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Meningitis Streptococcus Suis Outbreak Investigation in Blimbing Sari Village, Jembrana Bali

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Abstract

The aim of this outbreak investigation is to prevent the spread of the disease, prevent the recurrence of similar cases in the future, ensure that the situation is truly an outbreak, identify the source and method of disease transmission and identify vulnerable areas or populations at risk. The investigation was conducted with interviews to seek related information with the hospital's staff, the patient's family, the health center, the village staff and the animal welfare officer. We examined the medical records of patients and interviewed the doctor on duty and the health center officer, followed by interviewing the patient's family who was hospitalized. Interview with the head of the and the animal health officer was to find out the possible source of infection, pig farming in the village and related condition that enable MSS transmission. There were 5 cases residing in the same village. The patient's medical record indicated acute bacterial meningitis, but no laboratory diagnosis was performed due to limited equipment. The head of the village confirmed the history of processed pork products such as "lawar merah" consumption, which the meat was coming from the local pig farm in the village. The pig was slaughtered by themselves without checking the health condition of the pigs beforehand. This is not the first case of MSS in Bali Province, with cases dating back to 2015. This condition leads to conclude a suspected outbreak.

Introduction

Currently, advances in transportation technology can make the mobility of humans, animals and goods very high and fast (Rodrigue, 2020), this condition affects the risk of disease transmission globally. The world is currently facing the threat of the emergence of Extraordinary Events (KLB), namely the emergence of an incident and/or an increase in the incidence of illness or death beyond normal conditions in a group of people within a certain time period. Apart from that, the threat of the emergence of new and re-emerging diseases is also a global challenge that must be prepared to anticipate and overcome (Arrizabalaga et al., 2016; Abebe, 2020). Apart from that, climate change caused by global warming is also accelerating, this condition will influence the patterns and types of potential outbreaks of disease both directly and indirectly. Indonesia, which is geographically strategic, still has several potential outbreaks of disease. If these diseases are not monitored and controlled, they will threaten the health of the Indonesian people and cause larger outbreaks or even spread to other neighboring countries (Pascapurnama et al., 2018; Hayat et al., 2023; Coker et al., 2011).

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With all this background, it is very important that the implementation of the Early Awareness and Response System be improved again in all regions in Indonesia.

Public health is still closely related to the environment and animals (Guerra et al., 2014; Rabinowitz & Conti, 2013; Guerra et al., 2014). Several diseases that originate from the environment or animals are very dangerous for human health. In the world of medicine, diseases that spread from animals to humans or vice versa are called zoonoses. Several reports, both globally and in Indonesia itself, state that 70% of infectious diseases threaten human health because of the presence of animal elements. In general, diseases have their own history or scientific journey (Fearnley, 2020). One of the animals that carries diseases that are transmitted to humans is pigs. Pigs are animals whose living environment is far from hygienic sanitation and can even be said to be inadequate, especially in the Bali area. The environmental conditions in the pen that support it, even being connected to waste disposal, make it very easy for pigs to become hosts for other bacteria or viruses which can be transmitted to other animals and even humans. One of the bacteria found in babies and which can be transmitted to humans is Streptococcus suis (Gottschalk et al., 2007; Hakim, 2024).

Streptococcus suis is a Gram-positive bacterium that has a bean-like shape, and is a pathogen in pigs. Humans can become infected with Streptococcus suis when they handle infected pork carcasses or meat (Dutkiewicz et al., 2017; Yudhastuti, 2020), especially through open wounds and abrasions on their hands. Streptococcus suis was first reported by veterinarians in 1954, after outbreaks of meningitis, septicemia, and purulent arthritis occurred among piglets. Fourteen years later, the first human Streptococcus suis cases were diagnosed in Denmark, and subsequently, other cases were reported in other northern European countries and Hong Kong. Streptococcus suis infection in pigs is reported worldwide, from North America (United States and Canada) to South America (Brazil), Europe (United Kingdom, The Netherlands, France, Denmark, Norway, Spain, and Germany), Asia (China, Thailand, Vietnam, and Japan), Australia, and New Zealand. In addition to pigs, Streptococcus suis can be isolated from other animals, such as ruminants, cats, dogs, deer, and horses, and is believed to be a commensal in the intestinal flora. Healthy pigs can carry multiple serotypes of Streptococcus suis in their nasal cavities, tonsils, and upper respiratory, genital, and alimentary tracts. Of the 35 known serotypes, only a limited number are responsible for infections in pigs, including serotypes 1-9 and 14. Serotype 2 is considered to be the most pathogenic for both humans and pigs. Streptococcus suis is usually transmitted nasally or orally and colonizes the palatine tonsils of both clinically ill and healthy pigs. The infant piglets become infected after contact with colonized sows. Rates of asymptomatic carriage may be as high as 80%, and the morbidity ranges from <1% to >50%, although it rarely exceeds 5%.

