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Experience of East Sumatra: Eradication of Disease Outbreaks, 1880—1940s

(Pengalaman Sumatera Timur: Pemberantasan Wabah Penyakit, 1880—1940s)

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Abstrak

Pada masa awal ekspansi frontier di Sumatera Timur terjadi angka kematian yang sangat tinggi, terutama di perkebunan akibat wabah penyakit. Penelitian ini bertujuan untuk mengungkap berbagai masalah kesehatan terkait epidemi yang berlangsung di Sumatera Timur dan upaya penanggulangannya. Metode yang digunakan dalam penelitian ini adalah metode sejarah yang meliputi empat tahap penelitian, yaitu heuristik (pencarian sumber), kritik sumber, interpretasi, dan historiografi. Sumber-sumber penting yang digunakan dalam penelitian ini antara lain laporan dokter perkebunan, laporan dinas kesehatan kolonial, dan sumber sekunder sezaman lainnya. Foto-foto sezaman juga digunakan untuk memperkuat argumentasi. Hasil penelitian menunjukkan bahwa Sumatera Timur sebagai wilayah frontier perkebunan merupakan daerah yang rawan terhadap berbagai wabah penyakit seperti kolera, disentri, malaria, dan berbagai penyakit tropis lainnya. Wabah menyebabkan tingkat kematian yang tinggi. Peningkatan pelayanan kesehatan dilakukan antara lain melalui penyediaan rumah sakit yang layak, pembangunan stasiun karantina, penelitian kesehatan tropis, pemberian vaksin, dan peningkatan sanitasi. Akibatnya, angka kematian menurun secara signifikan.

Kata kunci: kesehatan, pemberantasan penyakit, penyakit menular, perkebunan. Sumatera Timur

Abstract

During the early phases of frontier expansion in East Sumatra, a notable surge in mortality rates, particularly within plantations, was observed due to widespread disease outbreaks. This study aims to illuminate the array of health issues linked to epidemics in East Sumatra, as well as the concerted efforts to mitigate them. Employing the historical method, the research encompasses four distinct stages: heuristics (source acquisition), source critique, interpretation, and historiography. Important sources include reports from plantation physicians, colonial health service documentation, and contemporaneous secondary references. Photographic evidence from the period is also incorporated to strengthen the analysis. The findings underscore East Sumatra's status as a plantation frontier, susceptible to a spectrum of outbreaks

encompassing cholera, dysentery, malaria, and various other tropical diseases. These outbreaks elevated mortality rates. Subsequent enhancements to health services were implemented, including the establishment of proper hospitals, construction of quarantine facilities, tropical health research initiatives, vaccination campaigns, and advances in sanitation practices. Consequently, the mortality rate registered a significant decline.

Keywords: disease eradication, East Sumatra, infectious diseases, healthcare, plantation.

INTRODUCTION

Until now the world is still struggling with efforts to conquer the Covid-19 outbreak, which has been circulating since the end of 2019 and caused many victims in almost all the world. In the Indonesian context, historical records of disease outbreaks cover a long period of time, as described in Harriyadi's study (2020). He mentions that during the Hindu-Buddhist era there were records of outbreaks of disease. The note is contained in a lontar manuscript in Balinese script and in Old Javanese language from 1462 Saka (1540 AD). Then, during the Islamic-Colonial period, it was stated that trade and maritime networks that opened relations between regions were suspected of being a medium for the spread of various diseases, including in the archipelago. The cholera epidemic became known in Indonesia in 1821 and was epidemic in 1910—1911. The cholera epidemic entered the archipelago through Malacca, then to Terboyo, Semarang. From Terboyo, cholera began to spread to Central Java and took its toll in April—November 1821. As a result of this epidemic, an estimated 125,000 people died in Java. The bubonic plague entered Indonesia in 1910, while smallpox epidemic had already infected Batavia in 1644. The Spanish flu also plagued Indonesia in 1917—1929 and killed at least 1.5 million Indonesians in 1918 (Harriyadi 2020).

