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Chikungunya Outbreak in Boyolali District: A Case Study of February 2024

[1]Amira Nada Fatikha, [2]Riris Andono Ahmad, [3]Teguh Tri Kuncoro, [4]Annisa Arum KD

[1,2] Master of Public Health Science Programme, Faculty of Medicine, Public Health, and Nursing, Gadjah Mada University
[3,4] Boyolali District Health Office
Corresponding author: Amira Nada Fatikha, e-mail: amiranadafatikha@mail.ugm.ac.id

Abstract

In February 2024, the Boyolali District Health Office received notification of a chikungunya outbreak in the Boyolali district. This study aims to provide an overview of the epidemiological analysis of chikungunya outbreaks in Boyolali District in 2024. This study uses a descriptive method based on the results of the Epidemiological Investigation to understand the dynamics of disease spread and control efforts. Chikungunya outbreak in Winong Village, Boyolali Subdistrict, from 1 February 2024 to 5 March 2024 recorded 43 cases, distributed in RT 2/RW 17 with 28 cases (65.1%) and RT 3/RW 16 with 15 cases (34.9%). Based on demographic data, it was found that females were more likely to be affected (53.5%), with an age group of 56-65 years (20.9%). Symptoms experienced were joint pain (100%) accompanied by muscle pain (95.4%), headache (95.4%), fever (93.0%), nausea (83.7%), vomiting (67.4%), enlarged lymph nodes (51.2%), rash (16.3%), chills (16.3%), itching in the rash (11.6%), and conjunctival redness (4.7%). A total of 9 cases (20.9%) that underwent Rapid Diagnostic Test showed positive results. Of the cases found, only 1 case (2.3%) had been treated at Primary Health Center. The larvae-free rate in Winong Village is still below 95%, and there are 28 houses (65.1%) among the sick found mosquito larvae. Therefore, it is necessary to strengthen the 3M Plus program (Menguras, Menutup, Mendaur ulang / Draining, Covering, and Recycling used goods that have the potential to become breeding grounds for mosquitoes), mosquito larvae-eating fish, larvicides in water reservoirs, and fogging. An integrated approach to chikungunya management is important, including increased public awareness and continued implementation of preventive measures to increase the larvae-free rate and reduce the risk of future outbreaks.

Keywords: Boyolali; Chikungunya; Outbreak

Introduction

Chikungunya is caused by the chikungunya virus (CHIKV), which *Aedes aegypti* or *Aedes albopictus* mosquitoes transmit through their bites. The virus was first identified during an outbreak in Tanzania in 1952 and has since spread to various parts of the world, including Southeast Asia, Africa, Europe, and the Americas. Clinically, chikungunya can cause acute symptoms such as high fever, joint pain, rash, and headache. These symptoms usually appear within 3-7 days of an infected mosquito bite and can last several weeks. In some cases, chikungunya infection can develop into a chronic condition lasting more than three months, with the most predominant symptom being prolonged joint pain (Madariaga, 2016; Silva & Dermody, 2017).

From a public health perspective, chikungunya is a serious problem due to its impact on morbidity

and quality of life. The chronic joint pain often experienced by chikungunya patients can lead to decreased productivity, inability to work, and high health costs. These long-term effects impact the household economy, especially for underprivileged populations. In addition, the increase in chikungunya cases also places an additional burden on public health systems that may already have limited capacity to deal with other infectious diseases (Silva & Dermody, 2017). Effective control efforts require comprehensive interventions, including strengthening the public health system, community education, and eradication of mosquito vectors.

Southeast Asia, including Indonesia, has been one of the regions with the highest prevalence of chikungunya, with several large outbreaks reported in the past decade. Tropical climatic conditions, high mosquito population density, and high human mobility strongly influence the spread of the virus in this region. In Indonesia, climate change leads to increased temperature and humidity, rapid urbanization that expands mosquito breeding habitat, and high population movement between areas, all of which are significant risk factors for the spread of chikungunya (Weaver & Lecuit, 2015). In addition, socio-economic factors such as limited access to health services and lack of public awareness about preventive measures also contribute to the high number of chikungunya cases in some areas (Coffey et al., 2014).

According to Boyolali District EWARS (Early Warning Alert and Response System), there was a significant increase in chikungunya cases until August 2024, more than double from 2023. This phenomenon indicates an increase in chikungunya transmission in the region. Winong Village in Boyolali Subdistrict was identified as a chikungunya transmission cluster in 2024.

This study aims to provide an epidemiological overview of the chikungunya outbreak in Winong Village, Boyolali Subdistrict, Boyolali District, in 2024. This epidemiological analysis provides insights into disease transmission dynamics and effective public health interventions to prevent further spread..