Meningitis is an inflammation of the membranes that envelop the brain and spinal cord. This inflammation is caused by infections from viruses (Kumar & Garg, 2020; Jiang et al., 2023; Howard et al., 2024), bacteria, microorganisms, or in rare cases caused by unhealthy consumption of certain medications. Meningitis caused by a bacterial infection or bacterial meningitis is an inflammation of the brain membrane (meningen) due to the invasion of bacteria into the central nervous system (CNS), especially in the cerebrospinal fluid (CSS) in the subarachnoid and ventricular regions. Patients with bacterial meningitis show the main symptoms in the form of impaired consciousness, febris, stiffness and headache. Other symptoms can be accompanied by focal neurological deficits such as aphasia, hemiparesis, seizures and cerebral nerve paralysis. One of the bacteria that causes meningitis is the bacteria Streptococcus suis (S. suis). Streptococcus suis meningitis or MSS is a zoonotic bacterial meningitis due to infection with S. suis bacteria due to exposure to infected pigs and pig products. The clinical symptoms of S. suis are generally the same as bacterial meningitis by other causes such as headache (Zalas-Więcek et al., 2013; Shen et al., 2024), febrils, nausea-vomiting accompanied by meningeal irritation signs with the onset of this disease about 2-5

days. The most prominent and frequently reported symptom is the presence of hearing loss in more than half of cases.

Food is a primary need for humans carry out life and carry out activities every day actively. Food functions to maintain the human body in growth and development, regulate metabolism, and obtain energy to carry out daily activities and plays a role in the body's immune mechanisms (Noor et al., 2021). Several countries defines food as a substance that is processed, partially processed, or not processed for human consumption. However, sometimes these foods can be one of them the cause of an illness, even death because of the possibility contamination occurs. Food that contains pathogenic bacteria or germs Toxic substances consumed by humans can cause certain diseases, namely diseases transmitted through food (Foodborne Disease). This disease can cause several symptoms such as nausea, diarrhea, weakness, and others. According to WHO, food safety is a guarantee that food or materials Food raw materials will not have a negative impact on health or be dangerous consumers if processed and/or consumed according to its intended purpose (Salgueiro et al., 2010).

The hearing loss that occurs in Streptococcus suis infection is higher than that of other bacteria. Bali is an area that is synonymous with pig farming and also a characteristic of food with processed pork (Sedano et al., 2023). In the processed food of pigs themselves, there are several types of food whose processing process. It is not cooked or mixed using raw materials (pig blood) and it is also possible that the cooking or processing process is not optimal. One of the risk factors for the spread of Streptococcus suis is through pig products that have been infected and consumed by humans. These things cause Streptococcus suis to easily be infected and enter the human body, causing the discovery of MSS cases in Bali itself.

Indonesia is collaborating with WHO and the United States Center for Disease Control and Prevention (US CDC) to build a system for early detection and response to potential outbreaks of disease. This system is known as the Early Warning Alert and Response System (EWARS) or Early Warning and Response System (SKDR). The Early Warning and Response System (SKDR) or what is usually called the Early Warning Alert Response and System (EWARS) is a system that functions to detect threats of indications of infectious disease outbreaks which are reported weekly on a computer-based basis, which can display alerts or warning signals. an early increase in disease cases exceeding the threshold value in an area, and an alert or early warning signal that appears on the system does not mean that an outbreak has occurred but is a pre-outbreak that requires officers to respond quickly to prevent an outbreak. The implementation of SKDR is carried out routinely in stages starting from the lowest health service unit to the central level. In 2009 SKDR was first implemented in Lampung and Bali Provinces. All health center surveillance officers or managers, District/City/Provincial Health Services in the two provinces were trained. The implementation of SKDR in Indonesia has been carried out since 2009 through the Sub-Directorate for Extraordinary Surveillance and Response (Ditjen P2P) of the Indonesian Ministry of Health. At the end of 2015, the Ministry of Health of the Republic of Indonesia (RI) created a website/SKDR to facilitate data processing and reporting as an effort to detect disease early and respond quickly. The scope of this SKDR guideline is all surveillance activities in order to detect and respond to potential outbreaks of disease both in health facilities (puskesmas, hospitals, laboratories) and their networks, the Health Service and the Ministry of Health. The Early Warning and Response System (SKDR) or what is usually called the Early Warning Alert Response and System (EWARS) is a system that functions to detect threats of indications of infectious disease outbreaks which are reported weekly on a computer-based basis, which can display alerts or warning signals. there is an early increase in disease cases exceeding the threshold value in an area, and the Alert or early warning signal that appears on the system does not mean that an outbreak has occurred but is a pre-outbreak that requires officers to respond quickly to prevent an outbreak. The implementation of SKDR is carried out routinely in stages starting from the

