

PENELITIAN EPIDEMIOLOGI WABAH LEPTOSPIROSIS DI KOTA METROPOLITAN JAKARTA, INDONESIA

(Leptospirosis Outbreak Epidemiology Study In Jakarta Metropolis, Indonesia)

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ABSTRACT

Jakarta Metropolis was severely swept by flood in 20 days from January 29 to February 17, 2002. The number of hospitalized patients were increased in many hospitals and Health Centers since the flood occurred. Until the first week of April 2002, it was reported that 103 cases of leptospirosis were confirmed and 20 persons among these victims died or 19,4% Case Fatality Rate. The highest number of leptospirosis cases, 35 persons, were occurred in March 10-16, 2002 period while the highest death number, five persons, were occurred in March 3-9, 2002 period. Epidemiology Cross Sectional study was conducted in Central and West Jakarta from where the leptospirosis victims were predominantly reported. All the victims were visited to their addresses. Interview and physical examination were performed to them together with their suspected family members, environment surrounding their houses were observed, 2.5 ml serum specimen was collected from each respondent. Rodent trapping was done inside and out side of their houses and animal serum specimens were also collected. About 153 human and 142 animal blood sera were collected. Microscopic Agglutination Test was performed for *Leptospirae* serovar examination. It was found that 18(11,8%) out of 153 human sera were positive of *L. pyrogenes* serovar pyrogenes 9(5,9%), *L. canicola* serovar Canicola 5(3,3%), *L. bataviae* serovar Bataviae 4 (2,6%) and *L. icterohaemorrhagiae* serovar Icterohaemorrhagiae 4(2,6%) where four persons were infected by two serovars. About 10(9,8%) serum specimens belong to 102 persons up to 40 years old group were positive of leptospirosis antibody serovars. Of 10(8,8%) out 113 human sera which collected from the flooded area up to two weeks period were found positive of leptospirosis antibody serovars. All of 153 suspected cases (100,0%) were suffered from fever, myalgia 107(82,6%), headache 120(78,4%), abdominal pain 90(59,0%), jaundice 68(44,2%) conjunctival suffusion 43(28,4%). The species of rodent trapped were *Rattus norvegicus* 60(42,2%), *Rattus rattus diardii* 64(45,0%), *Rattus exulans* 2(1,4%) and *Insectivora*'s species of *Suncus murinus* were 16(11,3%). Of 67(47,2%) out 142 animal serum specimens were positive of various *Leptospirae* serovars, which consisted 39(65,0%) out of 60 *R. norvegicus*, 20(31,3%) out of 64 *R.r. diardii*, 2(100,0%) out of two *R. exulans* and 6(37,5%) out of 16 *S. murinus*. Regarding performed serological test, *L. bataviae* serovar Bataviae was found among 42 animal sera, *L. icterohaemorrhagiae* serovar Icterohaemorrhagiae among 31 animal sera, *L. canicola* serovar Canicola among 12 animal sera and *L. pyrogenes* serovar Pyrogenes among five animal sera. Some serovars were found in some individuals of animal sera.

Key words : *flood, serovar*

INTRODUCTION

Indonesia, consisting of about 21.000 islands and about 17.000 were identified with it's name but not more than 8.000 islands inhabited. Indonesia is located in the tropical zone with two seasons, dry and rainy seasons. All along the year with the average temperature between 22°C to 33°C is the favourable temperature for the germs to survive and to continue its life cycle including *Leptospirae*.

Many places in Indonesia were known as an endemic areas of Leptospirosis (Ressang, A.,A. 1984), and sometimes an occurrence of Leptospirosis were reported. An outbreak of Leptospirosis occurred due to the heavy rainy seasons which sometimes continued with flood. But, in many places especially in the crowded population especially in the rural areas like in Central Java and East Java provinces, an outbreak of Leptospirosis occurred also during the heavy dry seasons. In Boyolali and in Demak districts, Central Java province an outbreak of Leptospirosis were reported many times during the heavy dry seasons (Kusharjono, at.al.1979). At that seasons water resources was very limited. Only very few available unhealthy stagnant water that used by the local population and simultaneously there will be the hard competition to use that water with some other domesticated animals like cows, buffalos, dog, goat, sheep, cat and even wild life animal including rodent. The same source of water that used by animals and human but in the other hand those animals can contaminates that water with their Leptospirosis urine. That's the way how an outbreak of Leptospirosis occured in some areas in Indonesia during the dry season (Simanjuntak, Gindo, M.,1997)

