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Knowledge, attitudes and practices regarding rabies among community members: a cross-sectional study in Songan Village, Bali, Indonesia

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ABSTRACT

Background: *Rabies is a preventable yet endemic zoonotic disease caused by a neurotrophic virus, a member of* Rhabdoviridae *family. Rabies remains a public health threat in Indonesia, specifically Bali Province. The present study aimed to understand the knowledge, attitudes and practices (KAP) regarding rabies among community members in Songan Village, Bali, Indonesia.*

Materials and methods: *We conducted a cross-sectional survey using a structured questionnaire among 175 community members residing in the administrative area of public health centre of Kintamani V in Songan Village of Bangli District, from December 2019 to February 2020. Statistical analyses were performed with SPSS software, version 21.*

Results: *Of the 175 community members, 53 (30.3%) owned a dog. Majority of the respondents were Hindu (98.8%), female (56.0%), aged ≥ 29 years old (54.9%), with an educational background of higher secondary (28.6%), residing in Songan A and B residential village (86.9%), working as farmers (50.9%), with the level of income less than district minimum wage (71.4%). The KAP scores mean ± standard deviation were 6.93 ± 1.83 and 8.04 ± 1.07 (out of 10), respectively. Multivariable logistic regression models were constructed and the KAP of the community members was found to be significantly influenced by occupation (p-value < 0.05).*

Conclusions: *Albeit community members demonstrated some level of KAP regarding rabies, overall, this study revealed critical gaps in their fundamental knowledge of rabies, the prevention in dogs, and the local rules and regulations concerning rabies. In accordance with One Health Approach, further enforcement on the collaborative efforts for comprehensive education programmes, scheduled mass vaccination for dogs, and promotion for healthier attitudes and practices are recommended.*

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Key words: knowledge, attitude, practice, rabies, Bali

INTRODUCTION

Rabies, a zoonotic disease, is caused by a neurotrophic virus member of the *Lyssavirus* genus and *Rhabdoviridae* family. This disease is mostly spread through the bite of an infected dog [1]. Globally, domestic dogs contributed over 95% of approximate 59,000 human rabies deaths annually in more than 150 countries, with the highest burden of disease in parts of Asia and Africa [2]. Regionally, in South-East Asia, over 3 billion people were affected with dog rabies and more than 30,000 deaths occur annually with a mortality rate of one per 15 minutes, and nationally, in Indonesia, only nine out of 34 provinces are rabies-free province [3, 4].

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According to the Ministry of Health of the Republic of Indonesia, within 5 years (2011–2015), the rate of dog bite cases per year was 78,413 cases with 65,534 cases receiving the anti-rabies vaccine [4]. In 2019, Bali Province ranked first for dog bite cases with 38,187 cases, followed by Nusa Tenggara Timur Province with 13,599 cases [5]. Bangli was recorded as one of Bali Province districts with high dog bite cases [6].

In Indonesia, the Ministry of Health has established rabies elimination strategy by 2020 through integrated strategy using the One Health Approach engaging multiple stakeholders with advocation and socialisation, mass immunisation and population management towards dogs, and pre- and post-exposure prophylaxis with the anti-rabies vaccine as several of the listed strategies. This strategy is in line with the global "Zero by 30", a global action to attain zero human deaths from dog-mediated rabies by 2030, which is supported by the World Health Organization (WHO), World Organization for Animal Health (OIE), Food and Agriculture Organization of the United Nations (FAO), and Global Alliance for Rabies Control (GARC) [7]. Following this strategy, community members serving as one of the stakeholders, further assessing rabies understanding, were pivotal, and one of the methods that can be used to evaluate is through knowledge, attitudes and practices (KAP) studies. Nevertheless, in Indonesia, only a few reports have been published and data concerning KAP in Bali were limited or not made readily accessible. To address this, we developed this research to assess knowledge, attitudes and practices towards rabies in Songan Village of Bangli District, Bali Province, Indonesia.

PARTICIPANTS

The present study adopted a purposive cross-sectional design with the enrolment of 175 community members presenting to the public health centre (PHC) of Kintamani V from December 2019 to February 2020. The PHC of Kintamani V includes 35 *banjars* (sub-villages) and animals suspected of rabies (free-roaming dogs [FRDs], cats, monkeys, and bats) were spread throughout the *banjars*. Therefore, all the community members were a population at risk for rabies infection.

