

EPIDEMIOLOGICAL INVESTIGATION OF DIPHTHERIA EXTRAORDINARY EVENTS (KLB) IN GILI KETAPANG VILLAGE, PROBOLINGGO REGENCY IN 2022

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Abstract

Diphtheria infection is caused by a toxigenic strain of *Corynebacterium diphtheriae* with humans as the only reservoir. Diphtheria attacks children under 10 years old and is highly contagious, especially in susceptible populations. Diphtheria can cause an outbreak although it can be prevented by immunization. In 2022, 3 cases of diphtheria were reported in Gili Ketapang Village, Probolinggo Regency. Objective: to describe the epidemiology of the outbreak and identify the risk factors for countermeasures. Methods: This research is a descriptive study with an outbreak investigation report design. Results: There were 3 cases of diphtheria within 7 months (February-August 2022) in Gili Ketapang Village with a CFR of 100% and the highest attack rate in the toddler age group (0-4 years) of 0.5%. There were 2 positive contacts (close contacts of 2nd Case) who were asymptomatic. Transmission is strongly suspected to be caused by the carrier. The identified risk factors were low IDL coverage, limited health facilities and availability of ADS, sociodemographic conditions, and population mobility at risk of diphtheria transmission. The problems found were the absence of PMO in providing prophylaxis and ORI coverage was still low and incomplete. Conclusions and suggestions: The diphtheria outbreak in Gili Ketapang Village has been confirmed by the laboratory test. The increase in the incidence and mortality from diphtheria is caused by multi factors. The government's role in increasing immunization coverage, early warning through active case finding surveillance, monitoring, and evaluation of obstacles in prevention is urgently needed.

Keywords: diphtheria, disease outbreaks, vaccination coverage, immunization

INTRODUCTION

Based on the Regulation of the Minister of Health No.82 of 2014, diphtheria is one of the direct infectious diseases that can be prevented by immunization (PD3I) and is one of the diseases that can cause extraordinary events (KLB) (Nurhalimah, 2020). Diphtheria is caused by the bacterium *Corynebacterium diphtheriae* strains of toxigenation where the only one that acts as a reservoir is humans. Transmission often occurs by droplets through the air from coughing or sneezing sufferers or objects

contaminated by bacteria. *C. diphtheriae* has 4 types, namely *gravis*, *intermedius*, *mythic* and *belfanti*. All biotypes can become toxicated and cause severity. When in the body, bacteria secrete toxins (toxins), then absorbed in the blood and can cause complications, especially the heart and nerves which can result in death (Control et al., 2005) (Akbar et al., 2019). Therefore, if one diphtheria suspect is found, the management is in accordance with the handling of extraordinary events (KLB) (Akbar et al., 2019).

Based on WHO data, over a period of 10 years (2010-2020), the incidence of diphtheria with the highest incidence rate was in 2019 as much as 3.4 per 1 million total population (22,986 cases) worldwide and almost half of them (10,224 cases) came from WHO South East Asian Region (WHO-SEAR) member countries. Indonesia ranks second highest with 495 cases in 2019 (4.8% of total SEAR cases), then the number of SEAR cases decreased to 4,002 cases in 2020 and Indonesia has 6.5% of the total SEAR cases, which is 259 cases (Gilder et al., 2022).

increase in Diphtheria cases in Indonesia occurred in 2016, namely 591 cases from the previous 529 cases in 2015. Areas affected by diphtheria cases also increased, from 89 districts/cities in 2015 to 100 districts/cities in 2016. In 2017, the Ministry of Health announced diphtheria outbreaks in Indonesia, reported 954 clinically diagnosed cases of diphtheria and 44 deaths and spread across 142 districts/cities from 28 provinces. In 2018 there was an increase in diphtheria cases in Indonesia, there were 1,386 reported cases with 29 deaths. Then the trend of increasing diphtheria cases decreased drastically in 2019 to 2020 is at the lowest incidence rate of diphtheria incidence in Indonesia in the last 10 years (0.96 per one million population) (Kemenkes, 2021).

