

Cost of Prevention Dengue Hemorrhagic Fever in Gianyar, Bali

Putu Ayu Indrayathi^{1*}, Ni Luh Widiyantari², Rini Noviyani³

¹Putu Ayu Indrayathi, School of Public Health, Medical Faculty of Udayana University

²Ni Luh Widiyantari, School of Public Health, Medical Faculty of Udayana University

³Rini Noviyani, Pharmacy Department, Udayana University

Email : pa_indrayathi@unud.ac.id

Abstract

Dengue Hemorrhagic Fever (DHF) is a disease caused by *Aedes aegypti* mosquito bites. In 2016, Gianyar District is one district in Bali has become area with highest dengue fever case in Bali. Up to now there is no complete data and publication of the costs incurred by the government. The purpose of this study is to determine the cost of prevention and control program of dengue disease in Gianyar District Health Office as a baseline data to determine the economic burden due to DHF. This research is descriptive research with mixed methods approach using secondary data and interview technique. Study found that fund spent by Departement of Health Gianyar District amounted to 91% for vector control, the cost incurred for KIE was 8.5% and the lowest cost was surveillance of 0.7% of total cost of prevention in Gianyar Regency. This is calculated as IDR 2.203.172.875,00 in 2016. The most widely applied cost for vector control is for fogging purposes which reached 96.3% of total DBD vector control with the cost of the three largest activities were for officer fee, ULV, and fogging insecticide. The highest level of expenditure was on prevention and control is fogging. This activity is the most widely used alternative of DHF control although it is realized that fogging is not effective to prevent DHF. This study suggests that more effective innovation prevention and control programs are needed, and to obtain maximum results further research can be done using a broader perspective to calculate the total cost of prevention of DHF.

Keywords : Dengue Fever, Cost of Prevention, Health Department, Gianyar

Introduction

Dengue Hemorrhagic Fever (DHF) is one of the infectious diseases transmitted by mosquito bites that are found in many tropical and subtropical regions around the world¹. Globally in 2012, based on morbidity and economic impact for a country especially in developing country DHF has become more important to be handled than Malaria^{2,3}. According to Senanayake (2014), knowing the economic impact of DHF can be useful for formulating policies ranging from prevention program planning and further research priorities³. Kongsin et.al (2010), also stated that considering the costs incurred as a result of the handling of vectors as well as humans such as fogging, program implementation, health promotion activities, and DHF surveillance will be very useful in public health⁴.

In Asia especially in Indonesia, estimation of the cost of prevention are difficult to ascertain. This is because the DHF case information is less clear due to incomplete reporting of some cases that occur⁵. In 2016, incidence rate of DHF per month in Bali province is 486.2 per 100,000 population, this number increased compared to 2015 with dengue IR 269 per 100,000 population⁶. The economic burden occur due to DHF has become the responsibility of each local government. Puskesmas plays pivotal point in handling prevention and control of DHF budget. An integrated information on the economic costs of vector control and other extras costs include plague management costs are not available for policy maker⁷. Therefore, it is important to conduct a research of cost-prevention analysis of dengue hemorrhagic disease because DHF is one of the causes of many deaths in Gianyar District. This study was conducted

to complement the limited empirical evidence in relation to the estimated cost of dengue disease, as local data collection will provide more accurate information.

Methods

This study is a cross sectional study with mixed methods sequential explanatory design. Based on the characteristics of sequential explanatory combination method, the first phase of the study using quantitative methods and in the second stage using qualitative methods. Thus a combination of research was conducted to answer the formulation of quantitative problems in order to complete each other. The method is used because lack of data available on how well vector, surveillance and IEC controls. This research had been approved by the ethical commission with ethical clearance number 762/UN.14.2/KEP/2017 from Research Ethical Commission Udayana University Medicine Faculty/Sanglah Hospital, Denpasar. This research was conducted at Gianyar Regency starting from March until April 2017. The study use primary and secondary data. Quantitative data is gained from secondary data from Department of Health (DOH) Gianyar and qualitative data is gained form in-depth interview. Sample is choose purposively with five informants and use triangulation technique to validate data.

Results

Cost of Vector Control in 2016

Based on interview with staff from DOH Gianyar, study found that there are three activities undertaken by DOH Gianyar Regency to control DHF vector in 2016 namely Environmental Management, Abatization, and Fogging

Table 1. Cost and Percentage of Vector Control of Dengue Disease in DOH Gianyar 2016

Control of Dengue Vectors Year 2016		
Activity	Rp	%
Environmental Management	13.550.000,00	0,68
Abatization	60.000.000,00	3,0
Fogging	1.925.020.000,00	96,3
Total	1.998.570.000,00	100

From Table.1 can be seen that total cost incurred by DOH Gianyar for vector control is Rp. 1,998,570.00,00 with the highest percentage for fogging activity that is equal to 96,3%

Cost of Communication, Information and Education 2016

This study found that DOH Gianyar and some related agencies spent Rp. 188.218.000,00 to develop posters, brochures, leaflets, brochures, booklets, messages for health education purposes, partnering with cross-sector agencies, radio broadcasts, print media, potential partners consisting of non-governmental organizations as a means of promoting the danger of DHF.

