# **Title; Health planning and management of Leptospirosis in Vanuatu; The Role of the government and the global community**

**Running Title; Health planning and management of Leptospirosis in Vanuatu**

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**Abstract**

**Introduction**: Leptospirosis is a disease caused by a bacterium in the genus Leptospira which is carried and transmitted by animals, thus making it a zoonotic disease. Leptospirosis is more commonly seen in the tropics and in people who work outdoors or with animals.

**Aim:** This present article aimed to equip the government of Vanuatu and the global community on the proper health planning and management of leptospirosis in Vanuatu. And also to bring leptospirosis to public light in Vanuatu so that appropriate government and private bodies in the country can put more resources towards eradicating the disease.

**Methodology:** In writing this article, peer-reviewed scientific articles obtained from PubMed, ResearchGate and Google Scholar databases were consulted. We synthesised our findings and engaged in a discussion emphasising the urgent need for global health attention and collaborative efforts to mitigate the rising cases of leptospirosis in Vanuatu.

**Result:** We found an increase in leptospirosis cases in Vanuatu from January to March 2023. As of 31 March 2023, 8 new Leptospirosis cases were recorded from 23 March to 30 March 2023. As a result of this, a total of 51 leptospirosis cases have been recorded since January 2023. One death was reported during the last week of March 2023, with a total of 6 deaths.

**Conclusion**: To halt the spread of leptospirosis in Vanuatu, a multi-pronged strategy must be devised by the government of Vanuatu, including various stakeholders in Vanuatu as well as international bodies, governmental officials, the medical communities, and public health scholars in the world.

**Keywords**; Leptospirosis, Vanuatu, Health planning, management, Government, Global community.

**Main Text:**

**Introduction**

Leptospirosis is a disease caused by a bacterium in the genus Leptospira which is carried and transmitted by animals, thus making it a zoonotic disease. Humans get infected through direct contact with infected urine or by ingesting water or soil that has been contaminated with the urine of an infected animal. These animals include cattle, pigs, horses, and dogs. (1) The time between exposure to the infection and the beginning of symptoms is usually between 2 days to 4 weeks. Symptoms include high fever, headache, rashes, abdominal pain, muscle aches, vomiting and diarrhoea. (2). Leptospirosis is more commonly seen in the tropics and in people who work outdoors or with animals. (3) There are about 1.03 million cases and 58,900 deaths globally each year, and these estimates place it as the leading zoonotic cause of morbidity and mortality. (4)

Vanuatu is a country in Oceania, located in the southwestern Pacific Ocean, with more than three hundred thousand inhabitants. Its capital, Port Vila, is the largest city and the most commonly used commercial centre. Agriculture and tourism are the two primary sources of income for Vanuatu's economy. (5) Due to the bacteria's affinity for hot and humid weather conditions and its increased incidence among agricultural and recreation centre (freshwater bathing activities) workers, Oceania is placed as the region with the highest incidence and burden of leptospirosis. (6) The disease was first identified in Vanuatu in cattle through a seroprevalence study carried out in 1980, and the first human cases were reported in Port-Vila in the early 1990s. A published case of an Australian tourist who contracted the disease, which proved fatal after spending the holiday in Vanuatu, emphasises the risk associated with freshwater swimming. (4)

Because there is inadequate knowledge about leptospirosis and its preventive measures among the population of Vanuatu, more cases of the disease can be on the rise, posing more threats to global health. In mitigating this menace of leptospirosis in Vanuatu, (1-5) we believe that more attention should be paid to public and global health preventive measures. This present article aimed to equip the government of Vanuatu and the global community on the proper health planning and management including the population of Vanuatu especially those at risk (agricultural workers and tourists) on the knowledge of prevention and transmission of leptospirosis, identification of early symptoms of the disease and seeking medical treatment as soon as possible in order to reduce the morbidity and mortality associated with it, also to bring leptospirosis to public light in Vanuatu so that appropriate government and private bodies in the country can put more resources towards eradicating the disease. In writing this article, peer-reviewed scientific articles obtained from PubMed, ResearchGate and Google Scholar databases were consulted. We synthesised our findings and engaged in a discussion emphasising the urgent need for global health attention and collaborative efforts to mitigate the rising cases of leptospirosis in Vanuatu.

