

EPIDEMIOLOGY OF DIPHTHERIA IN PURWAKARTA REGENCY, INDONESIA

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ABSTRACT

Background: Diphtheria is considered as a neglected disease since it was successfully eliminated in many countries. However, there were several sporadic re-emergence cases of Diphtheria and the peak was outbreak in Indonesia in 2017. This research was a descriptive study aimed to explore epidemiology of diphtheria by person, time and place in one of diphtheria endemic area.

Methods: This was a descriptive study with cross sectional design in Purwakarta Regency, West Java, Indonesia in 2018. Several data were collected in this study such as diphtheria cases by age, time of occurrence, gender, place and immunization status. The data was collected from Purwakarta Health Office. It was the data from the year of 2015-2017. The data was analysed by using descriptive analysis with percentages displayed in graphs and tables.

Results: This study reveals that Purwakarta regency is an endemic area of diphtheria with fluctuated cases since 2015-2017. More cases of diphtheria occurred from September to December in rainy season. More cases suffered by children in 5-9 years old, however, this disease also infected adult population. The area with high diphtheria cases in this study also areas with high population densities which is conducive for *C diphteriae* transmission. Low coverage of immunization is highlighted in the result of this study, which could explain why diphtheria cases occurred continuously in this area.

Conclusions: High number of diphtherias in this area should be an awareness for local health officer to do an effective preventive effort such as increasing the coverage of vaccination. Furthermore, optimizing the role of religious and community leader should be made to support diphtheria vaccination programs.

Keywords: Diphtheria, epidemiology, bacteria

INTRODUCTIONS

Diphtheria is considered as a neglected disease since it was successfully eliminated in many countries. This acute communicable disease is caused by *Corynebacterium diphtheriae* that is transmitted from person to person by airborne droplets. There are three *Corynebacterium* species which caused diphtheria, namely, *C. diphtheriae*, *C. ulcerans*, and *C. Pseudotuberculosis* (1). The characteristic of this bacterial infection is the local growth of the bacterium in pharynx. Symptoms and clinical signs of this disease are a fever up to 38 degrees Celsius, a greyish white pseudo-membrane that is not easily released and an easy bleeding in faring, larynx or tonsils. The incubation period of the disease is 2-5 days and can spread to other people 2-4 weeks from the incubation period. The transmission period reaches 6 months (2). Exotoxin of *C. diphtheriae* could inhibit the production of proteins by cells, destroy the tissue at the site of the infection, lead to membrane formation and cause inflammation of the heart and cause nerve damage. Besides, It also could affect low platelet counts, or thrombocytopenia, and produce protein in the urine in a condition called proteinuria (3).

Elimination of Diphtheria in Indonesia had been successful in 1998 after the implementation of massive vaccination. However, there were several sporadic cases which occurred in Indonesia. In 2011, Indonesia was the second highest country in the world after India with 806 cases of diphtheria and 4.71% Case Fatality Rate (CFR). In the following years, Diphtheria infection also occurred in several parts of Indonesia. And in mid-November 2017, the Ministry of Health of the Republic of Indonesia (MoHRI) declared that there was an outbreak of diphtheria in Indonesia. Since January 1 and week 44 in 2017, it was reported that there were 586 clinically-diagnosed diphtheria cases in 95 regencies among 21 provinces in Indonesia. The case fatality rate (CFR) reached 5.03 nationally, and between 0%-20% provincially (4).

The emergence of this outbreak raises the question whether there has been an epidemiological change in this disease. Based on Indonesia Basic Health Survey, Diphtheria immunization rate in Indonesia was only 67.7% in 2007, 61.9% in 2010 and 75.6% in 2013. Based on the previous studies, the outbreak of Diphtheria was correlated with incompleteness or low coverage of immunization program (4, 5). Based on The Health Ministry data, Diphtheria in 2017 outbreak was experienced by different age groups. Previously, diphtheria is considered as childhood diseases, and when it affected adults it could create more fatal clinical manifestations (6). Indeed, it is important to do routine surveillance to monitor the incidence of Diphtheria.

One of the districts in West Java Province with high diphtheria cases is Purwakarta Regency. This area is located at the intersection of three main strategic traffic corridors, namely Purwakarta-Jakarta, Purwakarta-Bandung and Purwakarta-Cirebon. The re-emergence of Diphtheria cases has occurred in this area for several years. In this study, the author would explore by descriptive study about epidemiology of diphtheria by person, time and place in the area of study. This information would be beneficial for basic data of the diphtheria prevention programme.