East Java Province is the province with the largest proportion of case contributors almost every year. Diphtheria has spread throughout regencies/cities in East Java, although not at the same time. As in 2018, of the total diphtheria cases in Indonesia, 50% of cases came from East Java (695 cases) and only 1 in 38 regencies/cities did not record cases, namely Tulungagung Regency. In 2019, cases decreased by almost 50% from the previous year (358 cases) and there were 5 districts with no recorded cases. Diphtheria cases continued to decline in 2020 (94 cases) until in 2021 only 45 cases were recorded in 18 districts/cities (Qomari, 2022).

Diphtheria cases in Probolinggo Regency were recorded nil during 2019-2021, until in 2022, in February a diphtheria case was reported from Gili Ketapang Village, Sumberasih District, Probolinggo Regency so that an Extraordinary Event (KLB) of Diphtheria was determined in Gili Ketapang Village by the Regent of Probolinggo. Then the diphtheria case occurred again in June (the 2nd case), and on August 21, 2022, the Probolinggo Regency Health Office again reported the 3rd diphtheria case in Gili Ketapang Village (CFR = 100%) through the W1 report. Based on this, an investigation of the Diphtheria Outbreak was carried out. The purpose of epidemiological investigation is to obtain an epidemiological picture and the spread of diphtheria in Gili Ketapang Village for countermeasures.

RESEARCH METHODS

This research is a descriptive study with a case report design from the KLB investigation conducted jointly between the East Java Provincial Health Office, Probolinggo Regency Health Office, Probolinggo Class II Port Health Office, Sumberasih Health Center and the Airlangga University FETP Team. The

investigation was conducted in Gili Ketapang Village, Sumberasih District, Probolinggo Regency in September-October 2022. The activities carried out are primary and secondary data collection. Primary data was obtained through home visits based on contact history, neighbors and playmates to obtain risk factor data as well as visits to the Gili Ketapang auxiliary health center for immunization data collection and vaccine storage. Other secondary data collection is immunization coverage data, geographical data and data on the number of residents of Gili Ketapang village. The instruments used for data collection are the Diph-1 form which contains information about the patient's identity, sick history, treatment history and contact history, as well as an RCA form to see the immunization status around the location of the case home.

To verify the diagnosis, clinical and laboratory examinations are carried out with throat and/or nose swab sampling in cases and potential close contacts. The case criteria used based on the 2018 Edition of the Diphtheria Surveillance and Control Manual are laboratory confirmation cases, epidemiological relationship confirmation cases, clinically compatible and discarded cases (Akbar et al., 2019). Data analysis is carried out descriptively.

RESULTS AND DISCUSSION

Identification of Diphtheria Outbreak Cases

Table 1 Identification of diphtheria confirmation cases in Gili Ketapang Village

Name (initials)	Sex (Age)	Address	Sick date	Symptom	Immunization status	Lab results	Number of close contacts		Outcome	
							In the swab	Given prophylaxis	case	Close contact
Case 1 (SSB)	P 6 Year 10 Month	Dusus Mardian	23/02/2022	<ul style="list-style-type: none"> • Fever • Swollen neck • White patches on the mouth 	DPT immunization 1, 2 and 3	Kultur (+) C. Diphtheriae	-	61	Die 10/03/2022	
Case2 (MAF)	L 2 Year 7 Month	Dusun Gozali	08/06/2022	<ul style="list-style-type: none"> • Fever • Sprue • Swallowing pain • crowded 	Not immunized	Kultur (+) C. Diphtheriae	10	21	Die 13/06/2022	Positive=2, i.e. Brother (P,13thn) and His Aunt (P,43thn)
Case 3 (MN)	L 3 Year 10 Month	Dusun Suro	19/08/2022	<ul style="list-style-type: none"> • Fever • Swollen neck 	Not immunized	Culture (+) C. diphteriae	3	3	Die 21/08/2022	

Verification of Diagnosis Results

Based on the classification of diphtheria diagnosis, the three cases of diphtheria in Gili Ketapang Village are laboratory confirmed cases. Case information as in figure 1