One of the areas in Indonesia that was reported to have experienced many disease outbreaks, especially at the end of the 19th century, was East Sumatra, an area outside Java that experienced extraordinary economic development due to plantation business (Darini 2022). The presence of plantation companies in East Sumatra also has an impact on health problems that have never appeared before, namely the emergence of new diseases. This disease outbreak was especially prevalent among plantation workers. Breman (1997) even estimated that one in three or four plantation coolies there died from contracting the disease before the end of his contract. In the early years of plantation development in East Sumatra, disease and death rates among plantation workers were still very high. As an illustration, in the Deli Company, the death rate for coolies at the company's hospital reached 7.4%. The earliest data for mortality rates in Deli companies are from 1882—1883. At the Senembah company, the death rate for its workers reached 71 people per 1,000 in the period 1890—1894 and 63 people per 1,000 in 1895—1899. The mortality rate in this company was also very high at first (Breman 1997). However after 1900 the number of deaths began to decline and stabilized in 1910 to a more reasonable level. A. F. Blommenstein estimates that the death rate for coolies on the East Coast of Sumatra fell from 6% in 1900 to just 1.5% in 1910 (Klaveren 1997).

The success in reducing mortality due to disease outbreaks in East Sumatra is very important to study. What diseases appear and contribute to high mortality rates, how they are spread, and the efforts made to eradicate disease outbreaks are the objectives of this study. Several studies that discuss health and disease issues in East Sumatra have been carried out by several researchers. A study conducted by Klaveren describes the comparison of mortality rates between Chinese workers and Javanese workers working in plantation companies. Oschendorf (2018) in his study of Java, East Sumatra, and Belitung states that plantation companies have social

responsibilities for the community. In the health sector, this responsibility is realized by building health facilities, although this is also inseparable from the interests of the company itself. The study of Agustono, *et al.* (2021) explained that the presence of a pathology laboratory in Medan that conducts a lot of health research so that this institution has a major influence on the development of health in East Sumatra. Therefore, this study will complement the existing health historiography of East Sumatra.

METHOD

The historical technique, which required four steps, was employed in this research. First, the heuristic approach, which involves gathering historical sources including records and archives from plantation companies, colonial health service reports, as well as notes and reports from hospital doctors. These resources were gathered from the National Library of Indonesia in Jakarta, the National Archives of the Republic of Indonesia, the KITLV Leiden website, and the delpher.nl website. Second, source critique involved both internal and external review of the sources used to establish the veracity and trustworthiness of the information presented as historical truths. The third step is interpretation, which is the process of analyzing and synthesizing historical information to create historical narratives. Then, writing and building historiography. The results of this study are expected to provide a valuable contribution to the history of health in Indonesia, particularly related to the handling of infectious diseases.

RESULTS AND DISCUSSION

1. Migrants and Disease Transmission

East Sumatra is one of the regions with the largest plantation economy outside Java. Since the development of the tobacco plantation business in Deli, the East Sumatra region has been increasingly recognized by the international community. Big profits from tobacco products attract foreign investors to open their businesses there. Moreover, with the issuance of the 1870 Agrarian Law by the colonial government which made it easier for foreign investors to invest, it increasingly attracted their interest. In the end, East Sumatra became a destination for private entrepreneurs to open various fields of business, not limited to tobacco commodities. The plantation sector is growing very rapidly through businesses developed by various countries (Thee 1976).

The presence of large plantations encourages migration to East Sumatra. The earliest plantation labor migration began when Jacobus Nienhuys opened a tobacco plantation business. The demand for tobacco plantation workers was increasing rapidly. At first in 1869 there were 800 to 900 Chinese coolies, but this number increased rapidly in 1900 to about 9,000 workers. By 1932 about 250,000 Chinese coolies had come to Deli from China.

At the beginning of the 20th century, the workforce from Java increased rapidly to replace workers from China. This was mainly due to the development of new trade crops such as coffee, sugar, oil palm, and rubber.

Table 1. Number of Workers in East Sumatra (People)

Year	Chinese	Javanese
1884	21.136	1.771
1887	33.526	6.168
1890	53.806	14.847
1900	58.516	25.224
1907	49.663	51.665
1916	43.689	150.392

Year	Chinese	Javanese
1926	27.733	194.189

(Source: Klaveren 1997)

In addition to the Javanese and Chinese, migrants from various other ethnicities also tried their luck in East Sumatra. In 1910 the number of workers employed on plantations was 170,000 and this increased to 308,000 in 1920. In 1930 the number was 372,000 (Kouwenaar n.d.). As a result of this influx of plantation workers there has been a tremendous increase in population in East Sumatra. In 1850 the population of East Sumatra reached 150,000 people and increased to 285,000 people in 1890. This number again increased to 568,417 people in 1905. From 1905 to 1930 there was an extraordinary increase in the number of people reaching around 300%. In 1930 the population in East Sumatra was 1,693,200 people (Langenberg 1976).