The sample size was calculated using Cochran's sample size formula for categorical data [8]. Allowing a confidence interval (CI) and a margin of error of 95% and 10%, respectively, the minimum sample size (N) of community members required for this study was 96 community members.

$$N = \frac{Z\alpha^2 PQ}{d^2} = \frac{(1.96)^2\,(0.5)\,(0.5)}{(0.1)^2} = 96$$

The study's inclusion criteria were: 1) community member who resided and were recorded as community members in PHC of Kintamani V (≥ 17 years of age), 2) communicative, and 3) agreed to participate in the study, while the exclusion criteria were 1) community members who do not reside and are not recorded as community members in PHC of Kintamani V.

MATERIALS AND METHODS

STUDY AREA

The study was carried out in the PHC of Kintamani V in Songan Village of Bangli District, Bali Province, Indonesia. Songan Village (–8.230699,115.407730) is approximately 40 km north of Bangli district and 80 km North-East of Denpasar, capital of Bali Province. PHC of Kintamani V provides a range of health services to the population living in the area of Songan (Songan A and B) Village, Pinggan Village, and Belandingan Village (approximately 3,400 households with 22,000 people in 2017) and is the only centre offering post-exposure prophylaxis (PEP) for humans bitten by animals suspected of rabies in and around this area. No rabies awareness campaign or dog population control measures had been conducted recently in the past year in the area before this survey.

QUESTIONNAIRE DESIGN

The knowledge, attitudes and practices (KAP) study were constructed to assess; 1) the awareness and knowledge about rabies, 2) the attitude and health-seeking practice regarding rabies, and 3) the attitude and practice which may have led to the village's persistence of the disease. The structured questionnaire consisted of closed questions on: 1) sociodemographic data (gender, age, religion, educational status, occupation, and income levels); 2) general questions regarding awareness about rabies, attitudes and practices towards dogs, and local rules and regulations concerning rabies; 3) knowledge of rabies (ten questions); and 4) attitudes and practices towards rabies (ten questions). The questionnaire's content validity was demonstrated since the questionnaire was developed based on expert consensus and international guidelines.

The respondents were orally informed about the study's purpose, emphasizing voluntary participation, confidentiality, and informed written consent was obtained prior to the interview. The questions were read out to the respondents in the local language (Bahasa Indonesia) by the interviewer and their answers were recorded in English.

ETHICAL CONSIDERATIONS

The study was reviewed and approved by the Ethics Committee of the Faculty of Medicine, Pelita Harapan University (Ref: 133/K-LKJ/ETIK/III/2020). The study was cleared by the Dinas Penanaman Modal dan Pelayanan Terpadu Satu Pintu, the provincial government of Bali Province and the district government of Bangli (Ref: 070/1106/IZIN-C/DISPMPT).

DATA MANAGEMENT AND ANALYSIS

The data collected from the questionnaires were entered into Excel files (Microsoft Excel, Microsoft Corp. Redmond, WA, USA). Descriptive and inferential analyses were performed. Statistical analyses were performed using Statistical Package for Social Sciences (SPSS) Statistics Version 21.0 (IBM Corp., Released 2012, Armonk, NY, USA). For analytical purposes, the respondents were dichotomised into two age groups based on the median age. The educational background was categorised into three divisions: 1) no formal education, 2) less than or equal to national basic level (1–9), 3) more than national basic level (≥ 10). Occupation was also categorised into three divisions: 1) not working, 2) blue-collar/manual labour workers (farmer, labourer, fisherman, and entrepreneur), and 3) white-collar worker/administrative workers (employee and civil servant).

The respondents were categorised as having adequate or inadequate knowledge of rabies and positive or negative attitudes and practices regarding rabies based on the median score to the responses to the questions pertaining to the questionnaire's relevant sections. Potential factors associated with knowledge, attitudes and practice scores were identified using chi-square (χ^2) tests of associations.

Multivariable logistic regression analyses were conducted for each outcome variable, namely knowledge, attitudes and practices regarding rabies. This was done to understand the associations of outcome variables with the respondents' characteristics. Results that were statistically significant at p-value of ≤ 0.25 were then offered to multivariable logistic regression models. Variables with p-value of < 0.05 were retained in the final model. The Hosmer-Lemeshow test assessed the model goodness-of-fit. The design, setting, analyses, and reporting of this study adhered to the STROBE guidelines for cross-sectional studies in epidemiology (**Supplementary File 1 — see journal website**) [9].