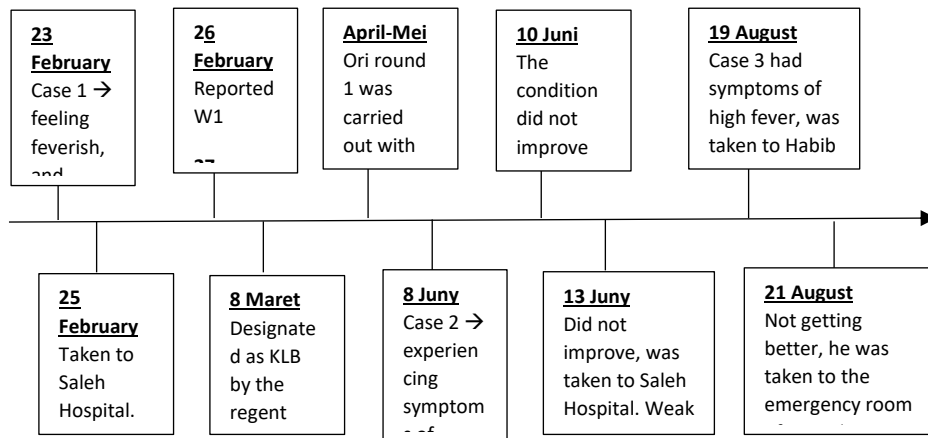


Figure 1 Chronology of diphtheria cases

In February 2022, a case of Diphtheria from Probolinggo Regency was reported in the Gili Ketapang Village area which was later determined to be a KLB. Following the death of the first case on March 10, the local government of Probolinggo Regency took a countermeasure policy to carry out ORI. However, the ORI has not yet been completed, another diphtheria case was reported in June and August 2022.

Identify the Source and Mode of Transmission

Based on the chronology of events, it is suspected that there is no epidemiological relationship between the three cases. This is attributed to the residences of the three cases located in different hamlets, so it is suspected that there was no interaction between the three cases before.

The absence of an epidemiological relationship between the three cases is also reinforced by the timing of events between cases. The time gap between cases appears more than the time of transmission of the disease. In theory, the transmission period of a case is 2-4 weeks after its incubation period. The distance from the emergence of case 1 to the occurrence of case 2 is 4 months (15 weeks) and the emergence of case 3 is 11 weeks from the occurrence of case 2. The time distance of emergence from case 1 to case 2 and case 2 to case 3, has exceeded the period of transmission of cases.

The possibility that can occur is transmission through carriers (carriers) located in Gili Ketapang Village or carriers who interact with cases outside Gili Ketapang Village. The possibility of transmission from carriers is very large considering that Gili Ketapang Village is a densely populated village.

Close Contact Tracing and Handling

Based on the results of contact tracing, case 1 obtained as many as 62 people (7 people (10%) from family, 25 people (40%) from school friends and teachers, and 30 people (50%) from neighbors or relatives). From the results of close contact tracing

of case 1, no clinical symptoms were found leading to diphtheria disease so as a form of prevention, all close contacts were given erythromycin prophylaxis at a dose of 250 mg in 4 doses for 7 days for children (schoolmates) and a dose of 4x500 mg / day for 7 days for adults.

The results of contact tracing in case 2, as many as 21 relatives/families. In contact case 2 a throat swab was performed on 10 close relatives due to the limitation of the tool. From the swab results of 10 close contacts, 2 contacts tested positive for *C. Diphtheriae* bacterial culture, namely in Big Brother and Aunt from case 2. There were no symptoms leading to diphtheria even though the swab result tested positive. This is a difficult thing to accept and a reason for the family to refuse the investigation. But as a form of prevention, all contacts of case 2 have been given erythromycin prophylaxis according to the dosage.

Family contact tracing results from case 3 were performed only on the nuclear family. Of the 3 contact cases, 3 were also swabed and the swab results tested negative for the three close contacts.

By Age

The three cases of diphtheria in Gili Ketapang Village are the age group of children under 7 years old, where the population group is a vulnerable group for diphtheria disease. If divided into age groups, the highest attack rate is the toddler age group (0-4 years) which is 0.5 per 100 population ($2/374 \times 100$ population). And the attack rate in the age group of 5-9 years is 0.2 per 100 population ($1/637 \times 100$ population).

By Gender

Based on gender, 2 (67%) cases are male and 1 (33%) cases are female. In addition, there were 2 positive close contacts of the female sex.

