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【Title of Research】

Epidemic analysis typhoid fever with complications on disaster affected area in Indonesia

【Purpose of Research】

A disaster is a situation that impacts negatively on society and the environment and is caused by natural or man-made hazards. Over the last 4 years, natural disasters in Indonesia have become almost inevitable. On December 26, 2004, an earthquake measuring 9.0 on the Richter scale occurring 150 km off the coast of Sumatra-Indonesia in the Indian Ocean triggered a widespread tsunami that hit Aceh 45 minutes later and devastated an 800 km coastal strip. Roughly 130,000 people died, and a further 37,000 went missing presumed dead. Two years later, on May 27, 2006, in the Indian ocean, around 25 km south-southwest of Yogyakarta city, on the southern side of Java island, earthquakes struck again, affecting 36,299 people, with 5,782 fatalities and 135,000 homes damaged (CNN, 2006).

Epidemics and infectious diseases are further problems in disaster affected areas. Typhoid fever is one of the epidemic infectious diseases, which occurs in humans due to systemic infections; mainly caused by *Salmonella typhi* bacteria and which may cause serious complications in disaster affected areas. It is known as a water borne disease, which is transferred to food from human excreta via hands. For internally displaced persons (IDPs), it is frequently difficult to acquire clean water for cooking or their own daily activities. This problem would be exacerbated by unhealthy human behavior in society.

There are many factors that influence typhoid fever as mentioned in previous studies in Indonesia. In 1997, Velema and colleagues located high risk groups and behavior in Ujung Pandang South Sulawesi and concluded that education and hand washing were needed to avoid typhoid fever. Gasem et al 2001 identified the risk factors in Semarang that were related to poor food hygiene and housing. The variables used were educational level, hand washing, eating outdoors and jobs. Gasem found that typhoid was usually associated with poor housing, inadequate food and personal hygiene. Vollard et al, in 2004, presented the fact that the transmission of typhoid fever was mainly within the household with the variables related family income, hand washing, clean water and sharing food.

Research purpose

The analysis, surveillance and control of social factors in infectious disease are the important functions in public health. Whether the type of disaster can influence and the strategy to prevent typhoid fever complication in disaster affected area have not been determined. In particular, such a strategy of avoiding typhoid complications in disaster affected area needs to be considered.

【Content/Methodology of Research】

Data collection and inclusion criteria

As a courtesy, ethics and permission to do the study was also obtained from the Director of Zainoel Abidin hospital in Banda Aceh, Sardjito Hospital and Bantul health office Yogyakarta, and Hasan Sadikin hospital Bandung. Inclusion criteria were typhoid fever patients and positive *Salmonella typhi* by culture or laboratory widal test in hospital. Widal test is a tube dilution test which measure human antibodies against the *Salmonella typhi* antigen. Blood and/or bone marrow test was not done in both disaster affected area due to lack of facilities. Nevertheless the widal test was still useful while interpreted with care. Patient's data was confirmed and noted from medical record, subsequently survey was conducted to see situation and to interview respondents. Inform consent was obtained from the respondent concerning about this study. Respondent would be excluded if they did not agree to join on this study. Data were stored anonymously and confidentially. During surveillance, open ended questionnaire had been made to guide interviewers and respondents in order to focus on the subject. Volunteers were recruited from staff or medical student at Syiah Kuala University in Banda Aceh, Gajah Mada University in Yogyakarta, and Padjadjaran University in Bandung to assist data collection and interview. Short training and explanation were given before surveillance and interviewing respondents. Interview was done directly at the patient's home. In case of patients was uncooperative like children, question was aimed to the mother or family member. Socio-cultural and customs must be precedence due to in each province of Indonesia has difference kind of customs and culture. Demographic data was requested to the local office government and permission from the person in charge was obtained as long as data from central bureau of statistics website was not sufficient.

Interview

This interview was conducted due to lack of disaster situation information in the medical record. We performed open ended questionnaire with informal nature of interview that allows for the empathic relationships between the interviewer and patients which was appreciated. All participants were response positively after giving informed consent as an important point to enable patients to be fully aware of what they were participating in. We collaborated with the local medical students because they were already familiar with the local customs, culture and language in each districts. It was necessary since we had to communicate to the patients in the local language, respecting their customs and culture as well. Although we have national language but not all respondents could speak Indonesian language as well and it would be easier for them to understand the subject of questions while using their local language. The people with lower educational level were purely speaking in the Javanese and Aceh language. The response of the patients was attempted in the complete explanation, in order to obtain the real description of disease and disaster situation.