Methods

This study used a descriptive method based on the results of an Epidemiological Investigation and Vector Survey in Winong Village, Boyolali Subdistrict, Boyolali District, in February - March 2024 to understand disease patterns by analyzing data related to time, place, and people. This study used secondary data from EWARS (Early Warning Alert and Response System). Using descriptive methods in epidemiology is essential to provide a comprehensive picture of the outbreak, thereby supporting the development of targeted interventions and policies to reduce the impact of chikungunya and similar vector-borne diseases (Madariaga, 2016).

Results

Based on an epidemiological investigation conducted in Winong Village, Boyolali District, from February to March 2024, there were 43 chikungunya cases with an incidence rate of 5.7 per 1,000 population. Of these, 9 cases (20.9%) were diagnosed using the Rapid Diagnostic Test (RDT) IgG, which detects viral

antigens or specific antibodies to the chikungunya virus, indicating an active infection. Meanwhile, 33 other cases (79.1%) were clinically diagnosed based on typical chikungunya symptoms such as sudden fever, severe joint pain, headache, muscle pain, and rash.

Chikungunya cases in Winong Village were concentrated in two neighborhoods. In RT 3/RW 16, 15 cases (34.9%) were reported, while RT 2/RW 17 had a higher number, with 28 cases (65.1%).:

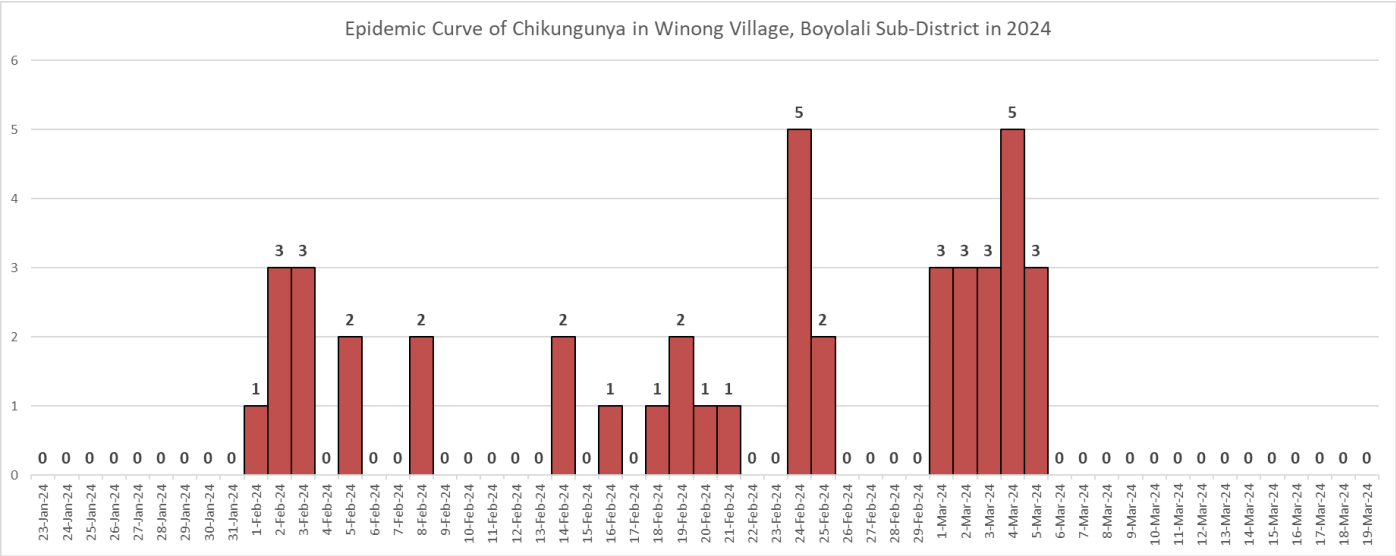

Figure 1. Epidemic Curve of Chikungunya in Winong Village, Boyolali Sub-District in 2024

The epidemiological curve (Figure 1) illustrate distribution of chikungunya cases in Winong Village, Boyolali District, in 2024. The first case appeared on February 1st with one case, and the number of cases increased in first week of February, reaching the first peak with three cases on February 2nd and 3rd. After this period, cases briefly decreased but increased again and reached a second peak on February 24th and March 4th, each with five cases. After this second peak, the number of cases abruptly declined, with the last case reported on March 5. No new cases were reported after two incubation periods of 14th days from March 6th - 19th, 2024, indicating the potential end of the outbreak. This pattern is consistent with the incubation period of chikungunya and has multiple peaks at irregular intervals, indicating that this is a propagated epidemic curve, which describes the spread of infection from person to person.