METHODS

Study design and area

This was a descriptive study with cross sectional design in Purwakarta Regency, West Java, Indonesia in 2018. This location of study is approximately 80 km southeast of Jakarta. The total area of Purwakarta Regency is 971.72 km² or approximately 2.81% of the total area of West Java Province with population of 845,509 people with an average population growth rate of 2.28% per year. The male population is 420,380 people, while the female population is 425,129. Climatic conditions in Purwakarta Regency are included in the tropical climate zone, with an average rainfall of 3,093 mm/year and are divided into 2 rain zone areas, namely: zones with temperatures ranging between 22⁰ – 28⁰ C and zones with temperatures ranging from 17⁰- 26⁰C.

Data source and data collection

Several data were collected in this study such as diphtheria cases by age, gender, place and immunization status. The Data were collected from Purwakarta Health Office. They were data from the year of 2015-2017.

Analysis

The Data were analysed by using descriptive analysis with percentages displayed in graphs and tables.

RESULT

Based on data from Purwakarta Health Office, Diphtheria cases in this area from 2015-2017 were 2, 52 and 33 respectively. The fluctuation of cases could be seen in Figure 1. The highest cases were observed in 2016.

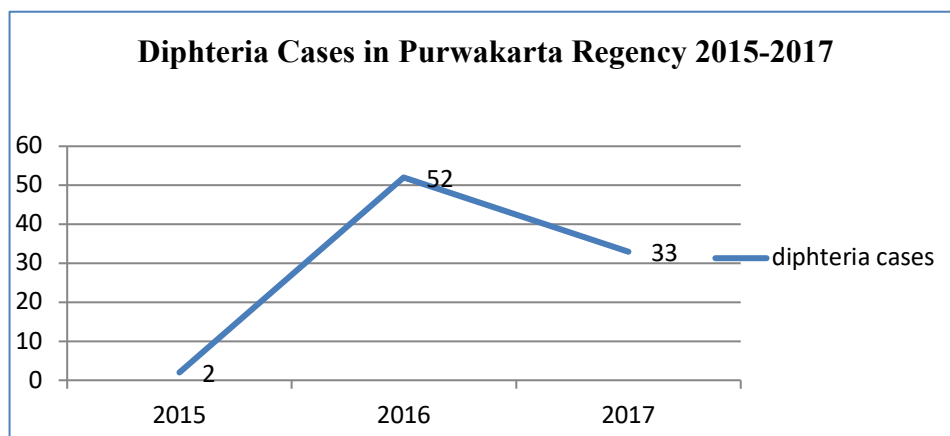


Figure 1. Distribution of Diphtheria Cases in Purwakarta Regency 2015-2017

We also recorded the cases based on the month of occurrence (2015-2017) and observed that more cases of diphtheria occurred from September to December (Figure 2).

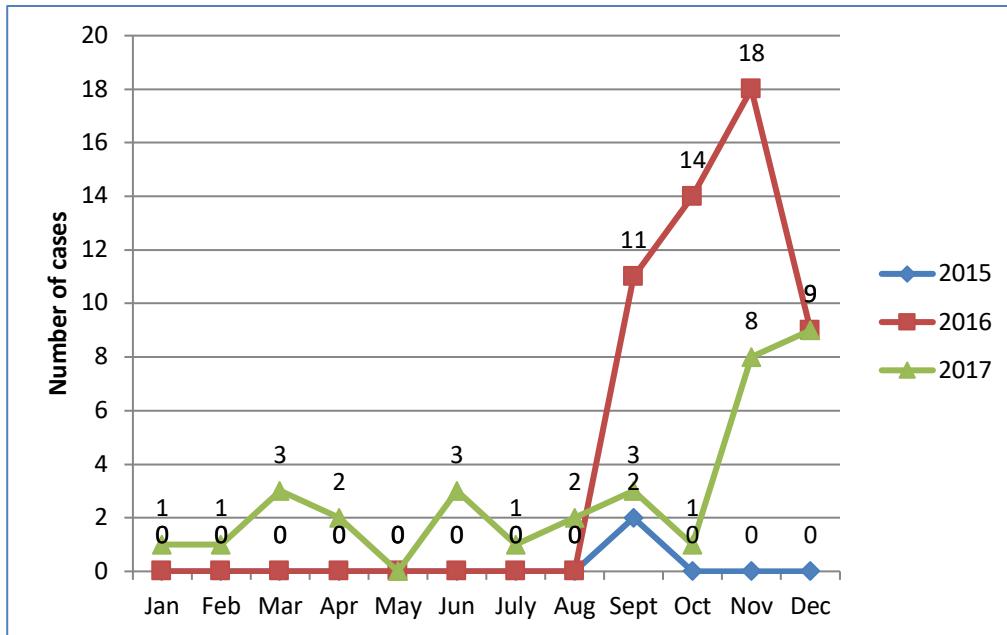


Figure 2. Diphtheria cases by month of occurrence in Purwakarta Regency (2015-2017)

While based on the age groups, more cases occurred in 5-9 years old children, however, this disease also infected adult population as it can be seen in Figure 3.

