

Risk Factors and Spatial Distribution of Rabies in Bali in the Year of 2014

Faktor Risiko dan Penyebaran spasial Rabies di Bali pada Tahun 2014

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ABSTRAK

Penelitian ini bertujuan untuk menentukan penyebaran dan faktor risiko kejadian rabies di Bali pada tahun 2014. Sebanyak 1286 sampel otak dari seluruh Bali diperiksa. Dari keseluruhan yang diperiksa, sebanyak 130 sampel dinyatakan positif rabies. Berdasarkan data tersebut, lokasi anjing dipetakan menggunakan alat Global Positioning System (GPS), selanjutnya data koordinat dianalisis menggunakan program GIS. Hasil penelitian menunjukkan bahwa penyebaran kejadian rabies di setiap Kabupaten di Bali bervariasi, namun penyebarannya memiliki pola yang sama. Faktor konseling, turunan, perdagangan, dan kondisi geografi berasosiasi dengan kejadian rabies. Penelitian lebih lanjut dibutuhkan untuk memetakan kejadian rabies dalam waktu yang lebih lama (lebih dari 3 tahun) untuk meningkatkan efektivitas surveilan dalam kaitan eradikasi rabies di Bali.

Kata kunci: rabies, faktor risiko, penyebaran spasial, GIS

ABSTRACT

The aims of this study was to determine the spatial distribution and the risk factors associated with the incidence of rabies in Bali on the year of 2014. A total of 1286 brain samples from all over the Bali was examined. Out of all brain samples, 130 samples were diagnosed positive for rabies. Based on these data, we collected the dogs location coordinates using a tool of Global Positioning System (GPS). Those coordinates were, then, analyzed with GIS software. The results showed that spatial distribution of the incidence of rabies in each regencies in Bali varied, however, it had a same pattern. The factors of counseling, breed, trade, and geographical condition associated to the incidence of rabies. Further research is needed to map the incidence of rabies over a longer time (more than 3 years), to improve the effectiveness of surveillance in connection with the eradication of rabies in Bali.

Key words: rabies, risk factors, spatial distribution, GIS

INTRODUCTION

Rabies also known as Lyssa hydrophobia, rage, tollwut, is an acute infectious disease of the central nervous system, that can affect mammals, including humans. Rabies is very dangerous viral zoonosis and one of the oldest known and most feared human diseases (Yibrah and Dantje, 2015).

The diseases causes thousands human death annually and millions of people have been vaccinated against rabies after dog bites worldwide. Failure in controlling rabies in many countries, especially in developing

countries, one of which is caused by not to reach an adequate levels of vaccination coverage of at least 70% (Dalem *et al.*, 2012). Cases of rabies in humans in Indonesia were transmitted 95% by dogs, and 5% by cats, monkeys, etc. (Naipospos, 2004).

Bali province is historically known as an area free of rabies. Bali is the latest province of contracting rabies in Indonesia and Bali officially was declared infected this disease by the Decision of the Minister of Agriculture No.: 1637.1 / 2008 dated December 1, 2008 (Putra *et al.*, 2009). The disease has remained an endemic problem in Bali since it was first reported. The vaccination of dogs and the

control of population are still the major control strategies of rabies, however, the prevalence of this disease is still high. During 2014, from the total of 1286 brain dog samples tested at Animal Disease Investigation Centre- Denpasar, about 130 were positive for rabies. Cases of rabies were found in 101 villages from 723 villages. It has also been reported that two people died due to rabies.

Processing the rabies connected data is still limited in Bali. Identifying the sites of rabies cases is possible, and then, those sites can be mapped using GIS approach. This study aimed to determine the spatial distribution of the rabies and the risk factors that associate with the incidence of rabies in Bali in the year of 2014.

MATERIALS AND METHODS

Data Collection

This study covered the dog that diagnosed positive for rabies by Animal Disease Investigation Centre, Denpasar from January to December 2014 in Bali Province. The data were collected in the following steps: a. coordinates of the locations of the rabies positive dogs were collected using a tools of the Global Positioning System (GPS), and then the GPS coordinates were analyzed using a GIS software. b. Interviews were conducted directly to the owner of the dogs (household) to obtain information that associates to the rabies incidence. A total of 130 households interviewed in this study.