RESULTS

RESPONDENT'S CHARACTERISTICS AND AWARENESS OF RABIES

A total of 175 responses were collected, including 53 (30.3%) dog owners. The sociodemographic characteristics of the respondents are summarised in Table 1. Most respondents were Hindu (98.9%), female (56.0%), aged ≥ 29 years old (54.9%), with an educational background of higher secondary (28.6%), residing in Songan A and B Village (86.9%), working as farmers (50.9%), with the level of income less than district minimum wage (71.4%).

Table 1. Sociodemographic characteristics of the respondents (n = 175)

Variable/Category	N (%)
Gender	
Male	77 (44.0)
Female	98 (56.0)
Age	
Range (years)	17–64
Mean ± SD (years)	32.063 ± 10.681
< 29 years	79 (45.1)
≥ 29 years	96 (54.9)
Residential village	
Songan (A and B)	152 (86.9)
Belandingan	13 (7.4)
Pinggan	10 (5.7)
Religion	
Hinduism	173 (98.9)
Islam	2 (1.1)
Educational background	
No formal education	19 (10.9)
Primary (1–6)	37 (21.1)
Lower secondary (7–9)	27 (15.4)
Higher secondary (10–12)	50 (28.6)
Tertiary or higher	42 (24)
Occupation	
Not working	28 (16)
Farmer	89 (50.9)
Labourer	2 (1.1)
Fisherman	1 (0.6)
Entrepreneur	19 (10.9)
White-collar worker	18 (10.3)
Civil servant	18 (10.3)
Level of income	
< District minimum wage	125 (71.4)
≥ District minimum wage	50 (28.6)

SD — standard deviation; the age groups were dichotomized at the median age, i.e., 29 years (< 29 years of age and ≥ 29 years of age)

AWARENESS OF RABIES

Most respondents (90.9%) had heard of rabies through mass media (69 respondents, 43.4%), non-mass media (51 respondents, 32.1%), and a combination of both (39 respondents, 24.5%). More than half of the respondents (64.3%) had encountered rabid animals, and less than a fifth of the respondents (30 respondents, 17.1%) had a history of animal bites. Nevertheless, not all respondents (15 re-

Table 2. Respondents' knowledge, attitude and practice parameter of rabies

Knowledge parameter			Attitude and practice parameter		
Variable	**Correct**	**Incorrect**	**Variable**	**Agree**	**Disagree**
Definition of rabies	162 (92.6%)	13 (7.4%)	Thinks vaccination as the initial management after a dog bite	73 (41.7%)	102 (58.3%)
The major reservoir of rabies is a rabid dog	125 (71.4%)	50 (28.6%)	Thinks washing rabies wounds as the initial management	171 (97.7%)	4 (2.3%)
Other possible reservoirs of rabies (cat, monkey, and bats)	139 (79.4%)	36 (20.6%)	Thinks anti-septic application on the wound as the second step after wound washing	139 (79.4%)	36 (20.6%)
Pathogenesis of rabies	163 (93.1%)	12 (6.9%)	Thinks after wound washing, going to the PHC/hospital to obtain PEP	173 (98.9%)	2 (1.1%)
Sign and symptoms of rabies in a dog	157 (89.7%)	18 (10.3%)	Thinks dog need to be chained or caged to avoid rabies	160 (91.4%)	15 (8.6%)
Sign and symptoms of rabies in human	146 (83.4%)	29 (16.6%)	Thinks chained or caged dogs still require vaccination	169 (96.6%)	6 (3.4%)
Initial management of a dog bite	72 (41.1%)	103 (58.9%)	Thinks vaccinated dogs does not require special identification signage	69 (39.4%)	106 (60.6%)
Infection risk of rabies	162 (92.6%)	13 (7.4%)	Thinks FRDs should be culled	97 (55.4%)	78 (44.6%)
Prevention through vaccination of both human and dogs	23 (13.1%)	152 (86.9%)	Thinks a dog that has bitten several people has to be observed	170 (97.1%)	5 (2.9%)
Culling as a method of prevention for rabies spread	64 (36.6%)	111 (63.4%)	Thinks FRDs with abnormal behaviour should be reported to local authorities (health and livestock department)	170 (97.1%)	5 (2.9%)

FRDs — free-roaming dogs; PEP — post-exposure prophylaxis; PHC — public health centre

spondents, 8.6%) were aware of rabies infection's fatality. Lastly, only approximately one-third of the respondents (75 respondents, 32.9%) had heard of the local rules and regulations about dog and control of rabies. Of these, only 60% knew the rules and regulations.