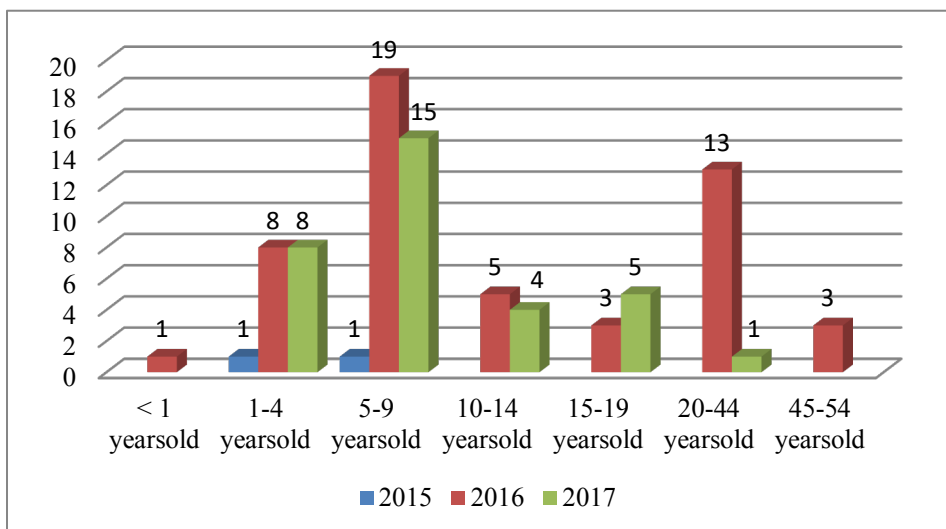


Figure 3. Diphtheria cases by age groups in Purwakarta Regency (2015-2017)

We also collected data of Diphtheria cases by gender and also immunization status (Table 1)

Table 1. Frequency Distribution of Cases of Diphtheria by Gender and immunization status in 2015-2017

Variables	Frequency (N)	Percentage (%)
	N= 87	
Gender		
a. Male	53	61
b. Female	34	39
Immunization Status		
a. Yes	14	16
b. No/Not known	73	84
Total	87	100.0

Table 1 shows that more cases were experienced by male (61%) and out of 87 people, 73 people (84%) were not immunized.

Meanwhile, epidemiology of diphtheria cases in Purwakarta regency by each sub district could be seen in Figure 4.

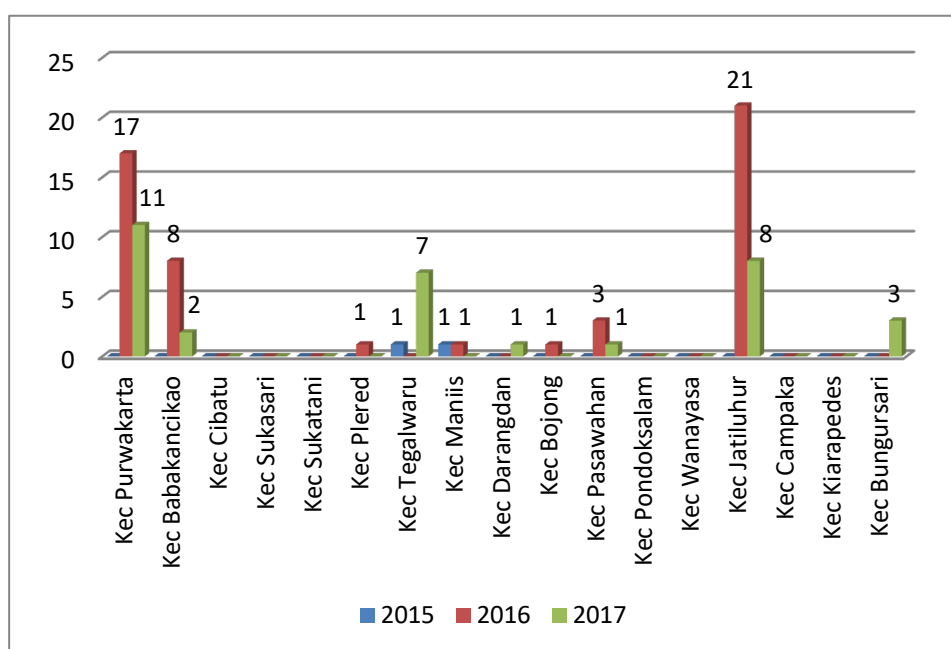


Figure 4. Diphtheria cases based on sub district in Purwakarta regency, West Java.