Questionnaire

Open ended questionnaires were used to guide the interviewers to explore patient's experience retrospectively. The format examples of the interview were as follow:

- "What was the doctor suggested to you after recovery?"
- "Why did you decide to recheck to the health facilities as the doctor suggested?"
- "How did you obtain the drugs and drink it properly?"

- “How did you get the clean water and check it?”
- “Why do you think, you have to wash your hands?”
- “How did you contact with other typhoid patients?”
- “What kind of complications did you have? (Confirmed with the medical record)”.

An open ended questionnaire is designed to encourage a full, meaningful answer using the patient's own experiences. It is tend to be more objective and less leading than closed ended questionnaire which encourages a short or single word answer.

Discriminant analysis

The typhoid variables from questionnaires were entered to the Microsoft Excel 2003 and SPSS 16.0 was applied for discriminant analysis. The purpose of discriminant analysis is to define the predictors of typhoid complications selected variables in each district. If P value of less than 0.05 then variables were considered significant. Wilks' lambda was obtained to consider the power to differentiate districts. The smaller Wilks' lambda for an independent variable, the more that variable contributes to the discriminant function. Wilks' lambda varies from 0 to 1, with 0 meaning group means differ (thus the more the variable differentiates the groups), and 1 meaning all group means are the same.

【Conclusion/Observation】

The complications of typhoid fever were founded in three districts. Many authors reported that the incidence of complications was common in typhoid fever as long as the treatment was not properly reached. Those complications would become burdens for hospitals while the situation was getting worse in disaster. The availability of diagnosis testing in disaster affected area is the other problem beside the difficulties of making diagnosis since it has the same symptoms like the other fever disease. In this case, the preparation of quick diagnostic device for typhoid fever is able to be considered for screening if such a number of cases had been reported. Gasem 2002 reported that simple rapid dipstick assay can be useful for quick diagnosis on typhoid fever in disaster Indonesia.

Table 1.Characteristic of typhoid fever patients in tsunami (Aceh), earthquakes (Yogyakarta) and normal situation (Bandung)

Variables	Classification	Tsunami (Aceh) n=42 [%]	Earthquake (Yogyakarta) n=39 [%]	Normal situation (Bandung) n=70 [%]
Age [years]	Mean ± SD	36.1 ± 15.4	35.5 ± 14.5	19.3 ± 13.7
	Range	11-65	13-80	7-61
Gender	Male	25[59.5]	20[56.4]	28[40.0]
	Female	17[40.5]	19[43.6]	42[60.0]
Education	Primary	13[31.0]	22[56.4]	47[67.1]
	Secondary	29[69.0]	17[43.6]	23[32.9]
Recheck		38[90.5]	36[92.3]	64[91.4]
Go to recheck		30[71.4]	30[76.9]	51[72.9]
Drug availability		28[66.7]	28[71.8]	50[71.4]
Clean water		34[81.0]	32[82.1]	58[82.9]
Water checking		10[23.8]	9[23.1]	15[21.4]
Hand washing		38[90.5]	35[89.7]	64[91.4]
Contact with other typhoid		19[45.2]	17[43.6]	36[51.4]
Complications		5[11.9]	8[20.5]	13[18.6]

In the aftermath of tsunami in Aceh, there were serious concerns regarding the clean water supplies and drugs availability. Consequently providing clean water supply, drugs distribution properly is the priority in tsunami. The diminishing direct contact with typhoid patients among internally displaced persons (IDPs) on the earthquakes in Yogyakarta is the way to avoid the typhoid transmission. Meanwhile in Bandung, Personally, a good hand washing is the line of defense against the typhoid infection and supporting drugs freely for the patients are need to be considered.

Table 2.Discriminant analysis with grouping variable complication and selected variable by district

Variables	Tsunami (Aceh)		Earthquake (Yogyakarta)		Normal situation (Bandung)	
	Wilks' Lambda	Sig.	Wilks' Lambda	Sig.	Wilks' Lambda	Sig.
Age	0.999	0.843	0.960	0.220	1.000	0.875
Gender	0.976	0.332	0.987	0.490	0.992	0.459
Education	0.848	0.011*	0.899	0.048*	0.888	0.005*
Recheck	0.983	0.408	0.992	0.579	0.986	0.338
Go to recheck	0.995	0.661	0.970	0.290	0.985	0.316
Drug availability	0.730	0.000*	0.969	0.280	0.929	0.025*
Clean water	0.426	0.000*	0.991	0.572	0.994	0.536
Water checking	0.958	0.192	0.984	0.439	0.995	0.563
Hand washing	0.983	0.408	0.999	0.820	0.857	0.001*
Contact with other typhoid	0.999	0.808	0.666	0.000*	0.997	0.679

Significant level at P<0.05