Leptospirosis Surveillance Based on Public Health Center  
(An Early Diagnosis and Treatment Efforts of Leptospirosis Control In Bantul District, Yogyakarta)

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Abstract

Background: Leptospirosis is an emerging and neglected disease, which its surveillance is classified as special, consisting of three aspects, such as the human, animals, and environmental factors. This research aims at describing the implementation of leptospirosis surveillance based on the Public Health Center (PHC) as an early diagnosis, treatment and control in Bantul District, Yogyakarta Province.

Methods: A quasi-experiment with a time series design was located at Bantul District, Yogyakarta Province, from February to December 2019. An intervention in the form of clinical lecture was given to the PHC clinician, and a leptospirosis case study with a laboratory examination was carried out according to WHO-SEARO criteria.

Results: The results showed that no case of leptospirosis was reported in PHCs before the intervention and 57 cases were reported after the intervention. Similarly, 70 cases were reported in the Hospitals before the intervention, and 11 cases, after the intervention. Furthermore, the cases reported in the hospitals and PHCs are mostly dominated in the male from the productive age group. According to PHCs and Hospital report, the cases were mostly distributed in Kasihan Subdistrict. The dominant symptoms reported are febrile, headache and muscle aches, and the laboratory confirmation using MAT showed that the infecting serovar of leptospirosis cases reported in PHCs consists of Djasiman, Batavia, Bangkinang, Pomona and Canicola.

Conclusions: The availability of trained personnel and laboratory facilities are the most important factor in implementing leptospirosis surveillance based on PHC and early detection helps in reduction of death rate.

Key words: Surveillance, leptospirosis, Public Health Center
Introduction

Leptospirosis is an emerging and neglected disease, which is a public health problem with a considerable spread, and the recorded incidence rate is increasing in developing countries. Furthermore, its surveillance in several districts is still hospital-based, which provide more information on severe cases according to the World Health Organization (199)\(^2\). Therefore, suspected cases are rarely reported in hospitals, and monitoring of the cases at the City Health Offices is generally carried out intermittently (irregularly) or episodically (a certain time span), such as waiting for reports from hospitals with uncertain time or monitoring in certain seasons. This method often causes delays in the prevention of leptospirosis transmission and death.\(^3\)

In addition, leptospirosis cases in the hospital originate from various places that are not easy to trace, making it difficult to predict the source.\(^4\) Furthermore, there is no measuring tool for the success of surveillance in the hospitals, while the results indicate that medical personnel are not monitoring the surveillance activities in the hospitals and filling out early warning alert forms (KDRS).

Leptospirosis surveillance, which includes special monitoring, the main activity is a survey that focuses on human, animal and environmental factors. However, human-focused activities aims at assessing the susceptibility of the human population to leptospirosis and determine the presence of the infection.\(^5\)

This study aims to analyze leptospirosis surveillance base on Public Health Center (PHC) as an early warning system at the PHC level. Furthermore, the implementation of leptospirosis surveillance based on PHC is expected to diagnose the diseases at early stage and reduce mortality rate. The activities carried out within the framework of the health center-based survey focused on the active and passive cases of leptospirosis, diagnosis, and laboratory tests for the determination of leptospiresserovar that infect humans.

Subjects and Methods

This research is a quasi-experiment using a time series design, which perform repeated measurements before and after the treatment without a comparison area. Furthermore, it was conducted in Bantul District, Yogyakarta Special Region Province (DIY) from January – November 2019.\(^6\) The PHC clinician (clinician, employee) received an intervention in the form of lectures (laboratory and supervisors) and the laboratory examination of leptospirosis was carried out according to the WHO-SEARO criteria: Suspect (which consist of clinical features), probable (clinical features + rapid diagnostic test), Confirmed (Clinical features,Positive Polymerase Chain Reaction (PCR) and Microscopic Agglutination Test(MAT).
WHO. The samples from active and passive leptospirosis patients in Bantul District. Active case report: clinical or cadet actively screened subject in the community. Similarly, passive cases report was perform in Hospital, PHC. The clinician screened the patients that fulfilled suspected leptospirosis criteria, and additional blood sample is obtained for subsequent confirmatory laboratory tests.

**Results**

**Distribution of leptospirosis by location**

The Bantul District is mainly lowland in which the landuse is mostly for agricultural purpose. Furthermore, it is also the estuary area of several rivers from Sleman and Yogyakarta City. Most people work as farmers and are at higher risk of leptospirosis, and the cases in 2019 are almost distributed in every district, especially in the northern region. The most cases were in Kasihan Sub District, followed by Pandak and Bantul Sub District. (Figure 1)

![Figure 1. Distribution of leptospirosis cases in Bantul District in 2019](image-url)

**Characteristics of leptospirosis**

Leptospirosis is a public health problem in the Bantul District, in 2010 and 2011 there was an outbreak, and between the last four years, mortality due to leptospirosis were reported in the regency. Similarly, in 2019, the cases reported in the hospital increased compared to the previous year, and the monthly distribution increases from January to April (rainy season). Leptospirosis cases reported by the District Health Office were a recapitulation of Hospital-KDRS reports (Hospital Early Warning), and
the cases are dominated in the male adult (77%), mostly farmers (62%), others were housewives, private employees and traders.