In some other areas of Indonesia, some rivers used to be influenced by the ocean tide, and some times up to hundred Kilometers into the flatted mainland. For this reason the mainland will be suffered by the flood due to the tide water (Simanjuntak, Gindo,M., at.al., 1996). When the tide decreased, spotted stagnant waters that already contaminated by some Leptospiroses urine animals will be the sources some water borne diseases Jakarta metropolis (see: Map), was swept by the flood during and after five days of heavy rains from January 29 to February 2, 2002. Some spotted flooded areas were dried included Leptospirosis (Faine, S., 1982, Steel James, 1979), to the local population. This quite happend in some countries of South-east Asia (Andrew, L. at.al., 1990) depend of the altitude just for five days. Depend of the irrigation system availability and mechanical drainage works by utilizing water pumps, some areas still flooded even after two to three weeks times.

There were 20 death out of 103 Leptospirosis cases with 19,4% Case Fatality Rate (CFR) that reported from some hospitals in Jakarta metropolis from February 4 until April 3, 2002. These case and death number were distributed geographically with 5(27,76% CFR) out of 18 cases from Central Jakarta, 6(15,3% CFR) out of 39 cases from West Jakarta, 1(6,6% CFR) out of 15 cases from South Jakarta, 4(40,0% CFR) out of 10 cases from East Jakarta, 3(42,8% CFR) out of seven cases from North Jakarta, and 1(7,0% CFR) out of 14 cases from satellite cities surrounding Jakarta where they were closer to get to Jakarta metropolis hospitals instead to their city residences (Table-1). Beside the treatment among the Leptospirosis victims in the hospitals, additional

Table-1: Leptospirosis case and death in Jakarta Metropolis
from February 2 to April 3, 2002

| Municipality | No. of case | No. of death | Case Fatality Rate (CFR) |
|------------------|-------------|--------------|----------------------------|
| Central Jakarta | 18 | 5 | 27,7% |
| West Jakarta | 39 | 6 | 15,4% |
| South Jakarta | 15 | 1 | 6,6% |
| East Jakarta | 10 | 4 | 40,0% |
| North Jakarta | 7 | 3 | 42,8% |
| Satellite cities | 14 | 1 | 7,2% |
| T o t a l | 103 | 20 | 19,4% |

case finding activities outside the hospitals were conducted simultaneously by the local health service officials.

This Leptospirosis outbreak epidemiology study was conducted in April 4-11, 2002 in Central Jakarta, North Jakarta, West Jakarta and East Jakarta. This Leptospirosis outbreak related to the main source of infection which was highly incriminated from the rodent animal. This suspicion is based on the former conducted survey result that 10% to 50% of the rodent in Jakarta were positive of Leptosirosis, and Leptospirosis infected animals can excretes about 100 million *Leptospirae* per milli liter urine (Ressang, A.,A.,1984).

MATERIALS AND METHODS

This study was designed as the Cross sectional study with hospital based as the stand point of activities. Regarding the hospital based, the cases data were taken from recorded patients in the hospitals and Health Centers that diagnosed as Leptospirosis. These cases then were visited to their houses, and interview were performed to these cases

and suspected persons of the family members with the minimum age of three years. The persons were categorized as suspected if they were contacted with flooded water at least five days during the flood period. The persons less than 13 years old of age were represented by their parents to answer the question. All of the interviewed respondents were bleed from *Antibrachial vein* with 5 ml. of the whole blood and drawn by sterile vacutainer apparatus in order to get 2,5 ml. blood serum. These blood specimens were kept in the room temperature for six hours and followed by centrifugation 5-10 minutes with 1.500 RPM. The separated sera were removed into the sterile serum vials and were kept in the freezer with -20°C .