lowest health service unit to the center, so the target population in implementing SKDR is the community in the work area of the Community Health Center, Hospital, Laboratory. Population can also be based on administrative areas starting from sub-district, district, province and national (Wolvaardt et al., 2013). The population is used to be able to compare the magnitude of the problem (number of cases per population multiplied by a constant) of potential outbreak/outbreak diseases in the SKDR between regions.

Especially in Jembrana Regency, there are 5 people reported to be affected by Meningitis Streptococcus suis (MSS), of which 3 people received treatment at the State Hospital and 2 more received treatment at the I Melaya Health Center. The definition of an Extraordinary Event (KLB) according to the 2010 Permenkes is the occurrence or increase in the incidence of epidemiologically significant pain and/or death in an area within a certain period of time and is a condition that can lead to an outbreak. Readiness and vigilance for KLB include increased surveillance activities for early detection of KLB vulnerability, increased early detection for early detection of KLB, epidemiological investigation of suspected KLB, readiness to face KLB and encourage the immediate implementation of KLB countermeasures The purpose of KLB investigation is to prevent the spread of a disease, prevent the recurrence of a KLB in the future, ensure that the situation is true of KLB, identify the source and mode of disease transmission and identify vulnerable areas or at-risk populations.

The report was followed up because it led to the KLB case because it occurred in the same place, allegedly from the same source and occurred in the same time periode. Based on this description, it is necessary to conduct an epidemiological investigation to the location related to the distribution of the disease and the factors that affect the event.

Literature Review

Outbreak (KLB) are the emergence or increase in the incidence of illness and/or epidemiologically significant deaths in an area within a certain period of time, and This is a situation that can be detrimental to the occurrence of an outbreak. Apart from infectious diseases, Diseases that can also cause outbreaks are non-communicable diseases and poisoning Certain situations that are vulnerable to outbreaks include disasters and emergencies. (Permenkes No. 1501 of 2010). Investigation of outbreaks/outbreaks that occur either in the community or in animals is carried out to identify ways to control the transmission of a disease so that the disease does not occur spread and cause more deaths. in general There are three main objectives in an outbreak/outbreak investigation, including: 1) Identify the agent that causes the outbreak/outbreak; 2) Look for sources of infection and modes of transmission based on descriptions of people, places, and time, as well; 3) Formulate recommendations to prevent the spread of outbreaks/outbreaks; 4) Find risk factors.

Disclosure of the existence of an outbreak/outbreak that is often done is by conducting analysis routine surveillance data, disease report data or reports from officers, civil servants or residents regarding an increase or incidence of disease/death in the area that is more than normal situation. The reasons for conducting an investigation into the possibility of an outbreak/outbreak are: 1) To carry out countermeasures and prevention The main reason for controlling outbreaks/outbreaks is to prevent the spread and occurrence of cases addition; 2) There are opportunities to conduct research and training Some infectious diseases were first discovered through outbreak/outbreak investigations. This too can be done to find out the nature of the agent in order to prevent outbreaks/outbreaks with the source similar. Apart from that, investigations into outbreaks/outbreaks can also be an appropriate tool for training the ability of health staff to respond to the situation. Carrying out small-scale outbreak/outbreak investigations can help health staff gain experience and confidence handle cases on a large scale.