Table 1. Distribution of Cases Based on Individual Characteristics

Characteristics	Frequency	Persentage (%)
Gender		
Male	20	46.5
Female	23	53.5
Age		
0-5	3	7.0
5-11	5	11.6
12-16	0	0.0
17-25	2	4.7
26-35	4	9.3
36-45	6	14.0
46-55	7	16.3

56-65	9	20.9
>65	7	16.3
Treatment Status		
Yes	1	2.3
No	42	97.7

Table 1 shows the distribution of chikungunya cases in Winong Village, Boyolali Sub-district, based on individual characteristics. The distribution by gender showed that females were more affected, with 23 cases (53.5%), compared to males, who recorded 20 cases (46.5%). Based on age group, chikungunya cases were spread across various age ranges, with the highest incidence in the 56-65 years age group, with 9 cases (20.9%), followed by the 46-55 years and over 65 years age groups, with 7 cases each (16.3%). The 17-25 age group reported the fewest cases, with only 2 cases (4.7%). Children were also affected, with 3 cases (7.0%) in the 0-5 age group. Based on treatment status, most chikungunya cases (97.7%) did not seek medical treatment, with only 1 case (2.3%) reported to have sought treatment. These data indicate variations in the distribution of chikungunya cases across different age groups and genders and suggest low treatment rates among those infected, underscoring the need for increased awareness and access to health services in these communities

The distribution of clinical symptoms felt by food poisoning cases is described as follows:

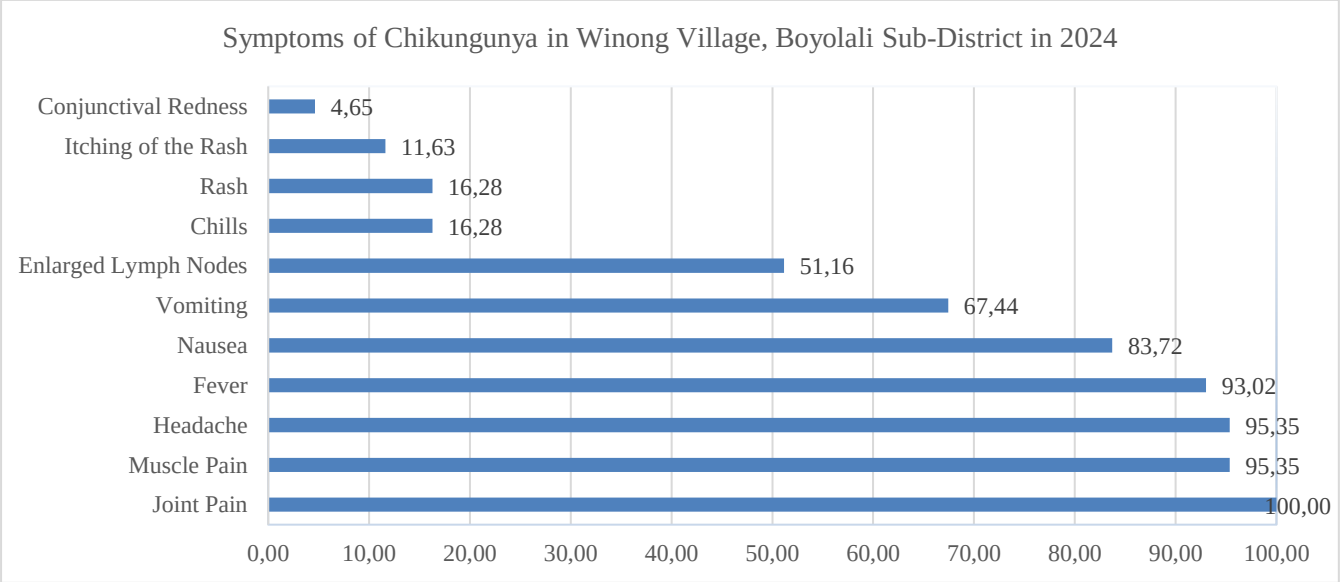

Figure 2. Distribution of Cases Based on Symptoms

Figure 2. shows the distribution of chikungunya symptoms reported by chikungunya patients in Winong Village, Boyolali District, in 2024. Every patients reported joint pain (100%) was joint pain. Muscle pain and headache were also very commonly reported, each at 95.35%. Another frequent symptom was fever, reported by 93.02% of patients. Gastrointestinal symptoms such as nausea and vomiting were also reported quite frequently, at 83.72% and 67.44% respectively. In addition, enlarged lymph nodes were reported by 51.16% of patients, indicating a systemic reaction of the body to the infection. Less common symptoms included chills and rash, each reported by 16.28% of patients. Itching of the rash and redness of the conjunctiva were the least commonly reported symptoms, at 11.63% and 4.65%, respectively. This distribution shows

variation in the clinical manifestations of chikungunya in Winong Village, with some symptoms being very common and others being relatively rare.