Figure 4 shows that the highest cases of diphtheria in 2016 were in Jatiluhur Subdistrict which were as many as 21 cases, while in 2017 there were in Purwakarta Subdistrict, which were 11 cases.

DISCUSSIONS

Information about epidemiology of diphtheria, particularly in outbreak occurrence is undoubtedly important as basic data for its prevention and control program. In Purwakarta Regency, diphtheria cases from 2015-2017 were 2, 52 and 33 respectively. This fact indicates that diphtheria is endemic in this area, in fact there was also high cases (52 cases) in 2016 before the national outbreak in 2017. In this study, it was found that more cases of diphtheria occurred from September to December in rainy season. According to Indonesian Meteorology and Geophysics Agency, the rainy season in Indonesia begins in the late October-November while the peak of the rainy season occurs in December-February. This result is in accordance with the previous studies which stated that more diphtheria cases occurred in rainy season because immunity of people tend to decrease in rainy season which affects more susceptibility for infectious diseases (7). Several seasonal changing and environmental factors, such as temperature, sunlight, rain, wind and humidity are correlated with the increasing number of infectious diseases (8).

Based on the age groups, more cases occurred in children between 5-9 years old, however this disease also infected adult population. Among 5-9 age groups, 19 cases occurred in 2016 and 15 cases in 2017. This result is also in accordance to the previous belief that diphtheria is childhood disease and responsible for childhood morbidity and mortality in the pre-vaccination era (6, 9). In this study, it was also found that Diphtheria cases occurred more in male (61%) than female (39%). Meanwhile, based on immunization status, it was found that 84% of cases were caused by not being immunized. Low coverage of DPT (Diphtheria, tetanus and pertussis) immunization in this area could be an explanation of the diphtheria occurrence. The World Health Organization had recommended this vaccination since 1974 and resulted more than 90% decrease in number of cases globally between 1980 and 2000 (10). The Low coverage of vaccination in Purwakarta regency could be due to some communities who refused to bring their children to be vaccinated because of religious reason. The communities' belief in several areas in Purwakarta that the vaccine is haram made parents refuse to vaccinate their children. Several studies showed that the number of religious exemptions has been increasing and it is leading to the outbreak of vaccine preventable diseases (11, 12). Research in India also found that, Muslim children had greater chance of being under-vaccinated or unvaccinated compared to Hindus (13).

Based on the location, the highest cases of diphtheria in 2016 were in Jatiluhur Subdistrict which were as many as 21 cases, while in 2017 were in Purwakarta Subdistrict, which were 11 cases. In the research setting, Purwakarta Regency experienced a sporadic occurrence of Diphtheria infection. The first re-emergence of diphtheria case happened in 2007 when the first case was discovered in Maniis Sub-District area. The high cases which were observed in Jatiluhur sub district could be because this area is a tourism area where there is a reservoir of *Ir. H Juanda* so that there are many tourists from outside of the area bring the source of transmission. The first case in 2016 was also the first case appeared in the Jatiluhur Health Center until it spread to the village of Cisalada, Jatiluhur sub-district. The previous research in Indonesia showed that child/parent mobility was the major risk factor of diphtheria

outbreak (14). Other risk factors of diphtheria occurrence were nutritional status of children and the source of transmission (15). The area with high diphtheria cases in this study is also areas with high population densities which is conducive for *C diphtheriae* transmission. In line with it, several previous studies confirmed that high population density is correlated with higher risk of diphtheria infection in certain area (16, 17).

CONCLUSIONS

This study revealed that Purwakarta regency, West Java is an endemic area of diphtheria with fluctuated cases since 2015-2017. A low coverage of immunization is a highlighted finding of this study, which could explain why diphtheria cases occurred continuously in this area. High number of diphtheria in this area should be an awareness for the local health officer to do effective preventive effort such as increasing the coverage of vaccination. Besides, Optimizing the role of religious and community leaders should be made to support diphtheria vaccination programs.

AUTHORS' CONTRIBUTION

SPMW the conceptual of research, writing paper manuscript

ANF data collection

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Conflict of interest

There are no conflicts of interest

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