This KLB research uses descriptive epidemiological analysis. In the investigation of this case, aspects such as time, place, and person who are or are involved in the MSS case are looked at.

Methods

The Bali Provincial Health Office (Dinkes) received information from the Jembrana Regency Health Office on March 5, 2023. There are people with complaints of fever, stiffness, vomiting, headache and impaired consciousness in Blimbing Sari village, Melaya District, Jembrana Regency. The investigation team prepared investigation preparations to the designated location. Investigators held discussions with the Jembrana Regency Health Office team and local epidemiologists about information about the incident. Officers observed the location in the form of the scene of the incident, the location of the distribution, and the number of people who were sick. Cross-sector involvement is urgently needed to provide assistance and facilitate investigations to the community.

Data collection (primary) was carried out by direct observation to the location, and interviews with doctors who were on duty to treat the patient at the State Hospital, the Melaya I Health Center and the Blimbing Sari Village Prebekel as well as the patient's family who were undergoing treatment. Interviews were also conducted with local health officers who had made observations to one of the pig farmers in the area. Secondary data was obtained from the State Hospital and the Melaya I Health Center related to the patient's medical records.

Result and Discussion

From the results of the KLB investigation conducted on the MSS case report in Jembrana Regency, the following results. These three variables are considered the most commonly used variables in epidemiological studies. Researchers in epidemiology and public health use these three variables (person, place, and time) (Diez-Roux, 2000) to search for relationships and determinants of health that explain several health phenomena, especially disease. Often, it is important to know who the person is – although, it could also be an animal, insect, or other living creature, or inanimate object involved in a particular event or incident; and place, and time of occurrence. This is similar to what journalists use in their news writing/reporting, who, where, and when. Who – person, Where, place, and When, time.

Time

Following who, where, and when are used, time is when. Other concepts of time In addition, it is customary (in most epidemiology books) to include in this section on time, the main characteristics of time, which include the concepts of cyclical variation, point epidemics, secular trends, and clustering. Cyclic fluctuations are a term used to describe oscillations that occur over long periods about a secular trend line or time series curve (Demetrescu & Dobrica, 2014). On the other hand, cyclical fluctuations often involve a disease that does not appear (frequency) at a certain time but appears and reappears at certain periods of time. The term secular comes from the Latin, “Saeculum”, which generally means someone who is not a priest, but in epidemiology, secular is used to refer to a long period of time (usually years) in which some disease occurs. This trend is influenced by the level of immunity in the population and possibly non-specific factors such as levels of poverty, or, lack of access to preventive health services. Time variables can analyze differences in views of the epidemic curve. The relationship between time and disease is a basic requirement in the analysis epidemiology due to changes in disease over time represents a factor etiological. Some disease patterns: 1) Sporadic (rare and irregular); 2) Endemic disease (predictable occurrence); 3) Epidemic (unusual event/KLB); 4) Propagating epedemics (diseases that continue to increase over time)

The Bali Provincial Health Office (Dinkes) received a report from Jembrana Regency related to a case of MSS incident found in the area on March 5, 2023. Based on the report, an

investigation was carried out at the location by the Bali Provincial Health Office on March 6, 2023. The chronology of patients who experience symptoms of meningitis includes:

Patient 1

On Thursday, March 2, 2023, a patient in the name of I Made Suwita, 58 years old, male, address Banjar Blimbingsari, Blimbingsari Village, came to the ER of the I Melaya Health Center at 06.50 WITA with complaints of heat since 3 days, vomiting more than 3 times, joint pain. The patient was then examined and decided to be hospitalized on the same day. At 11.00 WITA, patient I Made Suwita experienced complaints of restlessness, difficulty urinating, and tantrums of pulling out the IV while in the inpatient room. The family said there was no history of dog bites in the patient. The patient was then referred to the ER of the State Hospital at 14.08 WITA.

Patient 2

On Wednesday, March 1, 2023, a patient on behalf of I Ketut Adi Wirawan, 46 years old, male, address Banjar Blimbingsari, Blimbingsari Village, came to the ER of the I Melaya Health Center at 22.35 WITA with complaints of dizziness, headache, fever, vomiting 1 time from noon. The patient was discharged at 23.05 WITA and received treatment for outpatient treatment. On Thursday, 2-3-2023 the patient came again to the ER of the Melaya I Health Center at 07.30 WITA with complaints of fever for 2 days, vomiting 3 times, severe headache, starting at 07.35 WITA the patient was seen starting to get restless due to pain. The patient was decided to be hospitalized but when the infusion was installed, the patient went berserk and the infusion failed to be installed. Furthermore, the patient was given tablet medicine to be taken but the patient refused and went berserk. The patient's condition deteriorated until 10.00 WITA the patient was not cooperative at all and beat his family. The family said there was no history of dog bites in the patient. The patient was decided to be referred to the ER of the State Hospital at that time.