Demographic changes drastically because of population migration and environmental changes due to massive land clearing turned out to influence public health problems. The movement of population between regions is a risk factor for the spread of disease outbreaks. Especially at that time, East Sumatra was a growing plantation frontier area, resulting in a very massive flow of migrants. Immigrants can transmit so many diseases for several reasons. First, they bring germs from the area of origin to the area they visit; second, immigrants are mostly or small consisting of homeless people who do not have a permanent place to live so they are susceptible to disease. Third, hygienic care for immigrants is often inadequate, for example small barracks without air or light, latrines accessible to flies or other animals and raw drinking water (Kuenen 1914b).

Some diseases that were suspected to be brought from outside include cholera and leprosy. In addition to transmission from outside, there are also other types of infectious diseases caused by vectors from the tropical climate, which are referred to as tropical diseases. Infectious tropical diseases are also known as tropical infections. Disease transmission can be through various intermediaries such as bacteria, air, animals, water, and humans. Some of these tropical diseases can be fatal and cause death, and many of them lead to lifelong disability. Tropical diseases are spreading rapidly and are one of the factors that increase mortality rates.

2. Emerging Disease Outbreaks

Prior to the development of the plantation business, there were no records of disease outbreaks that occurred in East Sumatra. However, information about this disease outbreak is often found after this area developed into a large plantation area. The data has shown conclusively that the East Coast of Sumatra was one of the areas in the world that was believed to be an unhealthy tropical area. The high mortality rate in this region is inevitable. In this region, a cholera outbreak was reported in 1891, and resulted of 136 deaths people per 1,000 coolies. The main cause was the arrival of Chinese porters who brought with them cholera.

It was reported that in 1896 a cholera outbreak aboard a Chinese ship anchored in Belawan. It is said that the coolies were transported like palm leaves that were piled up. This is a source of transmission of cholera. The space that should have been overcrowded for 40 people was filled with 102 people. Of the 102 people, 51 of them have died. On January 15, 1901 there was a cholera epidemic. Of the 196 patients, 68 of them died, 56 were declared cured and 72 people were under treatment. On 26 January 120 people were declared dead of cholera (Modderman 1929).

The cholera epidemic again occurred at the end of 1909 and throughout 1910 cholera outbreaks in Deli occurred sporadically, sometimes endemic in several places. Kuenen dares to guarantee that the cases were imported from Java or China, and it is impossible for the infection to come from Deli itself. In observations in Deli during 1909 and 1910 about 52 boats from Java and 15 boats from China arrived in Belawan. The coolies were then transported by train to Medan and there they were placed in a *hong* (a place where the workers gathered). Usually, they do the contract the next day. They were divided among companies that were often located far from Medan. In 1909 there were two ships infected with cholera arriving from Java, as well as until the end of August 1910 there were 31 ships from Java which were found to be infected with cholera (Kuenen 1911). In addition to plantations, cholera also attacks the population, especially the Batak community. Cholera occurs repeatedly, including in small epidemics. Two cholera epidemics took place in May—June 1914 and July—August 1918, while in July 2019 several cholera cases occurred in Simalungun (Bais 1920).

Another epidemic was the influenza pandemic that hit the world in 1918—1919. This plague was also brought from outside. The pandemic caused almost half of the number of deaths that occurred in East Sumatra, namely 2,027 of the 5,937 deaths. In Bais' report on the Rubber Plantations Investment Trust Ltd. (RPIT) the influenza epidemic reached its peak in November 1918. More than 13 per 1,000 Javanese died from this influenza with pulmonary complications. Of the 131 deaths, 12 were complicated by acute malaria (Bais 1920). The bubonic plague was reported for the first time in the Dutch East Indies, precisely at the Deli plantation in 1905. The plague sufferers were two coolies from China. The two patients were immediately quarantined so that they did not have time to become an epidemic that did not spread.

Climate and environmental changes that occur due to deforestation were one of the factors that increase the risk of outbreaks, for example, increasing cases of malaria, dysentery, and helminthic diseases (Kouwenaar, n.d.). Schuffner's research states that one of the causes of the high mortality rate for workers was due to poor sanitation in workers; housing (Janssen 1914). Finding plantation workers was not an easy matter, nor was the money spent on recruiting workers from outside cheap. On the other hand, planters must provide facilities for these workers, one of which was housing. Usually, to save on company expenses, the workers were placed in barracks which function as wards to sleep together. Coolie barracks with dirt floors, clapboard walls, and palm leaf roofs were built in a row around the field which also functioned as a kitchen. The rest of the garbage and stagnant water becomes a source of odor and a source of dangerous diseases, especially for the latrines, only open holes are made without a drain that is made not far from the housing. The laborers live in barracks during the granary period, while in the field season they live in drying beds or barns which are very unfit to live in (Breman 1997). The sanitary conditions of the living environment and poor working environment give rise to health problems.