Statistical Analysis

Data from the questionnaires were analyzed with chi square test and odds ratio (Riwidikdo, 2009). Factor with the highest OR is a factor that most likely associates to the disease. Data of the GPS coordinates of the location of rabies cases were used to depict the spatial distribution of the cases.

RESULTS AND DISCUSSION

Results

Descriptive Statistical Incidence of Rabies in Bali

From the 1286 samples of brain, 130 brain samples were diagnosed positive for rabies. Temporally, the highest incidence of rabies was found in September 2014 with 21 cases (16.15%), and the least was found two cases (1.54%) in January 2014. The questionnaire analysis also showed that 66.92% (87/130) respondents (households) owned dogs more than one, more than 70% dog owners (households) had the dogs that have been vaccinated, and all respondents (100%) oversaw dog traffic and dog elimination activities.

Based on the survey data, the incidence of the free roam dogs in the village was 40.77% (53/130), while incidence of the presence of other dogs that entering the village was 45.38% (59/130). About 2.31% (3/130) respondents stated that there were trades of dogs in the village, and 3.08% (4/130) respondents expressed that there were trades of dog meat for consumption. There were about 10% (13/130), 48.46% (63/130), and 1.54% (2/130), respondents stated that they got counseling about the awareness of rabies, there was geographical conditions that inhibit the activities of vaccination and elimination, and there was a dog ownership regulation in the village respectively.

Based on dog ownership data, the households that owning a local breed dog were 90.77% (118/130). In relation to the sex, the households that owning the female dogs (68.46%) was higher than owning the male dogs (31.54%). The households that having the dogs from adoption were 83.08% (108/130), while the others that having the dogs from buying were 16.92% (22/130).

The Risk Factors Associate to the Incidence of Rabies in Bali

The variable of counseling related to the awareness of rabies associated significantly to the incidence of rabies in the District of Badung and Gianyar. But, in Bangli District the variable of geographical condition was the only one variable that associates to the rabies (Table 1).

Table 1. Chi Square and Odds Ratio (OR) of the Variable Associated with Incidence of Rabies in the Districts/Cities in Bali

Variable	X ²	P-value	OR	95% CI
Badung				
Counseling of rabies	5.2	0.023*	6.91	1.04 -45.79
Breed	16.58	0.000**	4.95	1.78 – 13.75
Bangli				
Geographic. condition	4.98	0.026*	2.92	1.11 – 7.63
Gianyar				
Trade	15.04	0.000**	29.75	2.43 – 364.05
Counseling	4.81	0.028*	4.71	1.05 -21.09

* = strong relationship; ** = very strong relationship

Spatial Distribution Pattern of Incidence of Rabies in Bali

The incidence of rabies in the districts in Bali spread evenly but do not have a specific pattern. The distribution maps of the incidence of rabies in Bali was shown in Figure 1.



Figure 1. Map of the Distribution of Rabies in Bali

Table 2. Distribution of Rabies Cases in Districts/Cities in Bali

No.	Districts / Cities	Frequency	Percentage
1	Denpasar	2	1.5
2	Badung	5	3.8
3	Gianyar	10	7.7
4	Klungkung	10	7.7
5	Karangasem	26	20.0
6	Tabanan	9	6.9
7	Jembrana	22	16.9
8	Buleleng	23	17.7
9	Bangli	23	17.7
Total =		130	100.0

The highest incidence was found in Karangasem District (20.0%). While the District of Buleleng and Bangli had the same percentage of the incidence ie. 17.7%. The

detail of the distribution of the incidence of rabies across the districts in Bali was depicted in Table 2.

Discussion

The lack of sufficient awareness about the disease reported influence the high incidence of rabies (Jumberu et al., 2013). Information, education and communication (IEC) are expected to improve the public knowledge and understanding about the awareness of rabies (Yousaf et al, 2012).