KNOWLEDGE, ATTITUDES AND PRACTICES REGARDING RABIES AND DOGS

The median score for correct responses towards rabies knowledge; attitudes and practices towards rabies were 7 and 8, respectively.

KNOWLEDGE TOWARDS RABIES

In general, the knowledge parameter of rabies was sufficient (Table 2). A large number of respondents answered correctly and identified dogs as the major host of rabies, followed by a similar proportion who knew other possible hosts of rabies (cat, monkey, and/or bat), as well as the pathogenesis of rabies, its sign and symptoms in both dog and human and infection risk of rabies. Nonetheless, their ignorance about the initial management, prevention through vaccination, and culling as a prevention method for the spread of rabies should be noted.

Statistically, the mean knowledge ± standard deviation (range) score (out of ten) was 6.93 ± 1.83 (1–10). The score was significantly higher in females aged < 29 years old with an educational background of secondary and above who have heard of rabies, encountered animals suspected of having rabies, with no previous history of animal bites, and were aware of rabies infection's fatality. The association between sociodemographic characteristics and awareness of rabies reflected by the respondents' knowledge is presented in Table 3.

ATTITUDES AND PRACTICES TOWARDS RABIES

In general, a large proportion of respondents disagreed that vaccination/PEP is the initial management after a dog bit and agreed that washing rabies wounds is the initial steps of management followed by anti-septic application on the wound and going to the PHC/hospital to obtain PEP. Nearly all respondents agreed that a dog needs to be chained or caged and that vaccination is compulsory to avoid rabies. Furthermore, observation and report to the local authorities should be made for an FRD dog showing abnormal behaviour.

Statistically, the mean attitudes and practices ± ± standard deviation (range) score (out of ten) was 8.04 ± ± 1.07 (4–10). A similar result was obtained in females with an educational background of secondary and above who has heard of rabies, met rabid animals, with no previous history of animal bites, and was aware of rabies infection's fatality. In contrast, respondents aged ≥ 29 years old were showing more positive attitudes and practices towards rabies. The

Table 3. Respondents' knowledge, attitudes and practices stratified by their sociodemographic characteristic and awareness of rabies

Variable	Good knowledge (n = 78)	OR (95% CI)	P value	Positive attitudes and good practices (n = 125)	OR (95% CI)	P value
Sex						
Male	30 (39.0%)	1.0 [Reference]	0.186*	51 (66.2%)	1.0 [Reference]	0.178*
Female	48 (49.0%)	0. 665 (0.363–1.218)		74 (75.5%)	0.636 (0.329–1.230)	
Age [years]						
< 29	40 (50.6%)	1.0 [Reference]	0.143*	53 (67.1%)	1.0 [Reference]	0.249*
≥ 29	38 (39.6%)	1.565 (0.858–2.857)		72 (75.0%)	0.679 (0.352–1.313)	
Religion						
Hinduism	77 (44.5%)	1.0 [Reference]	0.877	124 (71.7%)	1.0 [Reference]	0.500
Islam	1 (50.0%)	0.802 (0.049–13.032)		1 (50.0%)	2.531 (0.155–41.261)	
Educational background						
No formal education	5 (26.3%)	1.0 [Reference]		13 (68.4%)	1.0 [Reference]	
≤ National basic education	19 (29.7%)	2.425 (0.748–7.861)	0.14*	43 (67.2%)	0.664 (0.214–2.063)	0.479
> National basic education	54 (58.7%)	2.052 (0.964–4.369)	0.062*	69 (75.0%)	0.736 (0.346–1.565)	0.426
Occupation						
Not working	11 (39.3%)	1.0 [Reference]		19 (67.9%)	1.0 [Reference]	
Blue-collar worker	39 (35.1%)	4.033 (1.293–12.585)	0.016*	71 (64.0%)	18.830 (2.167–163.632)	0.008*
White-collar worker	28 (77.8%)	4.041 (1.519–10.750)	0.005*	35 (97.2%)	24.330 (3.058–193.574)	0.003*
Income						
< District minimum wage	47 (40.9%)	1.0 [Reference]	0.173*	74 (64.3%)	1.0 [Reference]	0.004*
≥ District minimum wage	31 (51.7%)	0.647 (0.345–1.212)		51 (85.0%)	0.319 (0.142–0.712)	
History of hearing rabies						
No	1 (6.3%)	1.0 [Reference]	0.001*	10 (62.3%)	1.0 [Reference]	0.407
Yes	77 (48.4%)	14.085 (1.817–109.195)		115 (72.3%)	1.568 (0.538–4.572)	
Encounter with rabid animals						
No	25 (39.1%)	1.0 [Reference]	0.266	41 (64.1%)	1.0 [Reference]	0.101*
Yes	53 (47.7%)	1.426 (0.763–2.664)		84 (75.7%)	1.745 (0.893–3.410)	
History of animal bites						
No	67 (46.2%)	1.0 [Reference]	0.339	99 (68.3%)	1.0 [Reference]	0.042*
Yes	11 (36.7%)	0.674 (0.299–1.517)		26 (86.7%)	3.020 (0.996–9.157)	