Based on Symptoms

Based on the symptoms experienced by the three cases. Here is the distribution of symptoms

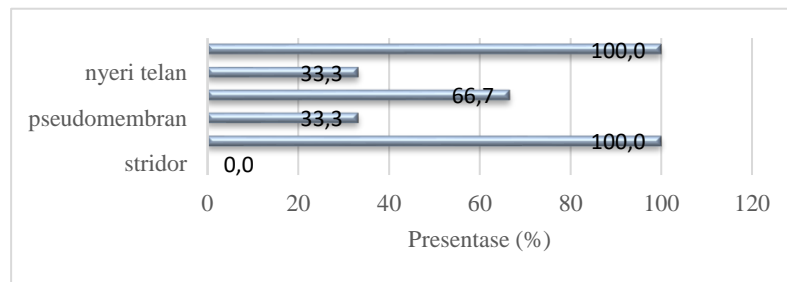


Figure 2 Distribution of Symptoms of Diphtheria Cases in Gili Ketapang Village in 2022

All cases (100%) experienced symptoms of fever and swollen neck, but only 1 case (33%) had pseudomembrane and 1 case (33%) had swallowing pain.

Based on Immunization Status

Based on the results of epidemiological investigations (form diph-1) regarding immunization status, as many as 2 (66.7%) cases have never been immunized.

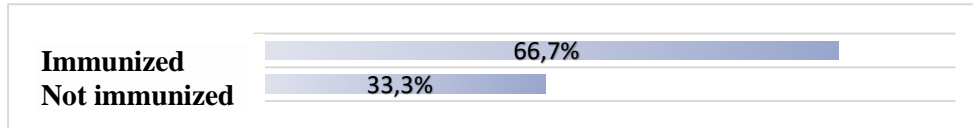


Figure 3 Distribution of Immunization Status of Diphtheria Cases in Gili Ketapang Village in 2022

By Time

Analysis of diphtheria cases in Gili Ketapang Village by time can be seen in the following figure.

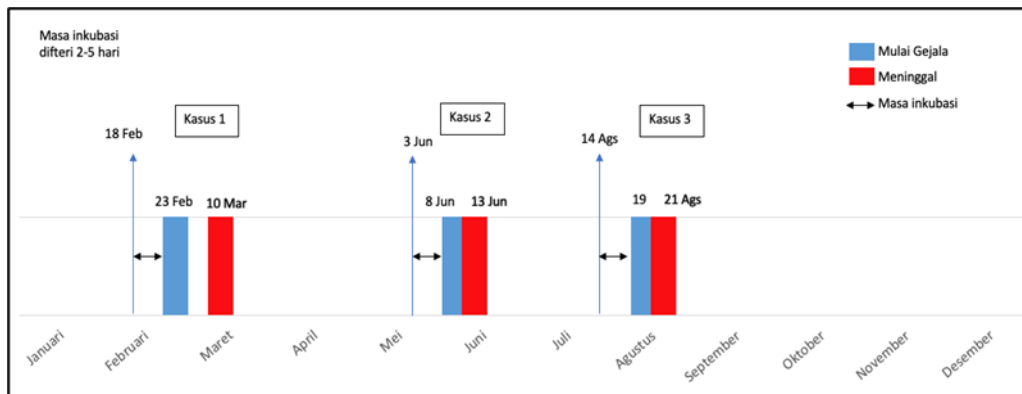


Figure 4 Diphtheria Case Analysis based on the incubation period of Diphtheria Outbreak in Gili Ketapang Village in 2022

The three cases of diphtheria in Gili Ketapang Village, in theory, do not have an epidemiological relationship according to the time of occurrence. This can be seen from the calculation of the incubation period of the next case not being in the transmission period previous case. The longest transmission period of diphtheria disease is 4 weeks from the onset of symptoms. So in case 2, the incubation period is in the range of June 3, 2022, while the transmission period of case 1 ends on April 7, 2022. Likewise, case 3, the incubation period is in the range of August 14, but the transmission period of case 2, according to the calculation of the longest transmission period in theory ends on July 11, 2022.

By Place



Figure 5

Location of diphtheria case distribution in Gili Ketapang Village

The three cases are spread across 3 hamlets, the first case is from Mardian Hamlet, the second case is residing in Gozali Hamlet and the third case is domiciled in Suro. There was no linkage in activity between the three previous cases.

Identify risk factors

a. Immunization Coverage

The target of routine immunization coverage of diphtheria, both basic and advanced, is 95%. From IDL coverage data in Gili Ketapang Village in the last 5 years (2017-2021), those with coverage below the target are 2017 and 2021, namely 89.9% in 2017 and 70.1% in 2021.