Cost of Surveillance Program 2016

Data on surveillance costs are obtained from secondary data. While the flow and surveillance system of Dengue Hemorrhagic Fever in DOH Gianyar obtained from in-depth interview.

"... there is supervision, official travel, ... there for the web every week is made. There is STP (integrated surveillance of puskesmas), the same format from the center under the ministry is distributed to the puskesmas ... by name by case ... integrated report ... "(R.02)

Table 2. Cost of Surveillance at DOH Gianyar 2016

Activity	Rp	%
Buying Goods	1.400.875,00	9
Meeting	2.304.000,00	14
Supervision	12.680.000,00	77
Total	16.384.875,00	100

The cost of surveillance is fully utilized by the DOH Gianyar Regency, there is no fund given to the Puskesmas because community health center has become is a public service agencies primary health care policy (BLUD) institution. The public service agencies primary health care policy has been implemented to all primary health care in Gianyar district since 2010⁸.

Cost of Prevention of Dengue Hemorrhagic Fever (DBD) in DOH Gianyar 2016

Based on in-depth interview and secondary data available in DOH Gianyar, this study found that cost of prevention of DHF is Rp. 2,203,172,875. Detail is as follow:

Table 3. Cost of Prevention of DHF in DOH Gianyar 2016

DHF Prevention and Control Program DBD Year 2016		
Activity	Rp	%
Vector control	1.998.570.000,00	91%
Communication, Information and Education	188.218.000,00	8,5%
Surveillance	16.384.875,00	0,7%
Total	2.203.172.875,00	100%

Based on table. 3 , it can be seen that the most fund is for vector control Rp. 1,998,570,000.00 or about 91% of the funds for the P2DBD program at the DOH Gianyar Regency. Follow by communication, information and education, and surveillance with Rp 188.218.000,00, and Rp 16.384.875,00 respectively.

Discussion

DHF is the most important vector-borne disease in terms of disease and economic burdens. The government has invested substantially for dengue prevention program. This is because Dengue creates a real economic burden for society. Cost of prevention is a disease prevention activity that uses the resources needed to perform various intensive activities undertaken by the parties concerned to prevent and control the disease. DHF prevention and control activities are surveillance, periodic larvae in houses, larvacide use in water storage containers, peripheral insecticide spraying against adult mosquitoes (fogging), health education/ promotion related to disease prevention⁹ . Based on the secondary data collection , it can be concluded that the large cost incurred by the DOH Gianyar in 2016 for P2DBD (DHF Prevention and Control) activities is Rp. 2.203.172.875,00. These costs are spent on vector control consisting of environmental management, abatization, and fogging. Environmental

management activities consist of PSN (Mosquito Nest Eradication) and PJB (Periodic larva monitoring) by Jumantik cadres in the working area of DOH Gianyar. The cost incurred for Jumantik incentives in 2016 is Rp. 13.550.000,00 or equal to 0.68% of the total cost incurred for vector control in 2016. The incentive given to Jumantik is given by the Gianyar District Health Office directly without going through the puskesmas. Based on DOH Gianyar District report, the activity that absorbed most of APBD funds managed by DOH Gianyar Regency is fogging which is 96,32% from total cost of DBD vector control. As can be seen from table.1 that the cost is high enough for the fogging activity. This is because fogging is an activity that is routinely done every year and is realized to spend high cost with low effectiveness in preventing dengue disease. But fogging is still done to prevent and control the vector of dengue fever which aims to kill infective adult mosquitoes quickly and break the chain of dengue virus spread carried by mosquitoes¹⁰. This fogging activity is not only an alternative to vector control in Indonesia but also in Cambodia which costs 500,000 USD every year. While Thailand spent 4.87 million USD each year for the fogging activities. The fees vary depending on the policies of each country in the P2DBD⁹

However, there are several concerns about the use of insecticides in dengue prevention, namely the development of mosquito resistance, environmental risks, and the transient variable efficacy of peridomestic area spraying¹¹. According to WHO, education programs / programs to the public about prevention and control of DHF more effectively can raise awareness about the importance of prevention and control activities to be done independently by community rather than fogging¹². The DOH Gianyar also conduct health promotion activities to prevent DHF. There are several health promotion activities undertaken by the DOH namely advocacy, business development, and community empowerment. The activities not only targeting community groups but also for policy advocacy and foster relationships with partners in the process of disseminating information to the community about DHF. By raising public awareness through education activities against the dangers of dengue fever and doing activities of prevention and control of dengue fever is the choice to avoid this infectious disease¹¹. However, the fund provide for health promotion through communication, information and education program in Gianyar District not as much as fund for fogging activity. This approach may be driven by public expectations of government reaction to dengue outbreaks in the district area rather than higher expectations of proactive actions to prevent dengue outbreaks.