→

Table 3. cont. Respondents' knowledge, attitudes and practices stratified by their sociodemographic characteristic and awareness of rabies

Variable	Good knowledge (n = 78)	OR (95% CI)	P value	Positive attitudes and good practices (n = 125)	OR (95% CI)	P value
Awareness of rabies infection fatality						
No	3 (20.0%)	1.0 [Reference]	0.045*	6 (40.0%)	1.0 [Reference]	0.005*
Yes	75 (46.9%)	3.529 (0.959–12.985)		119 (74.4%)	4.354 (1.460–12.978)	
Heard of the local rules and regulations						
No	40 (40.0%)	1.0 [Reference]	0.160*	71 (71.0%)	1.0 [Reference]	0.885
Yes	38 (50.7%)	1.541 (0.842–2.819)		54 (72.0%)	1.050 (0.541–2.040)	
Knew the local rules and regulations						
No	55 (42.3%)	1.0 [Reference]	0.306	95 (73.1%)	1.0 [Reference]	0.412
Yes	23 (51.1%)	1.426 (0.722–2.815)		30 (66.7%)	0.737 (0.355–1.531)	
Ownership of dog						
No	35 (66.0%)	1.0 [Reference]	0.591	35 (66.0%)	1.0 [Reference]	0.298
Yes	90 (73.8%)	0.836 (0.436–1.606)		90 (73.8%)	0.691 (0.344–1.388)	

CI — confidence interval; OR — odds ratio; * — Variables with $p \leq 0.25$ in univariate analysis were further included in the multivariate analysis

association between sociodemographic characteristics and awareness of rabies towards the respondents' attitudes and practices is presented in Table 3.

RESPONDENTS' ATTITUDES AND PRACTICES TOWARDS DOGS

In general, most of the respondents in this study are non-dog owners (122 respondents, 69.7%). The majority of the respondents (70.9%) believed that dogs were kept as pets and a minority (5.7%) agreed that dogs have economic value. A large proportion of the respondent (72.6%) believed that dogs should be kept in a cage or chained in their land property, while 14.9% and 9.1% believed that dogs should be allowed to roam freely in and outside their land property, respectively. Nevertheless, 6 (3.4%) respondents did not know how to pet a dog.

Out of the 53 dog owners, 46 (86.8%) respondents regularly vaccinate the pet dog, 35 (66.0%) respondents chained or built a special cage for the pet dog, yet 34 (64.2%) respondents let the pet dog roamed freely. In terms of hygiene, 47 (88.7%) respondents wash hands after contact with the pet dog. In terms of willingness to take action, the majority (88.7% and 69.8%) of the respondents were willing to observe and cull the pet dog if the pet dog bites or show abnormal behaviour, respectively.

KNOWLEDGE, ATTITUDES AND PRACTICES REGARDING RABIES

In general, the majority of the respondent in this study have good knowledge, followed by positive attitudes and good practices regarding rabies (66 respondents, 37.7%). However, 21.7% of the respondents have poor knowledge, negative attitudes, and poor practices regarding rabies. Association between respondents' knowledge and attitudes and practices has shown to be statistically significant (P-value = 0.001) with an odds ratio (OR) (95% CI) of 3.542 (1.694–7.409).