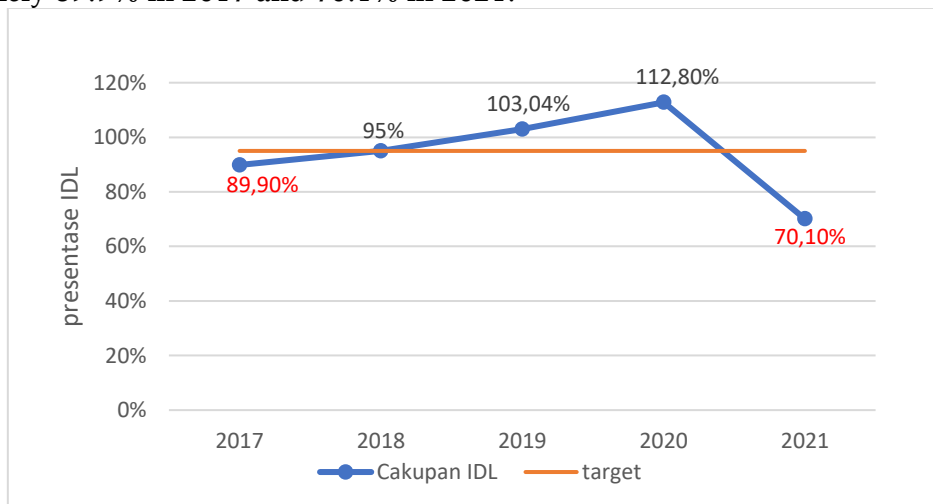


Figure 6 Achievement of Complete Basic Immunization Coverage (IDL) of Gili Ketapang Village in 2017-2021

Cold chain conditions and vaccine management

Based on cold chain observations, it is known that at the Gili Ketapang Village Auxiliary Health Center, there is only 1 cold chain that can store ± 15 boxes of vaccines. Cold chains are in a functioning condition but less optimal because they have been using for a long time. The cold chain is not a new procurement, but used use from a pharmaceutical warehouse that was functioned in Gili Ketapang Village in 2017. The midwife on duty always checks the temperature every day. Temperature indicators still work. The temperature is monitored at 2-4°C. Vaccine Vial Monitor (VVM) indicates condition A, which means the vaccine is suitable for use. Cold chain cleaning is carried out once a month.

Administration of Anti-Diphtheria Serum (ADS)

Of the 3 cases that occurred, only case 1 received ADS, while case 2 and case 3 had not had time to get ADS because the condition had decreased when taken to the hospital. ADS is not available at the District level, so patients have to wait for ADS from the province after getting confirmation from a team of Diphtheria experts. This is an obstacle in handling cases in hospitals that are at risk of increased CFR.

Drug Monitoring (PMO)

The designated medication monitoring for the 85 close contacts were cadres and community leaders, but the PMO was not given a medication monitoring form that was supposed to be filled out daily for 7 days. This is a possibility of losing control of the continuity of monitoring medication adherence.

Condition of Health Services and Health Workers

Gili Ketapang Village is the working area of the Sumberasih Health Center which is a separate island, so the distance to the main health center is quite far. The only basic health service in Gili Ketapang Village is an auxiliary health center. If residents need advanced health services such as practicing doctors, clinics or hospitals, they must leave the village in Probolinggo City (because the crossing port is in the city area). Meanwhile, the health workers assigned to the Gili Ketapang center are 4 midwives.

In terms of administration, Gili Ketapang Village is divided into 8 hamlets, namely Coastal Hamlet, Mujahideen Hamlet, Krajan Hamlet, Baitur Rohman Hamlet, Mardian Hamlet, Gozali Hamlet, Suro Hamlet and Marwa Hamlet. There are 7 posyandu and 34 cadres to assist in Community Resourced Health Efforts (UKBM) activities.

Socio-Demographic Conditions

The total population of Gili Ketapang Village in 2021 is 8,509 people (the result of BPS projections for Probolinggo Regency) with an area of 0.61 km² (1.9% of the district area). The average population density is 13,949 inhabitants for each km². The population density is categorized as very dense. The residents of Gili Village are a Madurese tribe with Madurese as a colloquial language.