Hookworm disease was very common among Javanese immigrants. The Javanese immigrant group suffered from severe anemia. Almost all were infected with worms, although it was not immediately confirmed at first examination that they were anemic. Each carrier of the worm will lay thousands of eggs each day, which in turn causes other people to become infected (Kuenen 1914b). Hookworm disease or ankylostomiasis mostly attacks coolies who live in places with poor hygiene levels. This disease was spread through infection with worms that can enter through the skin. Poor environmental conditions, especially the unhygienic latrines around the coolie barracks and the humid climate cause hookworm larvae and eggs to develop and live. This disease attacks the digestive system which can cause nausea, vomiting, abdominal

pain, and diarrhea. In chronic conditions hookworms can suck the blood of the sufferer and cause anemia (Kuenen 1914a).

An epidemic of tropical malaria broke out when Deli Spoorweg Maatschappij (DSM) had to build an embankment through the swamps along a large river in Langkat Hilir in 1903. Malaria was reported to have attacked the workers who built the railway. The work was left to free Chinese, who worked under the supervision of his foreman. They build a house in a swamp close to their workplace. An epidemic of chronic malaria was imminent. The administrator made sure that the Chinese obeyed the rules for living outside the swamp. This rule was rejected because it was considered a waste of time. New workers replaced the sick people until the death rate from malaria became very large at 50 per 1,000 inhabitants. This epidemic attacked the coolies who preferred to live in the construction area of the railway line. In its development, malaria appears in Deli in general relatively few, although an increase in this disease has also occurred in recent years. The treatment given is to give quinine for malaria sufferers (Kuenen 1914a).

Beriberi, a disease that attacks the central nervous system due to vitamin B1 (thiamine) deficiency, was also a major health problem in East Sumatra. The beriberi epidemic took place in 1896. This plague also caused the deaths of 105 people per 1,000 coolies. The beriberi outbreak occurred because of poor food conditions and the nutrition of the food received by the coolies. This condition often occurs at the beginning of the plantation so that the spread of the disease is relatively fast. This was also because many plantation companies do not pay attention to the health problems of workers because they are still pursuing high profits. Workers must provide their own food. The twice-monthly living allowance by plantation workers is spent on the most basic food needs. Breakfast and dinner consisted solely of rice whose rice was obtained from credit at the plantation tavern.

In Bais' observations as a hospital doctor, it turned out that in some cases, the beriberi that occurred was related to the distribution of rice that was stored for too long so that its nutritional content was lost. In addition, the rice consumed by the coolies is white milled rice imported from Siam. Vitamin B1 levels of this type of rice have been lost (Bais 1920).

Leprosy was one of the endemic diseases in East Sumatra. This disease was thought to have been brought on by contamination from workers who regularly came from China because South China at that time was known to be a leprosy base with very poor treatment. In East Sumatra, hundreds of people with leprosy were reported to be on the loose, especially in Serdang, Deli, and Langkat. Leprosy was found in the Chinese and sometimes among the Javanese. This disease is not easy to recognize at first glance. The danger of contamination of this disease is especially in healthy people who carry the bacilli and transmit the disease unnoticed. Dr. Mulier estimated that there were 200 people with leprosy at the end of 1900. The number of sufferers increased to 443 in 1904. Transmission took place through contact with lepers in markets or patients bathing with healthy people in rivers (Broersma 1922; van Kol 1902). In the Karo highlands, leprosy was an endemic disease. The Batak people were very afraid of this disease and isolated people with leprosy in small houses in the fields. Schuffner estimates that there are 2—3 lepers per 1,000 people (Hermans 1924).

3. Health Improvement Efforts

Several reports indicate the high mortality rate in the early days of plantation business in East Sumatra, among others, due to the heavy workload (clearing land and cultivation), various

infectious diseases that are very common in the tropics, sanitation problems, poor food, and unavailability of food and good medical care. To be able to survive various kinds of diseases that are indirectly due to climate, it must be armed with the necessary knowledge of pathology, parasitology, and epidemiology. Modern hygiene must be based on accurate knowledge of the causes of disease. Without special hygienic measures, high rates of morbidity and mortality will occur in people living in the tropics, mainly due to infectious diseases.