The rodent metal live trap were set with two traps in each house of respondents, where one trap stationed inside the house and another one stationed outside the house. All traps were set about 06.00 o'clock in the evening and collected at 06.00 c'clock in the next morning. The captured rodent then processed and the rodent blood were collected by intra cardiac punctured, using sterile disposable syringe. The bloods specimens were

kept six hours in the room temperature and then centrifuged 5-10 minutes with 1.500 RPM. Sera were separated into the serum vials with sterile Pasteur pipette, The sera were kept in the freezer with -20°C until being tested in the laboratory.

All the human and rodent sera were brought to the Veterinary Research Laboratory Diagnostic (VRLD) to perform the Microscopic Agglutination Test, MAT (Faine, S., 1982, Khantong, at.al.,1998), for *Leptospirae* serovar examination

RESULTS

From the secondary data about the length of treatment that collected from some hospitals and Health Centers shown that 10(50.0%) out of 20 reported death number were treated only for one day, another 7(35.0%) death out of 20 were treated for two days in the hospitals, 2(10.0%) death out of 20 were treated for four days while another one person or 10.0% death out of 20 was treated for five days (Table-2).

Table-2 : Death case related to the number of Treatment day in the Hospital and Health Center

| No. of Treatment day | No of death | (%) |
|----------------------|-------------|-------|
| 1 | 10 | 50,0 |
| 2 | 7 | 35,0 |
| 3 | 0 | 0,0 |
| 4 | 2 | 10,0 |
| 5 | 1 | 5,0 |
| T o t a l | 20 | 100,0 |

All of these patients according to the recorded status were very bad condition when they arrived and they were too late for being brought to the hospitals for treatment.

Table-3 : Death Number of Leptospirosis by age group

| Age group (Year) | No. of case | No. of death | CFR (%) |
|------------------|-------------|--------------|---------|
| < 5 | 1 | 1 | 100,0 |
| 5 - 14 | 9 | 0 | 0,0 |
| 15 - 40 | 51 | 9 | 17,6 |
| > 40 | 42 | 10 | 23,8 |
| T o t a l | 103 | 20 | 19,4 |

It was also found by age group that only one case which lately dead which his age is less than five years old. Age group 5-14 years old were nine cases and all recovered. But among 15-40 years age group were found 9(17,6%) death out of 51 Leptospirosis cases. Among the group more than 40 years old were found 10(23,8%) death out of 42 cases (Table-3)

According to the weekly period of time from February 2, 2002 to March 30, 2002 which 20 death out of 103 Leptospirosis cases, it was found that the highest number of death were seven out of 14 cases occurred in March 3 -9 weekly period, three death out of 14 cases in February 10 – 16 weekly period, three death out of 13 cases in February 24 – 23 weekly period, two death out of eight cases in February 24 – March 2 weekly

Table-4 : Death number caused by Leptospirosis by weekly period

| Week | No. of case | No. of death |
|-----------------------|-------------|--------------|
| <February 2 | 1 | 1 |
| February 3 – 9 | 3 | 1 |
| February 10 – 16 | 14 | 3 |
| February 17 – 23 | 13 | 3 |
| February 24 – March 2 | 8 | 2 |
| March 3 – 9 | 14 | 7 |
| March 10 – 16 | 34 | 2 |
| March 17 – 23 | 8 | 1 |
| March 24 – 30 | 7 | 0 |
| > 30 | 1 | 0 |
| T o t a l | 103 | 20 |

period, two death out of 34 cases in March 10 – 16 weekly period, one death out of eight, three, and one cases in March 17 – 23, March 3 – 9, and up to February 2 weekly periods. No death out of seven and one in March 24 – 30, and after March 30 weekly periods (Table-4)

A total of 153 human blood sera were collected which 72 sera from the patient that treated in the hospitals and Health Centers

and 81 sera from their family members who contacted of flooded water at least five days during the flood period. About 18(11,8%) of that total sera were positive of antibody against *Leptospirae*. Of 13(16,7%) out 78 positive sera were males and 15(6,7%) out of 75 positive sera were females (Table-5).