The dominance of the population according to age is 30-49 years old which is the population of productive age. Fishermen's livelihoods are the main livelihood in Gili Ketapang Village. Based on data on the level of education of the population over 5 years, it is known that most of the population has a low level of education, namely

45% do not go to school, 26% do not finish elementary school and 24% finish elementary school. Only 2% completed high school and college education.

Population Mobility

The mobility of the residents of Gili Ketapang Village is quite high. This is because the village is a separate island, so every day there is always traffic in and out of the village to meet the needs. Every morning there is always a motorboat that transports the residents of Gili Village to Probolinggo City for shopping and other activities, as well as people who work on the island of Gili, such as teachers and other officers who are always travelers.

Countermeasures carried out

a. Health Counseling

Health counseling and information submitted are symptoms that must be watched out for, then advised to immediately inform health workers if they experience or there are neighbors / relatives who have symptoms like those suffered by the patient. Officers also provided information to the public about the importance of immunization.

b. Administration of prophylactic therapy on case contacts

One of the efforts to prevent and cure diphtheria is to increase immunity in people who have been in contact with sufferers. Prophylactic therapy is given to all contacts that have been identified at the time of epidemiological investigation. The therapy given is erythromycin at a dose of 50 mg / kgBB / day in 4 doses for 7 days.

c. Rapid Convenience Assesment (RCA)

This activity is carried out by recording the immunization status of toddlers in Gili Ketapang Village around the case house of at least 20 houses. This activity aims to validate the immunization coverage of toddlers in the region. The target coverage is that 95% of toddlers have been given basic immunizations. RCA results from 30 children, 17 children (56.7%) were under five years old (Toddlers) and 13 children (43.3%) were five years old and above. The complete basic immunization coverage for DPT-1-2-3 is 70%. The value is still below the supposed target.

d. Outbreak Respon Immunization (ORI)

After the establishment of the Diphtheria K1b in Gili Ketapang Village in March 2022, the implementation of the first round of ORI carried out in April-May has not yet reached the target target. The implementation of the first round of ORI until May is still below 70%, and due to these low achievements, the immunization status of ORI case 2 and case 3 is still nil, especially since they have not received basic DPT immunization at all. Finally, the implementation of the first round of ORI was accelerated and continued the 2nd round of ORI. Finally in August, the first round of ORI has reached 98.8% and the implementation of the 2nd round of ORI is 70%. The pursuit of the ORI 2 target will continue until the implementation of ORI 3 which starts in October until it is completed.

e. Verification of Diphtheria KLB Cases

There have been 3 cases of diphtheria in Gili Ketapang Village from February to August 2022. Based on the operational definition of diphtheria diagnosis, all three cases are laboratory confirmed cases. The symptoms

experienced by all cases are fever and bullneck, but only 1 case experienced the typical symptoms of diphtheria, namely the presence of pseudomembrane. The local government issued a decree establishing klb in Gili Ketapang Village after the first case was found in February. This is in accordance with the operational definition of klb determination which states if in a district / city area one diphtheria suspect is found with the confirmation of a positive culture laboratory is a diphtheria outbreak (Akbar et al., 2019).

The KLB can be determined by the head of the district/city health office, the head of the provincial health office or the minister of health. The determination of the diphtheria klb of Gili Ketapang Village is determined through the Decree of the Regent of Probolinggo No. 440/154/426.32/2022. This is expected to encourage more serious handling efforts because it involves the highest leadership in a region. It is associated with the support of operationalization of activities. In its operations, countermeasures are always accompanied by investigations, and their implementation requires preparation of both logistics, human resources and comprehensive cross-program cooperation (Akbar et al., 2019). So that it will be easier if you get direct support from regional leaders.

f. Identify the Source and Method of Transmission

Based on descriptive epidemiological analysis, there is no epidemiological relationship between the three cases in terms of chronology and time of occurrence, because the estimated incubation period of each case has passed the previous case transmission period if the first case (SSB) is considered an index case. Likewise, in terms of place, even though they are located in one village, the three of them never interact because they are in different hamlets and have no relative relationships. The source and method of diphtheria transmission in Gili Ketapang Village is strongly suspected to come from carriers. In endemic areas, 3%-5% of people who do not show symptoms can act as carriers or carriers of thioxxygenated diphtheria bacteria. *C. Diphtheriae* bacteria can survive in the outside air for up to 6 months (Hartoyo, 2018). In line with the epidemiological investigation at the Diphtheria Outbreak in Ngawi in 2015, the transmission of cases by proximity to the location has not found strong epidemiological evidence, but from the analysis of the transmission period from the incubation period the cases are likely to be more likely to be infected by the carrier (Rahman et al., 2017).

