28 September 2023," *Ayo Sehat*, 28 Sep. 2023. [Online]. Available: https://ayosehat.kemkes.go.id/aksi-bersama-untuk-satu-tujuan-satu-kesehatan-untuk-semua-all-for-1-one-health-for-all-hari-rabies-sedunia-28-september-2023. [Accessed: 19 Sep. 2024].

[4] T. Y. Aditama, "One Health, Kesehatan Satu Bersama," *EJournal Kedokteran Indonesia*, vol. 10, no. 2, pp. 90–91, 2022, doi: 10.23886/ejki.10.207.90-1.

[5] Kementerian Koordinator Bidang Pembangunan Manusia dan Kebudayaan, "Tangani wabah rabies NTT, pemerintah lakukan pendekatan kuratif incar vaksinasi anjing," 21 Nov. 2023. [Online]. Available: https://www.kemenkopmk.go.id/tangani-wabah-rabies-ntt-pemerintah-lakukan-pendekatan-kuratif-incar-vaksinasi-anjing. [Accessed: 19 Sep. 2024].

[6] Direktorat Jenderal Peternakan dan Kesehatan Hewan, Kementerian Pertanian, "Tekan kasus rabies di NTT, Kementan kejar target vaksinasi capai 70% populasi," 21 Nov. 2023. [Online]. Available: https://ditjenpkh.pertanian.go.id/berita/1760-tekan-kasus-rabies-di-ntt-kementan-kejar-target-vaksinasi-capai-70-populasi. [Accessed: 19 Sep. 2024].

[7] AIHSP, "Australia kirim vaksin rabies ke Nusa Tenggara Timur," 2021. [Online]. Available: https://www.aihsp.or.id/articles/australia-kirim-vaksin-rabies-ke-nusa-tenggara-timur. [Accessed: 19 Sep. 2024].

[8] E. Robert, "Kami merasa gelisah, kami harap pemerintah segera menangani' - 10 orang warga NTT meninggal terjangkit rabies, pengamat: sarana dan prasarana medis masih kurang," *BBC News Indonesia*, 26 Jun. 2023. [Online]. Available: https://www.bbc.com/indonesia/articles/c4nej7lvp4ro. [Accessed: 19 Sep. 2024].

[9] I. G. G. Pranadinata and I. W. Batan, "Kajian Pustaka: Kejadian Penyakit Anjing Gila yang Meletup Berkali-kali di Nusa Tenggara Timur," *Imv*, vol. 13, no. 3, pp. 313–321, 2024, doi: 10.19087/imv.2024.13.3.313.

[10] F. Mau and Y. Desato, "A Description of a Rabies and Effort Controlling in District Ngada Province East Nusa Tenggara (NTT)," *Buletin Penelitian Kesehatan*, vol. 40, no. 4, pp. 162–170, 2012.
[11] Universitas Nusa Cendana, "FKKH Undana bentuk dan latih kader siaga rabies di Desa Kualin, Kab. TTS," 18 Jun. 2024. [Online]. Available: https://undana.ac.id/en/2024/fkkh-undana-bentuk-dan-latih-kader-siaga-rabies-di-desa-kualin-kab-tts/. [Accessed: 19 Sep. 2024].
[12] K. Kaha, "Korban meninggal akibat gigitan anjing rabies di TTS bertambah," *Antara News: Humaniora*, 2023. [Online]. Available: https://www.antaranews.com/berita/3583572/korban-meninggal-akibat-gigitan-anjing-rabies-di-tts-bertambah. [Accessed: 19 Sep. 2024].
[13] Kementerian Kesehatan Republik Indonesia, "Integrasi Pengobatan Tradisional Dalam Sistem Kesehatan Nasional," *Kemenkes: Rilis Berita*, 2 Nov. 2011. [Online]. Available: https://kemkes.go.id/id/integrasi-pengobatan-tradisional-dalam-sistem-kesehatan-nasional. [Accessed: 19 Sep. 2024].
[14] WOAH, "Rabies control: A model for one health collaboration," WOAH, 2023.
[15] FAO, "Rabies - Food and Agriculture Organization of the United Nations," FAO, 2023.
[16] A. S. Karamoy, A. F. C. Kalesaran, and E. M. Mantjoro, "Implementation of the One Health approach in controlling rabies in Minahasa Regency, Indonesia," *Int. J. One Health*, vol. 9, no. 1, pp. 32–42, 2023, doi: 10.14202/IJOH.2023.32-42.
[17] S. Sabira, H. Helda, G. A. Siregar, and Q. N. Salamah, "Managing rabies cases with a One Health approach in various countries: Literature review," *Media Publikasi Promosi Kesehatan Indonesia (MPPKI)*, vol. 7, no. 5, May 2024. doi: 10.56338/mppki.v7i5.5167.
[18] C. D. Aptriana, E. Sudarnika, C. Basri, D. Indrawan, J. Daryono, and P. P. Suseno, "Assessment of the burden of rabies in one health approach control program in Ketapang District, Indonesia: Using zDALY," *Prev. Med. Rep.*, vol. 45, Jul. 26, 2024, Art. no. 102838, doi: 10.1016/j.pmedr.2024.102838.
[19] N. Mor, "Organizing for One Health in a developing country," *One Health*, vol. 17, Dec. 2023. doi: 10.1016/j.onehlt.2023.100611
[20] A. H. Haselbeck, S. Rietmann, B. T. Tadesse, K. Kling, M. E. Kaschubat-Dieudonné, F. Marks, W. Wetzker, and C. Thöne-Reineke, "Challenges to the fight against rabies—the landscape of policy and prevention strategies in Africa," *Int. J. Environ. Res. Public Health*, vol. 18, no. 4, pp. 1–15, 2021, doi: 10.3390/ijerph18041736.
[21] I. Lojkić, I. Šimić, T. Bedeković, and N. Krešić, "Current status of rabies and its eradication in eastern and southeastern Europe," *Pathogens*, vol. 10, no. 6, 2021, doi: 10.3390/pathogens10060742.