Table-5 : Antibody picture against *Leptospirae*
by sex in human blood sera

| Sex | No. tested sera | No. positive | % |
|-----------|-----------------|--------------|------|
| Male | 78 | 13 | 16,7 |
| Female | 75 | 5 | 6,7 |
| T o t a l | 153 | 18 | 11,8 |

Regarding the longevity of the flood inside and surrounding the housing sites it was found that there were 10(8,8%) out of 113 respondents positive *Leptospirae* antibody in the areas of maximum two weeks flooded, while another 8(15,7%) out of 40 *Leptospirae* antibody positive were the group members of more than two weeks flooded (Table-6)

Table-6 : Positive antibody against *Leptospirae*
by longevity of flooded area

| No. of week flooded | No of tested sera | No. of positive | % |
|---------------------|-------------------|-----------------|------|
| ≤ 2 weeks | 113 | 10 | 8,8 |
| > 2 weeks | 40 | 8 | 15,7 |
| T o t a l | 153 | 18 | 11,8 |

Among 18(11,8%) out of 153 positive sera against *Leptospirosis*, 1(7,2%) out of 13 respondents were maximum of five year old age group members. Of 8(11,8%) out of 68 positive sera were 6-25 years old group members, while another 1(4,8%) out of 21 were 26-40 years old group members, and 8(15,7%) out of 51 positive sera were more than 40 years old group members (Table-7)

Table-7: Positive antibody of human sera
against *Leptospirae* by age group

| Year age group | No. sera tested | No. positive | % |
|----------------|-----------------|--------------|------|
| ≤ 5 | 13 | 1 | 7,2 |
| 6 – 25 | 68 | 8 | 11,8 |
| 26 – 40 | 21 | 1 | 4,8 |
| > 40 | 51 | 8 | 15,7 |
| T o t a l | 153 | 18 | 11,8 |

About nine out of 18 sera that antibody positive against pyrogenes serovar, there were five with the titer of 1/100, one with the titer of 1/400, and another three with the titer of 1/1.600. Of four out 18 sera that antibody positive against bataviae serovar, there were three with the titer of 1/100, and one with the titer of 1/400. About four out of 18 sera that antibody positive against

icterohaemorrhagiae serovar, there were three with the titer of 1/100 and one with the titer of 1/400. Of five out 18 sera that antibody positive against canicola serovar, there were three with the titer of 1/100 and two with the titer of 1/400 (Table-8).

Regarding Leptospirosis symptom among the respondent where they were categorized as the patient from the hospitals and Health Centers together with the family

Table-8 Serovar antibody picture among 18 human positive against *Leptospirae*

| <i>Leptospirae</i> Serovar | No. of sera positive Lepto serovar | T i t e r | | | |
|-------------------------------|---------------------------------------|-----------|-------|---------|---------|
| | | 1/100 | 1/400 | 1/1.600 | 1/3.200 |
| Pyrogenes | 9 | 5 | 1 | 3 | 0 |
| Bataviae | 4 | 3 | 1 | 0 | 0 |
| Icterohaemorrhagiae | 4 | 3 | 1 | 0 | 0 |
| Canicola | 5 | 3 | 2 | 0 | 0 |
| T o t a l | 22 | 14 | 5 | 3 | 0 |

members as suspected Leptospirosis, it was found that all of them 153(100,0%) were suffered from fever, and 107(82,6%) of them with myalgia symptom. About 120(78,4%) were suffered from headache, 90(59,0%) were suffered from abdominal pain, 68(44,2%) with the symptom of jaundice and 43(28,4%) were suffered from conjunctival suffusion (Table-9)

During the study period, a total of 946 metal live rodent traps were stationed, where one trap was set in each inside and outside

of every house buildings of the respondents. About 142(15%) rodents were trapped. This percentage is known as Trap Success Rate (TSR). Among that total trap number, about 446 traps were sets in Central Jakarta where 67 (15,2%) rodents were captured. In West Jakarta about 370 rodent traps were used and 57(15,4%) rodents were captured. In North Jakarta about 66 rodent traps were used and 10(15,1%) rodents were captured and 64 traps were used in East Jakarta where 8(12,5%) rodents were captured (Table-10)

Table-9 : Leptospirosis symptom among 153 respondents

| S y m p t o m | No. | (%) |
|------------------------|-----|-------|
| Fever | 153 | 100,0 |
| Myalgia | 107 | 82,6 |
| Headache | 120 | 78,4 |
| Abdominal pain | 90 | 59,0 |
| Jaundice | 68 | 44,2 |
| Conjunctival suffision | 43 | 28,4 |