g. Close Contact Tracing and Handling

To control the spread of the disease and preventive efforts to prevent the spread of transmission, close contact tracing is carried out. 85 close contacts of all three cases have been identified. All contacts had been given erythromycin prophylaxis according to dosage and 13 close contacts were taken throat swabs. Positive *C. Diphtheriae* bacterial culture results were found from 2 close contacts of the second case (MAF) although both were asymptomatic. Both contacts can be a carrier and a source of contagion for their environment. A diphtheria carrier is a person who has a toxigenic diphtheria germ and can transmit it even if it does not cause upper respiratory symptoms (pharyngitis or laryngitis) or other systemic symptoms (Cdc, 1993). Therefore, any close contact is given antibiotics to prevent the proliferation of germs. With 3 cases of diphtheria with death and the discovery of a positive contact with diphtheria shows the spread of the disease in Gili Ketapang Village.

In close contact management should also appoint a Drug Supervisor (PMO). Close contact of diphtheria cases in Gili Ketapang Village has appointed a PMO, but no monitoring or recording has been carried out, this is also a risk. Supervision of taking medications should be carried out mainly on the 1st and 2nd days because bacteria are estimated to die after administering antibiotics for two days, as well as the 7th day so that there is no withdrawal of antibiotics that can cause resistance. PMOs should come from health cadres or community leaders and not come from families (Akbar et al., 2019).

h. Case Epidemiology

The three cases in diphtheria outbreak in Gili Ketapang Village are in the age range of under 10 years. The largest attack rate of 0.5% is in the age range of 0-4 years. 67% of cases have not received a complete basic immunization. From the results of close contact tracing, it was found that 2 positive close contacts were female who were over 10 years old, namely 13 years old and 43 years old. The two close contacts are strongly suspected to be carriers of diphtheria. Similar to other studies in Samarinda City show that there are more female diphtheria carriers than men (Pratama & Tandirogang, 2019). Several studies on susceptibility to diphtheria in adults have also shown that seroprotection deficiency is more common in women than men. This difference may be due to a gender-specific immune response after vaccination (Sharma et al., 2019).

All diphtheria cases in Gili Ketapang Village have the last state of death (CFR=100%). Apart from immunization factors, this is often attributed to delays in handling that can be caused by the existence of distant health facilities. Gili Ketapang Village is an island where there are only auxiliary health centers, so if you need intensive treatment, you have to go to the hospital, which means you have to cross the island to Probolinggo City. In line with the research on risk factors for diphtheria events in Blitar Regency which states that access to health services such as mileage to health care facilities is related to diphtheria events, long distances allow delays in treatment that can aggravate the patient's condition (Pratama & Tandirogang, 2019).

i. Risk Factor Identification

The cause of the increase in diphtheria cases or transmission is caused by multi-factors. Of the immunization status of the three cases, only the first cases received DPT immunization 1, 2 and 3, while cases 2 and 3 never received immunization. From the complete basic immunization coverage data report of Gili Ketapang village, immunization coverage is still below the target of 90% achievement. Although diphtheria immunization is an effective effort to prevent diphtheria disease, diphtheria can reappear due to low immunization coverage. In line with the study of epidemiological characteristics and immunization status of diphtheria patients in East Java, the completeness status of immunization plays a very important role in the incidence of klb in 2018, especially patients who do not have a complete immunization history and have never received immunization (Wigrhadita, 2019).

Gili Ketapang Village only has one auxiliary health center with 4 midwives on duty. This is not commensurate with the total population of Gili Ketapang Village which reaches 8509 people. The reason is, in addition to carrying out mandatory duties, village midwives also carry out puskesmas activities in the form of public services in their work areas. The existence of village midwives is very

important in infant and child health services, in this case including the implementation of basic immunization (Safitri, 2019). Vaccine monitoring should be carried out more strictly because the coldchain used has a long service life. Vaccines are very sensitive to heat and freezing temperatures, it is necessary to periodically evaluate how the distribution pattern is because once the vaccine loses its potency, it will not be able to be repaired and the vaccine will not provide the protection as expected (Sariadji & Sembiring, 2019).