Breed based incidence showed that the local breeds dogs positively associated with the incidence of rabies in Badung. This finding agreed with the finding of Karshima et al.(2013), that Breed based incidence was higher among the local breeds than the exotic breeds. The exotic breed dogs staying in the Badung Regency get a better attention than the local dogs, like feeding with adequate nutrition and regular, good maintenance management including health status and rabies vaccination. However, that statement is still being debatable because many local dog lovers who giving a good care to their dogs.

The data showed that the geographical condition associated to the incidence of rabies in Bangli Regency (Table 1). This finding agrees with those of Kaplan et al. (1986) who reported that the epidemiology of a disease depends closely on the ecology of the virus, and the factors associated with the geographical area including the range and the vulnerability of mammal species in different areas. Panichabhongse (2001) also confirmed

that the geographic differences lead to difficulties in the vaccination and controlling the source of rabies transmission and post-exposure treatment in humans.

In the present study, trade of dogs had an association with the incidence of rabies in Gianyar (Table 1). This finding agrees with Putra and Gunata (2009) who reported that the movement of the puppy during in the proces of trading has a potential for spreading rabies interlocation.

CONCLUSION

Incidence of rabies in Bali are associated with many factor including counseling, breed, trade of a dogs and geographic condition. The incidence of rabies in Bali spread evenly and do not have a specific pattern.

REFERENCES

- Dalem TIAC, Puja IK, Kardena IM. 2012. Ekologi dan Demografi Anjing Di Kecamatan Denpasar Timur. *Indonesia Medicus Veterinus*.2012. 1(2) : 160 – 172.
- Jemberu WT, Molla W, Almaw G, Alemu S, 2013. Incidence of Rabies in Humans and Domestic Animals and People's Awareness in North Gondar Zone, Ethiopia. *PLoS Negl Trop Dis* 7(5):1-6.
- Karshima NS, Kujul NB, Ogbu KI, Abdullateef MH, Dung PA, Salihu AA, Obalisa A, Paman N D.2013. Incidence and Risk Factors associated with Rabies and Dog Bites among Dogs Involved in Bites in Plateau State, Nigera between 2011 and 2012. *J Anim Sci Adv*, 3(3): 114-120
- Kaplan C, Turner GS, Warrell DA, 1986. *Rabies The Facts*. Great Britain (Bungay, Suffolk): The Chaucer Press Ltd. (Richard Clay).
- Naipospos TSH. 2004. Monitoring Keberhasilan program vaksinasi dalam pengendalian rabies secara Nasional. *Makalah pada Apresiasi SIKHNAS rabies secara ELISA, di Surabaya, 2004*.
- Panichabhongse P. 2001. "The Epidemiology of Rabies in Thailand". (*thesis*). New Zealand. Massey University.
- Putra, AAG, Gunata IK. 2009. Epidemiologi Rabies: Suatu Kajian Terhadap Wabah Rabies di Bali. Makalah dalam Workshop Kesehatan Hewan Regional VI, yang diselenggarakan oleh Balai Besar Veteriner Denpasar bekerjasama dengan Dinas Peternakan dan Kesehatan Hewan Provinsi NTB. Mataram, 9 Juni 2009.
- Putra AAG, Gunata IK, Faizah, Dartini, NL, Hartawan DHW, Setiaji G, Semara-Putra AAG, Soegiarto, dan Scott-Orr H. 2009. Situasi Rabies Bali: Enam bulan pasca program pemberantasan. *Buletin Veteriner*. XXI (74): 13-26.
- Riwidikdo H. 2009. *Statistik Untuk Penelitian Kesehatan Dengan Aplikasi Program R Dan SPSS*. Yogyakarta: Pustaka Rihama. hal. 33-51.
- Yibrah M, Damtie D,2015. Incidence of human rabies exposure and associated factors at the Gondar Health Center, Ethiopia: a three-year retrospective study.*Infectious Diseases of Poverty*, 4:3
- Yousaf MZ, Ashfaq UA, Zia S, Khan MR, and Kan S. 2012. Rabies molecular virology, diagnosis, prevention and treatment. *Virol. J.*, 9 (50).doi. 10.1186/1743-422X-9-50.