**Prevalence of leptospirosis in Vanuatu**

We found that Leptospirosis is among the most common and dreaded zoonotic infections worldwide. (7)  Recent evaluations of the global leptospirosis burden have identified Oceania as the region with the highest morbidity. (8) In Vanuatu, a seroprevalence study in the 1980s first identified leptospirosis in cattle. (9) Five cases were reported in 2003, which equals an annual incidence of 24.3 per million population. (10) A regional study in 2003–2005 included 10 patients from Vanuatu, showing positive serology in one case. We found an increase in leptospirosis cases in Vanuatu from January to March 2023. As of 31 March 2023, 8 new Leptospirosis cases were recorded from 23 March to 30 March 2023. As a result of this, a total of 51 leptospirosis cases have been recorded since January 2023. Furthermore, 1 death was reported during the last week of March 2023, with a total of 6 deaths. (11) However, these figures may not represent the actual burden of leptospirosis in Vanuatu, considering the gross underestimation of leptospirosis cases attributed to the lack of a "gold standard" test and a bias in considering patients for diagnostic testing. (12) Leptospirosis is more prevalent in people who work or live in rural areas. This means that those people who work outdoors, like farmers, fishermen etc., are most at risk in Vanuatu. So, it can significantly burden the healthcare system, especially in rural areas with scarce medical resources. If it spreads rapidly, it could have a major impact on global health. (13) Severe infection would be challenging to diagnose and treat, which could lead to serious conditions like kidney damage, meningitis and liver failure. This could put more burden on the healthcare system of Vanatou and the global community. Therefore causing more mortalities. Again, leptospirosis is often underdiagnosed in a community due to a lack of standard protocols for diagnosing the disease and a possible bias of clinicians in selecting the patients for diagnostic testing. Therefore, reported cases of leptospirosis in Vanuatu may not represent the actual burden of the disease and may spread unnoticed. (12)

**Health implications of Leptospirosis in Vanuatu**

Vanuatu is a developing country with a predominantly agricultural economy. (5) Such an outbreak may halt the crop production capability and livestock strength of the country, thus creating food shortages that will lead to a surge in food prices. Leptospirosis can negatively impact the economy of Vanuatu as the cost of treating and preventing the disease is significant (13,14). Vanuatu is known as a tourist destination with various outdoor activities like scuba diving. (5) The current leptospirosis outbreak will be threatening to tourism, and it will have a significant negative impact on the Vanuatu economy. (15) In addition, if the spread of leptospirosis in Vanuatu is not restricted, it could spread to other neighbouring countries in the Pacific region, which could have global health implications. This means that cases of leptospirosis in Vanuatu could be detrimental to the international community. (13)There is a great need for global attention regarding the spread of leptospirosis as it was previously recognised in developing, low-income-countries (LICs) as a vocational disease related to fresh water and animal exposure in which sewage workers, butchers, agriculturists, veterinarians, or Chasseurs were mostly exposed (16). Leptospirosis is now acknowledged as an environmental disease syndicated with pleasure ventures and outdoor sports with increased occurrence in people returning from vacations in temperate regions. (16) The diagnostic issues presented at laboratory and medical steps glaringly play a part in trivialising the disease in many countries.