**Case finding of leptospirosis**

a. Leptospirosis Case finding based on PHC by time:

Passive leptospirosis case report at the Community Health Center (Puskesmas) started with training of health professionals (doctors, surveillance officers and laboratory staff), using three stages of case detection: Suspect, Probable and laboratory confirmation. During the intervention of personnel training, frequent leptospirosis cases were reported every month, 74 suspected cases with the peak was reported in November, and officials conducted active case investigation in the community. 12 cases of leptospirosis was reported in Puskesmas Pandak II, Sanden and Kasihan II. Meanwhile, the others (18 cases) was reported in Puskesmas Pandak I, Kasihan I and Imogiri. (Figure 2).

![Figure 2. Leptospirosis at PHC and Hospitals in Bantul District, 2019](image)

b. Leptospirosis cases based on age, sex and occupation

The distribution of leptospirosis based on age showed that there were no cases in children under the age of five. Similarly, Leptospirosis cases based on sex were dominated by men (64%), and mostly laborers (37.2%), housewives (16.3%) and farmers (11.60%).

c. Leptospirosis Symptom

The results of the interview with a leptospirosis patients in Bantul districts showed that almost every patients (95.30%) had symptoms of fever, headache (86%) and muscle pain (72.10%). The symptoms

were not specific for leptospirosis, without considering the exposure of related risk factors, and other
diseases such as dengue may be diagnosed (Figure 3).

Figure 3. Distribution of leptospirosis symptoms from findings / screening in the Bantul area

![Symptoms distribution chart]

- Fever: 86.30%
- Headache: 72.10%
- Muscle ache: 67.40%
- Weakness: 60.50%
- Calf pain: 46.50%
- Cough: 45.00%
- Red eye: 25.60%
- Dypsnea: 20.90%
- Icterus: 18.60%
- Other Symptoms: 16.30%
- Rash: 4.70%
- Oligourea: 4.70%
- Cardiac Arrhythmias: 2.30%
- Bleeding Manifestations: 2.30%

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d. Laboratory examination results

Four RDT positive cases were reported from the results of examining human blood samples of
patients with leptospirosis that were discovered passively at the PHC. During PCR examinations at the
Banjaraneura Research and Development Center, 2 positive leptospire were obtained. The Microscopic
Agglutination Test (MAT) reported that there were 15 samples (27%) MAT positive out of 74. The most
common serovars reported in Bantul Districts were, Djasiman, Batavia and Bangkinang.

Discussion

Bantul District is classified as an endemic area of leptospirosis, and a well-managed public health
center-based surveillance system helps in reducing the mortality rate. 11 The number of leptospirosis
cases in Bantul Regency tends to be the same yearly, ranging from 80 to 100 cases. However, the death
rate has been reduced to a fairly low value below 6% compared to previous years between 2011 and
2012, which was very high, there has been a high increase in cases, which is categorized as an
extraordinary event. 12 The surveillance system in Bantul District had previously been running despite it
was an hospital-based, and in 2019 the PHC level started reporting leptospirosis cases. The
implementation of the hospital-based surveillance system have some challenges and it was only carried
out intermittently, causing delays in reporting to the public health office, which lead to delayinepideiologlical
investigation action. The Health Office only collects reports from the hospital with an uncertain timing or
monitoring for a certain season. This method often causes delay in preventing leptospirosis transmission and causes death among people with leptospirosis.  

The purpose of early detection of leptospirosis is to determine the susceptibility of the human population and to identify the presence of the infection. Furthermore, the distribution based on age group and sex were described in Bantul District, depending on the type of occupation, the cases were dominated by farmers and laborers. This result was in accordance with Sulistyawati research in Bantul District, which showed that 62.5% of cases were farmers. Agricultural areas such as rice fields, river banks and bushes in the environment have the potential to become habitats for rats.

The distribution pattern of cases of leptospirosis in Bantul District is related to the rainy season in the region, with heavy rainfall between January and March there was an increase in cases, during the dry season cases of the disease are rarely reported. Four RDT positive cases were reported from the results of examining human blood samples of patients with leptospirosis that were discovered passively at the PHC. During PCR examinations at the Banjarnegara Research and Development Center, 2 positive leptospire were obtained. The Microscopic Agglutination Test (MAT) reported that there were 15 samples (27%) MAT positive out of 74. The most common serovars reported in Bantul Districts were: Djasiman, Batavia and Bangkinang and the low proportion of confirmed positive patients from the number of suspected cases was due to several reasons, which includes the effect of incomplete panel serovar antigen of leptospires which were used in MAT.

From the description above, several things are formulated as alternative solutions for the control of the diseases in Bantul District, such as the training interventions for the clinician, laboratory staff and surveillance officials at Public Health Center; supporting the laboratory facilities (RDT) of the Public Health Center to improve the surveillance process. Furthermore, Public Health Center-based surveillance system helps in the reduction of number of deaths, and the PHC-based surveillance needs to be integrated with the reporting system for public and private hospitals in the district / city health office.

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