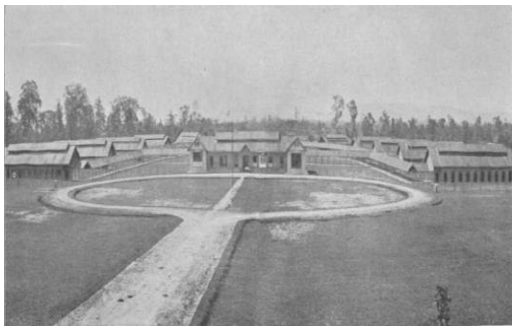
In relation to health issues, plantation entrepreneurs in East Sumatra have an obligation to provide medical care for their workers as stipulated in the Koeli Ordonantie. The regulation states that plantation entrepreneurs must provide free housing, food, and medical facilities. The treatment includes, among others, cases of illness or injury experienced by workers, giving mass vaccinations or other types of treatment. This is very important in efforts to improve the health of plantation workers. In 1908—1909 the death rate showed a significant decrease. At the Tanjung Morawa Hospital owned by Sanembah Maatschappij, 10.5 deaths per 1,000 coolies were recorded. At Deli Maatschappij's Deli Hospital, the death rate reached 16.6 per 1,000 coolies. Meanwhile, at the Sei Sikambing Central Hospital belonging to the Medan Plantation Tabak Maatschappij the death rate was recorded at 18.4 per 1,000 coolies. At the Petoemboekan Hospital, 13.5 deaths per 1,000 coolies were recorded (Kuenen 1910).

Some of the efforts made to eradicate and improve the quality of health in East Sumatra are as follows.

a. Hospital Provision

The demand for health care is realized by the gradual construction of hospitals. The first hospital in East Sumatra was a hospital founded by Deli Mij in 1871 with an European doctor. In general, hospitals that were established at the beginning of the pioneering period had very minimal hospital services. For example, in a hospital belonging to the British-owned Langkat tobacco company, a doctor must take care of many plantations, so he comes once a week or two weeks. Adequate supervision often does not occur, so many patients were delayed in receiving treatment. The hospital that was established was also still very simple and did not pay attention to air circulation so that the room became stuffy. The overall ventilation area was 12 m^2. With the number of patients more than 40 people, the area of light and air that enters for each person is less than 0.3 m^2. Therefore, it is not surprising that the air condition in this environment is always dirty and emits a foul odor. To prevent the patient from escaping, the doors and windows were closed at 9 pm and opened again at 6 am. Disposal of feces was still a problem, there was no permanent disposal so that the air and soil were polluted and unhealthy. The room for patients is also not ideal, it is still too narrow (Adriani 1893). Provision of hospitals with poor facilities does not lead to improvements in public health.

The treatment of patients in the hospital was also very bad. In a doctor's report it was stated that he encountered several patients who were very dirty, not treated, and not even fed. Negligence in health care could also be seen from the absence of even the simplest facilities that should exist in every hospital. There was no place to defecate and urinate, bedpans for the night, lights for night lighting, and drinking water. Male and female patient rooms are not distinguished. Patients with communicable and non-communicable diseases are also not separated. The patient bed is a wooden or iron cot without a pillow and the bed is only a burlap sack (Breman 1997).



Picture 1. Simalungun Central Hospital
(Source: Bais 1920)

Nevertheless, at the beginning of the 20th century, there were changes in the quantity and quality of hospitals. Around 1903 most of the companies had set up a central hospital for their coolies. The number of hospitals and doctors in Deli continued to increase, in 1910 there were 22 hospitals and 23 doctors, increasing again to 47 hospitals and 53 doctors, and in 1934 it was reduced to 35 hospitals with 35 doctors. The location of the hospital was built by considering the good transportation conditions with the distance from one hospital to another about 20 km. Central hospitals are generally built very efficiently with a pavilion system that can accommodate up to 600 patients. The hospital is also equipped with buildings needed for research activities, pharmacies, operating rooms, administration and so on. Some hospitals have larger laboratory facilities and X-ray equipment. The hospital also has isolation rooms for infectious diseases such as malaria, dysentery, and cholera (Bosch 1936; van de Velde 1918).