**Threats of Leptospirosis in Vanuatu**

Sadly, there are no authentic classification systems or predictive analytics to know which patients with leptospirosis are likely to catch severe disease, so it remains an area of research and possible worry for the world. (17) The aetiology of extreme leptospirosis remains ambiguous and basic research must focus on discovering symptoms and indicators for the severity. The cases of leptospirosis are mostly treated as other diseases or worse if not treated. (17) Another threat is that leptospirosis shows varying patterns in its geometric and terrestrial dissemination directed by a multiplex network of socioecological factors. Hence, it is challenging for scientists to build an effective mechanism for understanding the knowledge behind the pattern displayed by the infection. However, research can improve our comprehension of the frequency of leptospirosis outbreaks and mark high-risk areas. (17,18)

**Recommendations**

The onus of spreading awareness among the general public, workers of vulnerable occupations, and tourists lies on the government of Vanuatu. The state laws in Vanuatu must be revised and enforced to ensure vaccination against leptospirosis, public hygiene and sanitation and to prohibit indiscriminate rubbish dumping. Potential breeding grounds of leptospirosis must be identified, and awareness about appropriate prevention strategies must be dismantled among the vulnerable population in Vanuatu.

In the time of development, the diseases that were supposed to be restricted to tropical regions were not stationary units. These diseases are not only rising threats but have been a threat all the way along, which have gone unnoticed and ignored for many decades. (19) Due to the complications of leptospirosis, primary prevention is challenging. In low-income tropical areas, like Vanuatu, there is a very favourable environment for the conduction of the disease, but identifying such areas helps prevent the disease in the country and beyond. Also, awareness of leptospirosis in high-income countries like the United States, the United Kingdom, Germany, France, China, etc. where the disease is exotic is essential in diagnosing and treating the disease. (20,21) In a nutshell, it is crucial and necessary that the global community step up in their epidemiological surveillance on leptospirosis in Vanuatu and other endemic countries like Tanzania, Malaysia, India, Sri Lanka, and Brazil where thousands of cases of the disease are reported annually. (19, 22) The government of Vanuatu should also collaborate with the World Health Organization (WHO) on the availability of leptospiral recombinant protein vaccines in Vanuatu. Research has shown that recombinant protein vaccines have great potential against leptospirosis, especially recombinant OMPs, lipoproteins and virulence factors vaccines, especially Lig, LipL41 and Hap1 proteins. (23) Research revealed that when dogs were vaccinated twice with inactivated and attenuated vaccines and infection with L. interrogans followed the second vaccination, a high rate of protection against L. interrogans was observed and the duration of immunity was at least a year. (24) All these aforementioned vaccines should therefore be administered effectively to animals such as dogs, cattles, pigs and horses by veternarians in Vanuatu. Also, the government of Vanuatu should collaborate with infectious experts and researchers in developed nations to develop a leptospiral DNA vaccine against leptospirosis in Vanuatu, even though only two leptospiral DNA vaccine trials have been researched. Scientists tested DNA vaccine encoding hemolysis-associated protein 1 (Hap1) in gerbils, and luckily partial protection against leptospirosis by pathogenic strains of Leptospira was reported. (25) One Health approach towards zoonotic diseases have been proven to be effective in recent times. (26) The government of Vanuatu through its ministry of health and education should implement the One Health approach towards zoonotic diseases, leptospirosis inclusive among the population of Vanuatu. This can be achieved if the government of Vanuatu establish One Health institute in the country as well as collaborating with the Tripartite organisations; the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO) and the World Organisation for Animal Health (WOAH, founded as Office International des Epizooties (OIE),(27) as well as the One Health Commision (OHC) in the United States (28) in order to support and train health care personnel in Vanuatu about the strategic ways towards prevention of leptospirosis and other zoonotic diseases in the country.

**Conclusion**

Leptospirosis is a zoonotic disease that recently affected Vanuatu. Clinical features of the disease include high fever, headache, rashes, abdominal pain, muscle aches, vomiting and diarrhoea. The disease can negatively impact the economy of Vanuatu as the cost of treating and preventing the disease is significant. To halt the spread of leptospirosis in Vanuatu, a multi-pronged strategy must be devised by the government of Vanuatu, including various stakeholders in Vanuatu as well as international bodies, governmental officials, the medical communities, and public health scholars in the world.

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