Regarding the trapped rodent it was found that 85(59,8%) out of 142 trapped rodent were males and 57(40,2%) were females. About 60 out 142 rodents were *Rattus norvegicus* where 32(53,3%) were males and 28(46,7%) were females. There were 64 of *Rattus rattus diardii* species, and 41(64,1%) of these were males and 23(35,9%) were females. The rodent species of *Rattus exulans* trapped were two, each

one or 50,0% of these were male and female. There were also captured 16 *Suncus murinus* belong to *Insectivora* order which 11(68,6%) were males and 5(31,4%) were females (Table-11).

There were 67(41,5%) out of 142 collected rodent sera that positive of antibody against *Leptospirae*, where 39 (65,1%) out of 69 sera belongs to *Rattus norvegicus*

Table-10: Number of Rodent trapped during the study period*

| Location | No. of trap used | No. of rodent trapped | TSR (%) |
|-----------------|------------------|-----------------------|---------|
| Central Jakarta | 446 | 67 | 15,2 |
| West Jakarta | 370 | 57 | 15,4 |
| North Jakarta | 66 | 10 | 15,1 |
| East Jakarta | 64 | 8 | 12,5 |
| T o t a l | 946 | 142 | 15,0 |

*) . Rodent trapping in South Jakarta is not done since the survey was done before rodent species. It was also found that 20(31,2%) out of 64 rodent sera specimen were belongs to *Rattus rattus diardii* species. About two and all (100,0%) positive sera were the sera from *Rattus exulans*, while 6(37,5%) out of 16 positive antibody against

Table-11 : Species of trapped animal

| Animal species | Total | Male | | Female | |
|------------------------------|-------|------|------|--------|------|
| | | No | % | No. | % |
| <i>Rattus norvegicus</i> | 60 | 32 | 53,3 | 28 | 16,7 |
| <i>Rattus rattua diardii</i> | 64 | 41 | 64,1 | 23 | 35,9 |
| <i>Rattus exulans</i> | 2 | 1 | 50,0 | 1 | 50,0 |
| <i>Suncus murinus</i> | 16 | 11 | 68,6 | 5 | 31,4 |
| T o t a l | 142 | 85 | 59,8 | 57 | 40,2 |

Leptospirae were belongs to *Suncus murinus* (Table-12)

There were five pyrogenes serovar antibody out of 90 serum specimens positive

Table-12 : Positive antibody against *Leptospirae* by rodent species

| Rodent species | No. rodent | Positive | % |
|------------------------------|------------|----------|-------|
| <i>Rattus norvegicus</i> | 69 | 39 | 65,0 |
| <i>Rattus rattus diardii</i> | 64 | 20 | 31,2 |
| <i>Rattus exulans</i> | 2 | 2 | 100,0 |
| <i>Suncus murinus</i> | 16 | 6 | 37,5 |
| T o t a l | 142 | 67 | 41,5 |

which examined for *Leptospirae* where two out of these positive sera with the titer of 1/100, another one was positive with the titer of 1:400, one with the titer of 1/1.600 and

Table-13 : *Leptospira* serovar among 67 rodent serum species

| Serovar | Total | T i t e r | | | |
|----------------------------|-------|-----------|-------|---------|---------|
| | | 1/100 | 1/400 | 1/1.600 | 1/3.200 |
| <i>Pyrogenes</i> | 5 | 2 | 1 | 1 | 1 |
| <i>Bataviae</i> | 42 | 13 | 13 | 10 | 6 |
| <i>Icterohaemorrhagiae</i> | 31 | 16 | 5 | 10 | 0 |
| <i>Canicola</i> | 12 | 1 | 8 | 3 | 0 |
| T o t a l | 90 | 32 | 27 | 24 | 7 |

one with the titer of 1/3.200. It was found also that 42 out of 90 positive sera were bataviae serovar which 13 with the titer of 1/100 and 1/400, and 10 serovar with the titer of 1/1.600 and six serovar with the titer of 1/3.200. About 31 out 90 of icterohaemorrhagiae serovar were 16 serovar with the titer of 1/100, another five were the titer of 1/400 and 10 with the titer of 1/1.600. There were 12 out of 90 serovar belongs to canicola serovar which one with the 1/100, eight with the titer of 1/400 and three with the titer of 1/1.600 (Table-13)