LOGISTIC REGRESSION ANALYSIS

The analysis between the respondents' characteristics and rabies awareness with outcome variables is presented in Table 4. The results showed that each of the factors considered in this study had a p-value ≤ 0.25 for at least one of the outcome variables. This study's multivariate logistic regression analysis revealed that occupation had a statistically significant association with knowledge and attitudes and practice regarding rabies, while the history of hearing about rabies had a statistically significant association with knowledge regarding rabies.

DISCUSSION

This present study was developed and undertaken to assess the KAP of the community member in Songan Village to

Table 4. Multivariable logistic regression analysis of factors of knowledge, attitudes and practices regarding rabies

Variable	Adequate knowledge		Positive attitude and practices	
	OR (95% CI)	P-value	OR (95% CI)	P-value
Sex				
Male	1.0 [Reference]	0.459	—	—
Female	1.302 (0.647–2.619)			
Age				
< 29 years	1.0 [Reference]	0.235	1.0 [Reference]	0.229
≥ 29 years	0.636 (0.301–1.343)		1.636 (0.733–3.648)	
Educational background				
No formal education	1.0 [Reference]		1.0 [Reference]	
≤ National basic education	1.097 (0.281–4.289)	0.894	0.578 (0.159–2.103)	0.405
> National basic education	1.870 (0.827–4.227)	0.133	0.753 (0.327–1.733)	0.505
Occupation				
Not working	1.0 [Reference]		1.0 [Reference]	
Blue-collar worker	5.864 (1.479–23.258)	0.012	12.068 (1.253–116.199)	0.031
White-collar worker	4.053 (1.382–11.884)	0.011	20.146 (2.435–166.692)	0.005
Income				
< District minimum wage	1.0 [Reference]	0.422	1.0 [Reference]	0.236
≥ District minimum wage	0.716 (0.317–1.617)		1.760 (0.691–4.482)	
History of hearing rabies				
No	1.0 [Reference]	0.04	—	—
Yes	0.099 (0.011–0.902)			
Encounter with rabid animals				
No	1.0 [Reference]	0.809	1.0 [Reference]	0.293
Yes	0.914 (0.441–1.894)		0.663 (0.309–1.425)	
History of animal bites				
No	1.0 [Reference]	0.354	1.0 [Reference]	0.080
Yes	1.592 (0.596–4.252)		0.345 (0.105–1.134)	
Awareness of rabies infection fatality				
No	1.0 [Reference]	0.199	1.0 [Reference]	0.128
Yes	0.377 (0.085–1.672)		0.390 (0.116–1.313)	
Heard of the local rules and regulation				
No	1.0 [Reference]	0.632	1.0 [Reference]	0.636
Yes	1.189 (0.586–2.411)		1.203 (0.560–2.584)	
Hosmer and Lemeshow Test				
Chi-square	4.591		4.065	
Sig.	0.800		0.851	

CI — confidence interval; OR — odds ratio

understand further the challenges faced in Bali in the objective to reduce the incidence of dog-bite rabies. Although few studies have identified a lack of awareness in parts of Bali province, this is the first study that relates the KAP towards rabies of community members in Songan Village. Our findings highlight the factors contributing to rabies' knowledge, attitudes and practices across Songan Village that could be targeted to improve health-seeking behaviour and rabies control practices.

Bali province has an area of 5,632 km^2 with nine districts, namely, Jembrana, Tabanan, Badung, Gianyar, Ka-

rangasem, Klungkung, Bangli, Buleleng, and Denpasar city. Rabies was first detected in Bali Province in 2008. Ever since, there was a shift from the centre of case findings in Badung District towards the peripheral, including Bangli District. From 2008 to 2018 in Bali, 174 death cases due to rabies and 1.838 rabies-positive dogs have been reported. In 2009, the first recorded case of rabies in Bangli District was reported in Bebalang Village, followed by 2010, with the highest reported positive rabies cases in Bangli District constituting 51 cases. In Bangli district from 2008 to 2015, 7 death cases due to rabies and 289 positive dog rabies have been reported [6, 10].