Most of the porters who were seriously ill were kept away from the plantations. This helps minimize disease transmission and leads to a reduction in mortality. Deli's success in the health sector was due to the unanimous opinion that sick people have no or less chance of infecting their environment if isolated in a hospital for as long as they are infected. People suffering from infectious diseases were immediately removed from their environment. People who were mildly ill were carefully examined so that it was possible to discover new hidden diseases. The number of sufferers of intestinal worms (ankylostomiasis), chronic dysentery, malaria, and others found in this way was very large. Sick individuals can be detected and cured, and infections in healthy people can also be prevented (Kuenen 1910).

Indigenous people were generally reluctant to comply with European hygiene rules. Many of them are still illiterate and lack insight and knowledge, and the existence of prejudices and superstitious fears are factors that drive them to dislike European doctors and scientists and their hospitals. The people in Deli are convinced to indirectly follow the coolies' rules, namely following the workers' obligations to be treated if they were sick.

b. Provision of Clean Water and Good Food

Cholera and dysentery cause huge losses in human life although through proper treatment these diseases can be reduced. The transfer medium for this disease is exclusively water, so the preventive measure against this disease is to provide good water. The cause of outbreaks of infectious diseases such as cholera, typhoid, and dysentery were that many coolies in plantations drink water from the ditch which is very harmful to the body and accelerates the transmission of disease germs. Dr. Schuffner from Senembah Maatschappij recommended that workers working in the field be provided with boiled water or tea. This drink had to be carried by the porters in the fields so that they would not drink from the dangerous puddles to quench their thirst. The cost of providing water is quite large, for example for the Senembah company to

spend almost 19,000 NLG per year (Bureau 1919). Provision of water was done by building wells around the coolie settlements. There were two types of wells built, namely wells for bathing, washing, and latrines, and wells for drinking water. The well for drinking water was given a rather high barrier around it so that water and dirt from outside did not enter the well. This well was routinely checked for bacterial levels in the water so that action can be taken if the water is contaminated with germs.

German medical doctors employed by Deli Maatschappij identified dysentery as the most pressing health problem on the plantation. To anticipate the outbreak of dysentery, Durk recommended the construction of a fresh drinking water system to the plantations from the springs of Rumah Sumbul, a small village in the south of Medan.

Picture 2. Patient Dining Room at Bangkattan Hospital
(Source: Deli Maatschappij 1919)

The eradication of beriberi was done by providing nutritious food. The rice consumed by the coolies was white rice imported from Siam, so the tianin content was low, which led to the outbreak of beriberi. This disease has been eradicated by replacing milled white rice with half-milled rice which is still high in vitamin B levels. In addition, the coolies sometimes get rations to eat meat. Schuffner suggests creating a large vegetable garden, planting fruits such as bananas, pineapples, papayas, and other fruits. The rice provided to the workers was not white rice that is milled, but one that still contains grain that is still rich in tianin.

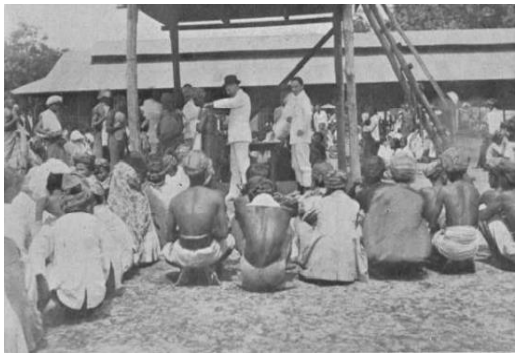
c. Pathology Laboratory

In connection with the number of endemic diseases and the high mortality rate, there are efforts to further improve the health and sanitation sector. Various studies were conducted to find the cause of some tropical diseases and take preventive or curative measures. Dr. W. A. P. Schuffner and Dr. W. A. Kuenen are two doctors who do a lot of research on tropical diseases in collaboration with environmental health services in various plantations in East Sumatra. To anticipate the threat of outbreaks, Schuffner proposed that clinical observations and patient care in hospitals be carried out as well as intensive scientific studies including first knowledge about the nature of the disease, pathogenesis, and causes of disease. However, it was not possible for every hospital to be able to provide adequate laboratories, so J. van Vollenhoven from Deli Maatschappij proposed the establishment of a separate research institute. Through the collaboration of Deli Maatschappij, Senembah Maatschappij, and Medan Tabak Maatschappij, on October 3, 1906, a Pathology Laboratory was established in Medan. His job was to conduct research in the field of bacterology and serology. Through laboratory work it was possible to get a quick and precise diagnosis of various tropical diseases as one of the main requirements for effective control of infectious diseases (Velde 1918).