In the diphtheria surveillance manual, the provision of ADS logistical support can be carried out at the provincial and district levels. However, ADS is not available at the district level so in its need it needs to wait from the provincial level. Treatment of diphtheria requires anti-diphtheria serum and antibiotics. Serum and antibiotics are given together because serums cannot be used to kill the causative bacteria and prevent disease transmission. Vice versa, antibiotics cannot replace the role of serum to neutralize diphtheria toxin. Serum will be effective when administered in the first three days from the onset of symptoms. Delays in serum administration will increase the risk of complications and death (Control et al., 2005) (Sariadji & Sembiring, 2019).

Gili Ketapang Village has a high population density compared to its area, this also causes the density of housing and the distance between houses is very close. The dense environment of residents facilitates the transmission of diphtheria (Sariadji & Sembiring, 2019). The total population of Gili Ketapang Village is dominated by the young adult age group. In addition to immunization factors, the increasing adult population that is susceptible to disease can also increase the incidence of diphtheria. This is in accordance with other studies that state the body's anti-DT decreases with age due to changes in the immune system and/or inadequate vaccination at an early age (Sharma et al., 2019). Therefore, revaccination in adulthood is recommended to maintain herd immunity. The majority of the education of the residents in Gili Ketapang village do not go to school and do not finish elementary school. The level of education of parents influences the knowledge and behavior of prevention as well as awareness to provide immunization to the child (Putranto et al., n.d.).

The geographical condition of Gili Ketapang Village in the form of an island triggers the high mobility of residents in and out of the island to meet their needs due to the limited public facilities on the island. Population mobility is a factor to watch out for because it increases the risk of spreading bacteria from one place to another and increases contact from one person to another (Rahman et al., 2017).

j. Obstacles in Countermeasures

Efforts to overcome klb are carried out with the aim of breaking the chain of transmission so as to reduce the number of pain, death and the area of the affected area. After being designated as a KLB, efforts have been made such as counseling related to diphtheria, symptoms, causes and prevention methods, close contact tracing followed by the provision of prophylaxis according to guidelines. The problem with the prophylactic administration is that there is no recording and reporting from the appointed PMO. Then ORI was carried out on the total population of Gili Ketapang Village. One of the provisions for the implementation of ORI is to be carried out on the area of one regency/city but if it is not possible for some reason, the ORI is carried out at least one sub-district with a target according to epidemiological studies and is carried out as soon as possible with an

interval of 0-1-6 months (Akbar et al., 2019). Regional policy establishes ORI in Gili Ketapang Village with a total population target in the hope of forming herd immunity in villages on one island. However, in its implementation there are obstacles, namely that it is not carried out immediately so that the initial achievements are still very low. The implementation of the first ORI has not been completed, until it appears next case. The next obstacle is a decrease in coverage at the next implementation interval caused by several factors such as employment reasons, illness and rejection. Incomplete implementation of ORI will cause an immunity gap. Individual immunity is affected by the frequency of immunization administration, while incomplete administration of the vaccine cannot form herd immunity. This causes groups that do not follow the complete immunization to have a greater potential to contract or transmit diphtheria in the future (Radian et al., 2018).

CONCLUSION

There has been a Diphtheria Outbreak in Gili Ketapang Village, Probolinggo, which has been confirmed positive by laboratory examination. There were 3 cases of diphtheria within 7 months (February-August 2022) in Gili Ketapang Village with a CFR of 100% and the largest Attack rate in the toddler age group (0-4 years) of 0.5%. From the identification of close contacts, 2 positive contacts (close contacts of case 2) were found who had no symptoms. Based on the epidemiological picture, transmission is strongly suspected to be caused by carriers, not direct transmission between cases. Risk factors for diphtheria outbreaks in Gili Ketapang Village include low basic immunization coverage or has not reached the target, limited health facilities and resources, inefficient ADS management, sociodemographic conditions and mobility of residents who are at risk of transmitting diphtheria disease. The problem found in the countermeasures was that the administration of prophylaxis was ineffective because there was no monitoring of drug adherence and constraints on the slow achievement of ORI targets.

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