There are several limitations to this study. The cost of prevention perspective is limited to the public sector only especially from DOH Gianyar District perspective. The study did not include the cost of dengue vector activities paid for by private corporations (e.g., fogging activities surrounding hotels, factories, and warehouses) and private households (e.g., fogging conducted in elite residential area) also not included community mosquito prevention activities conducted by non governmental organizations (NGO). Most cost datas for communication, information and educational are borne from interview since the DOH Gianyar office does not the written document

Conclusions

DHF disease creates a real economic burden for society. The community in Gianyar area has been reliant on a government funding for prevention and control program. The cost of prevention borne due to DHF is Rp 2.203.172.875,00. In 2016, spending for Dengue Prevention and Control activity at the DOH Gianyar Regency is the highest fund compared to other diseases. Fogging is the most costly alternative option from year to year that costs the most from other preventive activities from supporting equipment, human resources and chemicals used. Although fogging is not effective to prevent dengue fever, fogging activities are still done to kill infective adult mosquitoes to prevent rapid transmission but also driven by public expectations of government reaction to dengue outbreaks. The cost has increased notably over time, primarily due to price inflation and the increasing prevalence of DHF. Data on DHF costs in Gianyar will help indicate how much money could potentially be reallocated to other control approaches as they become available.

References

1. Guzman A, Isturiz RE. (2010). Update on The global Spread of Dengue. *Int J Antimicrob Agents* 36 Suppl 1: S40-42.
2. Gubler, Duane J. (2012). The Economic Burden of Dengue. *Am. J. Trop. Med. Hyg.*, 86(5), 2012, pp. 743– 744 doi:10.4269/ajtmh.2012.12- 0157
3. Senanayake P, Manouri. (2014). Childhood Dengue: An overview on Cost of Illness in Asia. *Pediat Therapeut* 4: 195. Doi: 10.4172/2161-0665.1000195.
4. Kongsin S, Jiamton S, Suaya JA, Vasanawathana S, Sirisuvan P, et al. (2010). Cost of Dengue in Thailand. *Dengue Bulletin*
5. Beatty ME, Beutels P, Meltzer MI, Shepard DS, Hombach J, et al. (2011). Health Economic of Dengue: a systematic literature review and expert panel's assessment. *Am J Trop Med Hyg* 84: 437-488.
6. Dinas Kesehatan Provinsi Bali. (2016). Laporan Kasus Demam Berdarah Dengue (DBD) Berdasarkan Kabupaten/Kota di Provinsi Bali Tahun 2016. Denpasar.
7. Baly, Alberto, Maria E. Toledo, Karina Rodriguez, Juan R. Benitez, Maritza Rodriguez, Marleen Boelaert, Veerle Vanlerberghe, Patrick Van der Stuyft. (2011). Costs of dengue prevention and incremental cost of dengue outbreak control in Guantnamo. *TMIH* Vol 17, Pages 123–132.
8. Indrayathi, Listyowati, Nopiyani, Ulandari, *Mutu Pelayanan Puskesmas Perawatan yang Berstatus BLUD Kesmas, Jurnal Kesehatan Masyarakat Nasional Vol. 9, No. 2, November 2014, Pages 164-170*
9. Packierisamy, P. Raviwharmman, Chiu- Wan Ng, Maznah Dahlui, Jonathan Inbaraj, Venugopalan K. Balan, Yara A. Halasa, Donald S. Shepard. (2015). Cost of Dengue Vector Control Activities in Malaysia. *Am J Trop Med Hyg*: 93(5): 1020–1027.
10. WHO (2016). What is dengue and how is it treated. Available :<http://www.who.int/features/qa/54/en/> (Accessed: 07 Mei 2017).
11. Doi, Hisaya, Eiji K., Hiroya M. (2014) Cost-effectiveness of dengue control using copper ions in Indonesia. Research Institute for Microbial Disease, Osaka University.
12. WHO. (2009). Dengue: Guidelines for Diagnosis, Treatment, Prevention and Control. New Edition. Geneva: World Health Organization