Research results from the Medan Pathology Laboratory became a reference for tropical health problems in the Dutch East Indies. The work and research carried out by doctors in the laboratory provides useful knowledge about diseases and epidemics in tropical environments, so that medical practitioners can use them in hygiene and health policies on the same issues. In the pathology laboratory Dr. Kuenen enriched medical science with his discoveries. His investigations included tropical diseases such as dysentery, beriberi, and hookworm disease (Broersma 1922).

Picture 3. Pathology Laboratory of Serology Section, in Medan
(Source: Bais 1920)

The pathology laboratory routinely monitors the rat population at the port, so that after 1918 no bubonic plague was recorded in East Sumatra (Velde 1918). Some of the activities carried out in this laboratory are prophylactic vaccination (disease prevention), treatment therapy, and preparation for diagnosis of disease cases (Agustono, *et al.* 2021).



Picture 4. Typus Vaccination at Simarito Plantation
(Source: Bais 1920)

The Medan Pathology Laboratory provides a cholera vaccination (15,000 million bacteria/cc, which was killed by adding carbola without heating). Regarding vaccines, the Malay population firmly refuses to be injected on the grounds that it was forbidden by religion, while from the workers there was no resistance (Bais 1920).

d. Quarantine Station

The outbreak of various kinds of disease outbreaks that hit East Sumatra led to the issuance of quarantine regulations. To avoid greater losses due to the high mortality rate, Deli Planter Vereeniging (DPV) agreed to establish a quarantine station in a place designated by the Resident. The building will serve as an emergency quarantine station for new arrivals sent by ship directly from China. Based on this agreement, the necessary steps were taken and in a relatively short time in 1899 21 barracks, guard houses, etc. were built which could

accommodate 600 immigrants on Pulu Berhala. The cost for this construction was $8,300 (Modderman 1929).

On August 19, 1899 the plantation association urged the government to realize the initial quarantine facility. While waiting, the emergency quarantine station in Pulu Berhala was handed over to the government. However, the cholera epidemic that again caused the plantation association to seriously consider building a special quarantine station in 1906. From the results of the association meeting on May 28, 1907, the funds needed to build a quarantine station were around $70,000. Provisions that complement the Quarantine Law on cholera and epidemics which stipulate those infected immigrants in Java, or the Straits can be taken to a quarantine facility and isolated for as long as deemed necessary (Modderman 1929).

A quarantine station was built on Pulu Brayan in 1911 to prevent a massive cholera epidemic from spreading. Newly recruited coolies from Java or China were checked at the recruitment site. They were examined by a quarantine doctor, and if they were suspected of carrying several infectious diseases, they were immediately taken to a large and modern quarantine facility (Bureau 1919). Ships were only allowed to enter through Belawan, Pangkalan Brandan, Tanjung Pura, or Tanjung Balai after being checked by a port officer who will immediately report to the quarantine doctor if he sees anything suspicious (Broersma 1922). Quarantine stations were highly hygienic, equipped with clean water supplies and excellent medical care. People who will be quarantined were transported by special train from Belawan with the Deli Spoor branch line that directly connects the port and quarantine station. The quarantine station building consists of 10 pavilions, each for 100 people with toilets and bathrooms that meet hygiene and isolation requirements. The two main buildings were equipped with pharmacies, laboratories, and doctors' residences for the treatment of cases of cholera and bubonic plague (Velde 1918).

Picture 5. Quarantine Station
(Source: Volker 1928)

Through general quarantine for cases of bubonic plague and cholera, and through hospital observations to keep most of the new patients such as the skin disease group, malaria, and dysentery away from the company through isolation, it has been able to avoid the occurrence of new infections as much as possible. This system was successful enough that in 1905 and 1910 the outbreaks carried were limited to a few cases and in this way the occasional re-emerging cholera infection was completely stopped (Velde 1918).

e. Sanitation Refinement

Sanitation, hygiene, and air ventilation were important issues in the settlements of plantation workers (Alkema 1929). Poor living quarters and neighborhoods caused disease outbreaks

among coolies and led to high mortality rates in the late 19th century. Several disease outbreaks that developed due to a bad environment include cholera, typhus, bubonic plague, and malaria. The action that was the focus of improvement was the maintenance of hygiene and sanitation on the plantation (Kuenen 1914a).