Patient 3

On Friday, March 3, 2023, a patient on behalf of Ni Made Dwi Rahmani, 59 years old, female, address Banjar Blimbingsari, Blimbingsari Village, came to the ER of the I Melaya Health Center at 20.10 WITA with complaints of fever for 2 days, vomiting 2 times, dizziness, headache, and on physical examination it was found to be stiff. The patient had eaten pork lawar at the Blimbingsari celebration on Friday, February 24, 2023, the family said there was no history of dog bites. The patient's consciousness worsened so that the patient was referred to the ER of the State Hospital on 3-3-2023 at 21.00 WITA.

Patient 4

On Tuesday, February 28, 2022, a patient on behalf of Ni Luh Putu Herlia Yustina, 43 years old, female, address Banjar Blimbingsari, Blimbingsari Village, came to the general polyclinic of the I Melaya Health Center with complaints of heat, dizziness and body pain, stiff hands, and stiff neck since Monday, February 27, 2022. The patient was diagnosed with carpal tunnel syndrome and second day of febris observation and leukocytosis. Sodium diclofenate, Paracetamol and amoxicilin are given treatment. After that, the patient is allowed to go home. Three days later on Friday, March 3, 2023, the patient came to the ER of the Melaya I Health Center with complaints of fever, nausea, and vomiting since 2 days on March 1, 2023, the body felt weak. The patient was diagnosed with obs febris on the 5th day, leukocytosis, and vomiting. So it was decided that the patient would be hospitalized at the I Melaya Health Center. The patient has a history of coming to the celebration in Banjar Blimbingsari.

Patient 5

On Saturday, March 4, 2023, a patient on behalf of Ni Kt Reti, 54 years old, female, address Banjar Blimbingsari, Blimbingsari Village, came to the ER of the I Melaya Health Center with complaints of fever since 2 days ago, headache, vomiting. The patient was diagnosed with febris on the second day, vomiting, cepalgia and was given medication and allowed to go home. The next day, on March 5, 2023, with complaints of fever, nausea and abdominal pain, the patient was decided to be hospitalized at the I Melaya Health Center. The patient has a history of coming to the celebration on Saturday, on 25-2-2023.

Place

In epidemiology, the use of 'Who?', 'Where?', and 'When?' helps to remember that 'Who?' is the person, 'Where' refers to the place, and 'When?' is time. One of the main characteristics of place is that place can mean more than one thing, for example, place can refer to a location (an area, city, state, country, etc.), but because place is a spatial concept, it is often described using coordinates geospatial such as latitude and longitude. That is one of the main reasons, in recent decades, geospatial analysis has advanced rapidly in the field of epidemiology and public health in general. Overall, differences between urban and rural populations may not be very different, however, health differences have been reported between rural and urban communities. These differences between urban and rural populations may not be that different, but people living in rural areas are more likely to engage in negative behaviors that affect their health and quality of life.

Based on the report received by the Bali Provincial Health Office, the location of the case suspected of being the MSS KLB is in Jembrana Regency, Bali. In conducting the investigation, the initial location was the State Hospital, where interviews were conducted with doctors on guard to obtain the patient's medical records and also interviews were conducted with the patient's family who happened to be at the location. However, at the State Hospital, which was previously reported to have 3 people suspected of MSS, at that time there were only 2 people left who were still undergoing hospitalization while 1 person had been allowed to go home with improved conditions. After conducting an investigation at the State Hospital, the next location to be visited was the Melaya I Health Center, where there were 2 patients who were undergoing treatment. Furthermore, the investigation was carried out at the Blimbing Sari Village Perbekel Office where the five patients with suspected MSS were located in Blimbing Sari Village. An interview was conducted with the Blimbing Sari Village Perbekel and also brought in a local Health Officer to dig up information related to pig farmers and also whether there are any ongoing activities in the village.