DISCUSSION

Leptospirosis is the worldwide geographical distribution, and can be found in Asia, Europe, Africa, Australia and in North and South America (Fraser, M. C., 1986, Chin, James, 2000). Many names were known regarding Leptospirosis including "flood fever". Leptospirosis outbreak was also occurred in Jakarta after five days of heavy rainy from January 29 to February 2, 2002. The number of Leptospirosis cases in order to get the treatment in many hospitals in Jakarta metropolis were increased. During this week until the the sixth week period of time the number patient's visiting to the hospitals in order to get the Leptospirosis treatment were increased and then in the seventh week become decreased. The peak of the visiting to the hospitals was the sixth week. Some Leptospirosis cases were treated until 10 days. But, the highest number of death due to the number of treatment day was one day, where 10 of them died. Mostly they were came too late with the very bad symp-

toms. This death number was decreased since Leptospirosis disease was intensively informed to Jakarta citizen in the newspapers, radios and television programs. The Jakarta populations were informed to come to the nearest Health Center and hospitals as early as possible if somebody is suffered from fever particularly for them who lives in the flooded areas.

The highest number of Leptospirosis cases were the age group of 15 – 40 years old and followed by the population with age group of more than 40 years old. In these groups the highest number of death were found also. These can be understood since they were the group of people who have to go out of their houses for their daily activities but they have to pass across the flooded houseyard, and there were the times for them to get Leptospirosis infection.

Regarding the sex group, there is no significant different between 78 cases in male and 75 cases in female groups. But the significant death number was found between 13 cases in male and five cases in female groups. This maybe due to the female group members were better management of their time to go to the nearest Health Centers to get the treatment for their health problems including Leptospirosis disease.

Although the number of tested blood sera in the group of <2 weeks (113) flooded time, and in >2 weeks time of flooded is significantly different, but there is no significant different number of positive antibody against *Leptospirae* of 10 and 8 between these two groups.

There was a significant different of Leptospirosis infection that showed by their antibody picture. Only 1,5% of five years or less age group, compare to six and more years age group which ranged 9,5% to 12,0%. These can be understood since up to five years old group used to be kept by their mother in their houses and became very limited time to get contact with stagnant water surrounding their houses, as it is known that Leptospirosis is one among some other water borne diseases (Andrew, at.al, 1990).

In human and rodent sera there were found four *Leptospirae* serovars which were serovars of pyrogenes, bataviae, icterohaemorrhagiae and canicola.

The average of Trap Success Rate (TSR) in all regions of Jakarta was 15,0% and ranged from 12,5% up to 15,4%, and the most predominant number of captured rodent species was *Rattus rattus diardii* (64) and followed by *Rattus norvegicus* (60). It seem that field rat *Rattus exulans* was the most lowest of trapped number (2) and all of this species members were found positive of antibody against *Leptospirae*. The percentage of Insecticora *Suncus murinus* six out of 16(37,50%) sera were found positive of antibody against *Leptospirae*.

CONCLUSION

There was an outbreak of Leptospirosis in Jakarta and this outbreak was highly related to the flood that swept this populated metropolis city. There were 20 death out of 103 cases of Leptospirosis that recorded from

the first until the ninth week after the flooded. The high death number was due to the very late of them to come to the Health Center and hospital in order to get the treatment. The age of five year or less group was the very minimum proportion of Leptospirosis infection since they were kept by their mothers to get no contact with the stagnant flooded water. There were the similar serovar of *Leptospirae* in human and the rodent that captured inside and outside surrounding the respondent's houses. The same serovar of *Leptospirae* antibodies were Pyrogenes, Bataviae, Icterohaemorrhagiae and Canicola that found in rodent and in human sera. It was highly suspected that rodent animals were the source of Leptospirosis infection to human in Jakarta metropolis. Public health education about the water borne diseases particularly related to the flood like Leptospirosis have to be given especially to all national public school as well as to the high school students in their class curriculum.

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