Actions to eradicate malaria were carried out by constructing water canals with good sanitation in workers' settlements. Eradication of mosquito nests and regular checks of gutters were carried out to prevent stagnant water as a breeding ground for malaria-carrying mosquitoes. Treatment measures were carried out by giving quinine to infected workers. The coolies were placed in a fever-free area and forbade the coolies to work before sunrise and after sunset. They were also given prophylactic quinine intake to prevent malaria.

The quality of the construction of coolie barracks was improved by paying attention to good sanitation. The latrines were built some distance from the drinking water supply well so as not to be polluted. The latrines were made of cement with good drainage, the waterways around the barracks were also cleaned regularly. This was mainly to prevent the outbreak of ankylostomiasis disease. The coolies were also given deworming medicine every half year. Coolies who were infected and show symptoms of worm disease were immediately taken to the hospital for treatment.

Dr. Schuffner of Senembah Mij and Dr. Maurer from Deli Mij collaborated to research the relationship of poor health problems with local conditions in Deli. They do a lot of research on tropical diseases. Schuffner advocated a complete change in the construction of coolie houses to get more sunlight (Janssen 1914). The construction of barracks and huts was carried out by paying attention to light and air ventilation so that the room inside was not stuffy. The settlement pattern of Javanese coolies was built with the cottage system. In one cottage consists of 20 houses. The houses were usually equipped with a small garden or yard in front or behind the house which could be planted with banana trees, vegetables, fruit trees or for raising poultry. Such houses were usually occupied by workers who were already married, while workers who were single were placed in elongated barracks inhabited by 30—40 single coolies.

Hygienic inspections of living quarters and existing wells, bathing facilities, latrines, etc. were carried out regularly at certain times. Public health was maintained by providing health education, the importance of house cleanliness. The mobile nurse oversees checking children's health and conducting inspections to homes and providing counseling about clean living and good nutrition for health.

f. Leprosy Treatment

Handling of people with leprosy was also carried out by private initiatives. In this case Deli Mij also contributed to the construction of a treatment center for leprosy patients on the island of Sicanang, near Belawan in 1910 (Broersma 1922; Verster 1919; Volker 1928). The hospital, which was established without government intervention, functions as a leprosium, which was a shelter and exile for people with leprosy, although sometimes it also treats ordinary people. Sicanang leprosy hospital could accommodate 350 sufferers (Broersma 1922). Maintenance costs were covered by contributions from planters, the landscape treasury, the wealthy Chinese in Medan, and several other private funds. By the end of 1915 there were as many as 277 patients who had been treated in this hospital. At the end of 1916 the Sicanang leprosy treatment accommodated 351 people, 238 of whom were Chinese.

Picture 6. Immigrant Asylum
(Source: Volker 1928)

Before the leprosy hospital was built on Sicanang Island, in 1884 Deli Mij had the initiative to establish a treatment center for contracted coolies who could no longer work. Deli Mij garnered support from plantation entrepreneurs and other residents in Deli, as well as government support. Although the government supports the proposal for the annual subsidy fund, the Lower House has rejected it. Despite this, Deli Mij stuck to his plan and in 1887 an asylum was established in Medan. Asylum was granted to all workers regardless of skill and nationality, who were no longer able to support themselves inside or outside the company, due to illness or other reasons. Its primary care was given to the blind, disabled, demented, and lepers. In 1889 the number who were treated in this place reached 110 people and in the following years the number continued to increase until a maximum number of 250 people was reached. After the Sicanang leprosy hospital was established, in 1915 the leprosy division in the mental hospital asylum was disbanded (Verster 1919).

CONCLUSION

Based on East Sumatra's experience in dealing with outbreaks, there were several important actions taken. Preventive measures (prevention) were carried out by quarantining people who were infected and suspected of being infected, providing clean water and good food, maintaining hygiene and sanitation, and conducting research on diseases, especially tropical diseases. Quarantine measures have proven effective in preventing further transmission of the disease. In collaboration with pathological laboratories, vaccination measures were given to reduce the number of infection cases. Treatment (curative) was carried out through the construction of health service facilities and tools. Hospitals with complete facilities were available to treat cases of infectious diseases. Care and treatment were given to sufferers of the disease. Thanks to these actions, the epidemic disease that occurs was still within reasonable limits, so that it only has a small impact on the percentage of disease and has almost no effect on death.

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