Person

When discussing who is at risk, the focus is usually on the individual. This is why it is generally referred to as “person”. The most common subcategories of person variables are race and ethnicity; gender, age, occupation, marital status, socioeconomic status, and other socioeconomic and political variables. Some of these characteristics may have a greater impact on a person's health more than others, but in general, they are all important because it is the combination of factors (also called, determinants) that 'determine' an individual's health. in public health and other fields of study, gender as a determinant of health has a strong influence on women's health status. The age variable seems self-explanatory, since we know that people are generally children (with several subcategories), youth, adults, or old. However, age is a complex variable, especially for data collection and analysis purposes, because a person's age determines several stages of health. Epidemiology is concerned with the presence of diseases in people of all ages, but childhood and adulthood are periods of particular concern because common knowledge dictates that there are diseases that are characteristic of these two age periods. A person's job seems to be a clear category because generally speaking, people and

their jobs are defined (broadly) by their jobs. If there is a place where job variables matter, it is in the field of environmental science. Exposure to toxic chemicals, and other environmental contaminants is higher in certain occupations or occupations. In general, marital status more than any other variable is primarily a legal category or other example of a social construct. What defines someone as single or married is controversial if we think of two people living together for a long period of time as a couple, and although they may not be legally married, Ras is largely a biological characteristic of a person, whereas ethnicity is largely related to the ethnic group to which the person belongs; both are socially constructed concepts. As defined by the American Sociological Association, "Ras" refers to physical differences considered socially significant by groups and cultures, while "ethnicity" refers to shared culture, such as language, ancestry, practices, and beliefs and is one of the main factors used to explain health disparities.

However, in the discussion here, the person at the heart of this case is anyone who is suspected or has symptoms leading to meningitis. Based on a report received by the Bali Provincial Health Office from Jembrana Regency, there are 5 people suspected of being MSS. Of these 5 people, they came from the same village, namely Blimbing Sari Village, and had previously consumed processed pork food on the same day. Of the 5 people, 3 people participated in the celebration in the village and 2 other people consumed processed pork food at one of the stalls in the area.

Tabel 1. History of patients suspected MSS

dentity	Place of Treatment	Symptoms				
		Headache	Nausea	Vomiting	Body Ache	Hearing Disorder
Patient I	National General Hospital	+	+	+	+	-
Patient II	National General Hospital	+	+	+	+	-
Patient III	National General Hospital	+	+	+	+	-
Patient IV	I Melaya Health Center	+	+	+	+	-
Patient V	I Melaya Health Center	+	+	+	+	-

Streptococcus suis meningitis or MSS is a zoonotic bacterial meningitis due to infection with S. suis bacteria. MSS disease is often found in areas that are synonymous with the pig industry because MSS disease itself attacks pigs and can be transmitted from pigs to other pigs as well as from pigs to humans. In 1994, the first case of Streptococcus in pigs was found in Bali and was successfully isolated by BPPV region VI (BBVet Denpasar).

The MSS incident was rediscovered in Bali in 2015, according to existing data there were no cases found until he died. However, it is hoped that the Balinese people who are identical to consuming processed pork food should be careful and process ingredients derived from pigs properly and correctly. Based on a report from Jembrana Regency on March 5, 2023, it is suspected that the MSS case was rediscovered. Based on the results of the interview, 3 of the residents who were suspected of experiencing MSS had previously consumed processed pork food, 1 of which participated in the process of slaughtering pigs. A few days after consuming the processed pigs, they experienced complaints of fever, vomiting, headache, and on physical examination it was found that the pig was stiff. In the area there are also pig farmers, where the ingredients from the processed pigs come from farmers in the village.

There are 9 pigs on the farm, but there are only 6 left because the other 3 have been used in celebration activities in the village. The patient's medical record pointed to acute bacterial meningitis, but laboratory diagnosis could not be made because of the limitations of equipment at the State Hospital. From the results of the investigation to the field, it cannot be said that it is a KLB related to several limitations, but the case that occurred led to a suspect in the occurrence of KLB where this is based on the Regulation of the Minister of Health Number 1501/Menkes/Per/X/2010. The Jembrana Regency Government has not designated this case as an Extraordinary Event (KLB).