Another finding from the chikungunya investigation in Winong Village is that the village's larva-free rate is still below 95%, which is a safe threshold for preventing the transmission of vector-based diseases such as chikungunya. This indicates that many places still have the potential to harbor Aedes mosquitoes, the primary vector of chikungunya. Furthermore, of the 43 houses that reported chikungunya cases, 28 (65.11%) had mosquito larvae. This figure indicates that most houses with chikungunya cases have an environment that supports mosquito breeding, which increases the risk of disease transmission. Based on the Vector Survey conducted in Winong Village on May 27-29, 2024, with the Indonesian Center for Public Health Laboratories Banjarnegara, 225 mosquitoes were captured inside and outside the house, all of which (100%) were Aedes aegypti species.

To overcome this problem, Winong Village strengthened the mosquito nest eradication program with 3M Plus, namely:

a. Menguras / Draining (cleaning places that could potentially become mosquito nests),
b. Menutup / Closing (tightly closing the water reservoir),
c. Mendaur ulang / Recycle used items that can collect rainwater and become breeding grounds for mosquitoes.
d. Mosquito larvae-eating fish management is applied in ponds or water reservoirs that are difficult to drain regularly. This method helps to reduce the mosquito larvae population naturally.
e. Larvicide application in water reservoirs is a step to kill mosquito larvae.

These measures are implemented continuously and involve active community participation to increase effectiveness. Fogging is also conducted quickly to reduce the adult mosquito population, especially during increased cases or outbreaks.

Discussion

Based on the results of an epidemiological investigation in Winong Village, Boyolali Subdistrict, in February - March 2024, 43 chikungunya cases were recorded, with an incidence rate of 5.7 per 1,000 population. In a systematic review by Harapan et al., (2019) it was stated that the incidence rate of chikungunya in Indonesia shows significant variation between regions and time, influenced by various factors such as the density of Aedes mosquito vectors, environmental conditions, and differences in health surveillance systems in each region. These incidence rates indicate a significant increase in local transmission, requiring immediate intervention to prevent further increase. The cases were spread across two areas, RT 2/RW 17 and RT 3/RW 16, with case distributions of 65.12% and 34.88%, respectively. This distribution shows a significant concentration of cases in one area, indicating a strong local transmission cluster (Weaver & Lecuit, 2015).

Epidemic curves are essential for assessing disease incidence and understanding outbreak dynamics

for estimate the magnitude and duration of an epidemic, identify the source of infection, and determine the mode of transmission and incubation period. The epidemiological curve for chikungunya in Winong Village shows that first case of chikungunya was reported on February 1 and the last case reported on March 5. This curve has multiple peaks at irregular intervals, indicating that this is a propagated epidemic curve, which describes the spread of infection from person to person. This information is essential for implementing effective containment measures and reducing the impact of the disease (de Souza et al., 2023).

Based on demographic factors, women are more commonly infected. Hormonal factors, immunity, or different inflammatory responses between men and women could influence this difference (Goupil & Mores, 2016). Based on age group, chikungunya cases are spread across various age ranges, with the highest incidence in the age group 56-65 years, followed by the age group 46-55 years and above 65 years. This may be due to decreased immune system function and concomitant health conditions that affect the healing process (Goupil & Mores, 2016).

All chikungunya patients in Winong Village reported joint pain. This is consistent with the literature, which states that joint pain is the main manifestation of chikungunya, is often the most bothersome symptom, and can persist for a long period. Muscle pain, headache, and fever often accompany chikungunya and contribute to patient discomfort and can help in the initial diagnosis process. Gastrointestinal symptoms, such as nausea and vomiting, suggest that these manifestations are significant and should be considered in clinical assessments. Lymph node enlargement indicates a systemic reaction to the infection that may require additional medical attention. Less common symptoms such as chills and rash, itching of the rash, and redness of the conjunctiva indicate variations in the clinical manifestations of chikungunya. A better understanding of these symptoms could increase public awareness, accelerating treatment-seeking, and reducing the risk of long-term complications (CDC, 2024; Craig et al., 2015; de Oliveira et al., 2023; Krutikov & Manson, 2016; Ojeda Rodriguez et al., 2024; Rahman et al., 2019)