Conclusion

The pathogenesis of Streptococcus suis infection is currently not completely known. However, what needs to be understood is that Streptococcus suis infection is a systemic hematogenous infection that can show various clinical manifestations such as meningitis, sepsis, septic arthritis, endocarditis and endophthalmitis. Prompt diagnosis and appropriate and comprehensive treatment greatly influence the prognosis of patients with Streptococcus suis infection.

As a result of the investigation into the field, in Blimbing Sari Village, Jembrana Regency, the findings of the case suspected of MSS cannot be said to be a KLB related to several limitations, but the case that occurred led to a suspect in the occurrence of a KLB. The Jembrana Regency Government has not yet designated this as an Extraordinary Event (KLB). In the human health sector, the determination of the KLB is carried out by: a) District/City Kadinkes, Provincial Kadinkes, or the Minister of Health can determine internal regions outbreak situation; b) District/City Kadinkes or Provincial Kadinkes. determine an area in an outbreak situation in their respective working areas by publishing KLB reports; c) In the event that the District/City Kadinkes does not determine an area in its territory under the circumstances KLB, Provincial Kadinkes. can determine the area in an outbreak situation; d) In the case of the Provincial Kadinkes. or the district/city Kadinkes does not determine an area in the region is in an outbreak situation, the Minister determines the area is in an outbreak situation.

Revocation of KLB status can be carried out by the Minister of Health, Governor, Kadinkes Province, Regent/Mayor and District/City Kadinkes if within the 2nd longest incubation period There were no other similar incidents in the area. There are several causes of outbreaks/outbreaks. However, in general, it is an outbreak/outbreak occurs due to four causes, as follows: 1) Susceptible individuals enter an endemic area for a disease infection; 2) New infectious diseases enter vulnerable populations. An example is contamination food by bacteria, viruses, or toxic materials; 3) Existing infectious diseases occur in areas with low endemicity and infect people who are vulnerable as a result of unusual social interactions. An example is when Refugees immigrate to a place; 4) The susceptibility and response of the individual/host are modified naturally by the drug.

As a form of anticipation, the Head of the I Melaya Health Center suggested to Kelian Banjar Blimbing Sari to inform the people of Blimbing Sari Village if they experience symptoms of fever, headache, diarrhea, nausea, vomiting to immediately check their health condition at the I Melaya Health Center and the nearest health facility.

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References

Abebe, G. M. (2020). Emerging and re-emerging viral diseases: the case of coronavirus disease-19 (COVID-19). *Int. J. Virol. AIDS*, *7*(067).

Arrizabalaga, J., Davis, J. E., & González, A. M. (2016). Global Threat of Reemerging Diseases. *JE Davis and AM González, To Fix Or To Heal: Patient Care, Public Health, and the Limits of Biomedicine*, 177–207. https://doi.org/10.18574/nyu/9781479878246.003.0008

Coker, R. J., Hunter, B. M., Rudge, J. W., Liverani, M., & Hanvoravongchai, P. (2011). Emerging infectious diseases in southeast Asia: regional challenges to control. *The Lancet*, *377*(9765), 599-609. Https://doi.org/10.1016/S0140-6736(10)62004-1

Demetrescu, C., & Dobrica, V. (2014). Multi-decadal ingredients of the secular variation of the geomagnetic field. Insights from long time series of observatory data. *Physics of the Earth and Planetary Interiors*, *231*, 39–55. https://doi.org/10.1016/j.pepi.2014.03.001

Diez-Roux, A. V. (2000). Multilevel analysis in public health research. *Annual Review of Public Health*, *21*(1), 171–192. https://doi.org/10.1146/annurev.publhealth.21.1.171

Dutkiewicz, J., Sroka, J., Zając, V., Wasiński, B., Cisak, E., Sawczyn, A., … Wójcik-Fatla, A. (2017). Streptococcus suis: a re-emerging pathogen associated with occupational exposure to pigs or pork products. Part I-Epidemiology. *Annals of Agricultural and Environmental Medicine*, *24*(4). https://doi.org/10.26444/aaem/79813

Fearnley, L. (2020). *Virulent Zones: Animal Disease and Global Health at China's Pandemic Epicenter*. Duke University Press.

Gottschalk, M., Segura, M., & Xu, J. (2007). Streptococcus suis infections in humans: the Chinese experience and the situation in North America. *Animal Health Research Reviews*, *8*(1), 29–45. https://doi.org/10.1017/S1466252307001247

Guerra, B., Fischer, J., & Helmuth, R. (2014). An emerging public health problem: acquired carbapenemase-producing microorganisms are present in food-producing animals, their environment, companion animals and wild birds. *Veterinary Microbiology*, *171*(3–4), 290–297. https://doi.org/10.1016/j.vetmic.2014.02.001

Hakim, L. (2024). INFEKSI MENULAR SEKSUAL YANG BERDAMPAK INFERTILITAS. *PROCEEDING BOOK RECENT CLINICALLY APPLIED-Comprehensive Diagnostic And Management of Sexually Transmitted Infections In Daily Practice*, 129.

Hayat, A., Subagiyo, A., Prayitno, G., Efendi, A., Hidayana, I. I., Wafa, R. H. S., & Salsabila, A. P. (2023). *Navigating the New Normal: Konsep dan Pola Penanganan Desa Wisata Saat Pandemi*. Universitas Brawijaya Press.

Howard, R., Benjamin, L., De Saram, S., Houlihan, C., & Manji, H. (2024). Infection in the nervous system. *Neurology: A Queen Square Textbook*, 369-432. https://doi.org/10.1002/9781119715672.ch12

Jiang, G., Zhang, J., Yin, X., Zhang, Z., Liu, Q., Xing, H., ... & He, Y. (2023). Spinal Cord and Spinal Canal Infections and Inflammatory Diseases. In *Radiology of Infectious and Inflammatory Diseases-Volume 1: Brain and Spinal Cord* (pp. 255-304). Singapore: Springer Nature Singapore. https://doi.org/10.1007/978-981-99-0039-8_20

Kumar, A., & Garg, S. (2020). Meningitis: bacterial, viral and fungal disease. *Res Rev Biosci*, *15*(2), 150.

Noor, S., Piscopo, S., & Gasmi, A. (2021). Nutrients interaction with the immune system. *Archives of Razi Institute*, *76*(6), 1579. https://doi.org/10.22092/ari.2021.356098.1775

Pascapurnama, D. N., Murakami, A., Chagan-Yasutan, H., Hattori, T., Sasaki, H., & Egawa, S. (2018). Integrated health education in disaster risk reduction: Lesson learned from disease outbreak following natural disasters in Indonesia. *International Journal of Disaster Risk Reduction*, *29*, 94–102. https://doi.org/10.1016/j.ijdrr.2017.07.013

Rabinowitz, P., & Conti, L. (2013). Links among human health, animal health, and ecosystem health. *Annual Review of Public Health*, *34*(1), 189-204. https://doi.org/10.1146/annurev-publhealth-031912-114426

Rodrigue, J.-P. (2020). *The geography of transport systems*. Routledge.

Salgueiro, L., Martins, A. P., & Correia, H. (2010). Raw materials: the importance of quality and safety. A review. *Flavour and Fragrance Journal*, *25*(5), 253–271. https://doi.org/10.1002/ffj.1973

Sedano, S. A., Cantalejo, M. G. C. T., Lapitan, C. G. A. R., de Guzman, A. M. E. S., Consignado, J. T., Tandang, N. A., ... & Silva, B. B. I. (2023). Epidemiology and genetic diversity of Streptococcus suis in smallhold swine farms in the Philippines. *Scientific Reports*, *13*(1), 21178. https://doi.org/10.1038/s41598-023-48406-9

Shen, B., Tong, L., Qiu, J., Zhong, J., Tong, Z., & Li, X. (2024). Suppurative Meningitis Complicated with Arthritis Caused by Streptococcus Suis Infection: A Case Report. *Infection and Drug Resistance*, 561-569. https://doi.org/10.2147/idr.s416341

Wolvaardt, G., Johnson, S., Cameron, D., Botha, B., & Kornik, S. (2013). Challenges and constraints at district management level. *South African Health Review*, *2013*(1), 81–92. https://hdl.handle.net/10520/EJC161448

Yudhastuti, R. (2020). *Pengendalian Penyakit yang Ditularkan Binatang*. Zifatama Jawara.

Zalas-Więcek, P., Michalska, A., Grąbczewska, E., Olczak, A., Pawłowska, M., & Gospodarek, E. (2013). Human meningitis caused by Streptococcus suis. *Journal of Medical Microbiology*, *62*(3), 483–485. https://doi.org/10.1099/jmm.0.046599-0