Just 20.9% cases were diagnosed using the Rapid Diagnostic Test (RDT) IgG, which can detect active infection through viral antigens or specific antibodies to the chikungunya virus. RDTs for IgG identify the body's immune response to Chikungunya virus infection quickly and are easy to use. IgG typically appears after the acute phase of infection, indicating that a person has been exposed to the virus and has developed antibodies (Simo et al., 2023). On the other hand, the remaining 79.1% cases were clinically diagnosed based on typical chikungunya symptoms such as sudden fever, severe joint pain, headache, muscle pain, and rash. This symptom-based diagnosis is often used in areas with limited resources, although there is a risk of misdiagnosis due to overlapping symptoms with other arbovirus infections. The symptom-based diagnosis approach, however, remains an essential method in epidemiologic emergencies to accelerate the treatment response (Arif et al., 2020).

Most chikungunya cases in Winong Village, Boyolali Sub-district, did not seek medical treatment. This finding is in line with previous studies showing that many chikungunya sufferers in endemic areas didn't

take medical treatment or don't have adequate access to health services (Rama et al., 2024). In addition, other studies have shown that low awareness of the importance of medical treatment for chikungunya is also a significant factor in the decision to forgo treatment. As a result, people with chikungunya often only receive supportive care at home without appropriate medical intervention, which can lead to worsening conditions and long-term complications. Education efforts and improved health infrastructure are essential to ensure that all chikungunya cases receive proper and effective medical care (Krutikov & Manson, 2016).

The Chikungunya investigation in Winong Village revealed significant challenges in vector-borne disease prevention and control efforts. The larva-free rate in the village was below the safe threshold of 95%, indicating that there are still many potential breeding sites for Aedes mosquitoes, the primary vector of chikungunya. This is suggests that vector control efforts have not been fully effective, and there is still a lot of potential for mosquito breeding that can cause disease spread (World Health Organization, 2017). Furthermore, mosquito larvae found in homes that reported chikungunya cases indicate that most homes with chikungunya cases are in an environment that supports mosquito breeding, increasing the risk of chikungunya transmission (Alwin et al., 2023). Vector surveys showed mosquitoes in the Winong Village environment were of the *Aedes aegypti* species. This finding confirmed the dominance of the *Aedes aegypti* species as the chikungunya vector in Winong Village, reinforcing the importance of control strategies targeting this species. Control efforts that focus on reducing *Aedes aegypti* populations and preventing mosquito breeding in neighborhoods are essential to prevent the further spread of chikungunya.

Eradication of *Aedes aegypti* mosquito nests is an essential strategy in reducing the population of this vector to minimize the transmission of chikungunya. The 3M Plus program is a strategy that has been proven effective in reducing the population of *Aedes aegypti* mosquitoes (Farid, 2023; Mubarak, 2023; Nurdin, 2023). However, in Winong Village, Boyolali Sub-district, the implementation of this program needs to be improved by ensuring consistent community participation and awareness, which is critical for sustained success in controlling Aedes mosquito-borne diseases (Mawaddah et al., 2023).

Control of chikungunya, transmitted by Aedes mosquitoes, can be done through biological methods using larval-eating fish, such as guppies, tilapia, or goldfish, which can reduce mosquito larvae populations (Sari & Novela, 2020). Chemical control is also possible, with larvicides killing mosquito larvae and fogging eradicating adult mosquitoes within 24 hours (Farooq et al., 2024). Although chemical control methods such as larvicides and fogging are effective in the short term, they have limitations, such as potential mosquito resistance and environmental impacts. Thus, they must be balanced with mosquito nest eradication measures to prevent further transmission.

Conclusion

The epidemiological investigation of the chikungunya outbreak in Winong Village, Boyolali Subdistrict, from February to March 2024, revealed several important points regarding the distribution of cases

and the necessary control efforts. There were 43 cases, with the highest incidence on February 24 and March 4, concentrated in two specific areas: RT 2 / RW 17 and RT 3 / RW 16. Based on demographic characteristics, this outbreak mainly affects women and age groups over 45 years. The most common symptoms, such as joint pain and fever, need more attention in diagnosis and public education. Most patients were clinically diagnosed and did not seek medical treatment, reflecting low public awareness of the importance of medical treatment and the potential risk of long-term complications. In addition, the low larva-free rate (<95%) in Winong Village and the fact that most of the houses with chikungunya cases have an environment that supports the breeding of Aedes mosquitoes indicating the importance of more effective vector control efforts. Therefore, intervention and collaboration in vector control, health education, more accurate diagnosis, and improved access to medical services are needed to reduce the spread and impact of chikungunya.

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