Of the 175 community members surveyed, the majority were female (56.0%) in contrast to studies in India and Grenada [2, 11]. The median age of the respondents was 29 years, ranging from 17 to 64 years, similar to a study in East Nusa Tenggara Province, Indonesia with a median of 34 and range from 19 to 73 years of age [12]. Our results indicated that the community members' younger population had a higher rate of good knowledge about rabies. This may be associated with the educational background among young people in whom the high level of education probably translated into higher knowledge of rabies compared to adults. This finding is in line with previous studies [13, 14]. Nevertheless, none of the associations between sex, age group classification, and educational background were statistically significant in our study.

Almost all of the respondents (98.9%) were Hindu. The relation between Hinduism, Bali and dogs is explained in a spiritual relation from the Tri Hita Karana's philosophy as well as a sociocultural study carried out in Bali [15]. From a socioeconomic perspective, Bangli District, specifically Sukawana Village, is a well-known conservation area for Kintamani dogs [16].

Our study further revealed that district minimum wage influenced attitudes and practices of rabies. A plausible explanation is related to the socioeconomic status in which the respondents with higher socioeconomic status were more likely to comply to the correct initial management, seek treatment in the PHC/hospital, vaccination among FRDs, correctly identified measures restricting FRD population, and alert the local authorities of the presence of an FRD with abnormal behaviour as seen in another study in India. As expected from other studies, better knowledge about the disease should translate into the adoption of better practices, which is supported by this study showing significant associations between respondents with good knowledge and positive attitudes and good practices regarding rabies (OR 3.542, 95% CI 1.694–7.409, and p-value = 0.001) [17, 18].

Rabies awareness assessment showed that 90.9% has heard about rabies, which is similar to a study in Morocco, India, and Ethiopia [14, 19, 20]. The majority has heard about rabies from mass media (43.4%), consistent with a study in Sukabumi, a province in West Java, Indonesia, and more than half of the community members had met animals suspected of having rabies [21]. This suggested that the community members were aware of rabies' presence in their area, which could be attributed to the prioritising of the disease by the Provincial Government of Bali. Nevertheless, only a small proportion of the community members have heard of the local rules and regulation about dogs and rabies' control. These findings suggested r advocacy for further informing about rules and regulations regarding rabies for a better comprehensive understanding of rabies in the community.

After excluding insignificant predictor factors from the analysis, the multivariate model revealed that occupation was the only independent factor of knowledge, attitudes and practices regarding rabies (Table 4). In the final model, there were increased odds of having good knowledge and positive attitudes and good practices among participants who were classified as white-collar workers compared to not working (OR 4.053 and 20.146, 95% CI 1.382–11.884 and 2.435––166.692, and p-value = 0.011 and 0.005, respectively) as well as blue-collar workers compared to not working (OR 5.864 and 12.068, 95% CI 1.479–23.258 and 1.253––116.199, and p-value = 0.012 and 0.031, respectively). Occupations were found to influence good knowledge, positive attitude and good practices significantly. A potential explanation might be related to the time allocation comparatively between white-collar workers and blue-collar workers, in which blue-collar workers have to work every day whereas white-collar workers have a holiday within the weekend. The discrepancy between the available times could lead as the main reason for less knowledge and the less translation of knowledge into positive attitudes and good practices for groups other than white-collar workers [20, 22, 23].

Most of the respondents (97.7%) correctly identified washing a wound from a suspected rabid dog as the initial step. Washing the bite wound with water and soap is a pivotal component of PEP; lack of wound washing has shown to be responsible for a five-fold increase in the risk of developing rabies [24, 25]. This fundamental result was in contrast with a study in Bali in which due to widespread local belief (prior to the rabies outbreak) that dog licks could heal wounds and this belief led to the practice of not washing wounds, including bite wounds. Almost all of the respondents (98.9%) believed that visiting a local PHC/hospital was necessary after a suspected rabid dog bite and that vaccination (PEP) should be sought, as reported in a similar study. A probable explanation is that respondents wrongly believed that in the PHC/hospital there was a medicine to treat rabies and a minority understood that vaccinations could only block the virus transmission and was not the same as medicine [15].

Majority of the respondents (63.4%) incorrectly identified culling as a prevention method for the spread of rabies followed by 55.4% who agreed that FRD should be culled. Culling is an ineffective method for controlling rabies. For instance, in response to a rabies outbreak in 1997, in Flores, Indonesia, nearly half of the dog populations were culled. Nevertheless, in 2004, although the total dog population was still considerably reduced, rabies was still endemic [26]. Similar failure reports of culling were also reported from Korea, while subsequent vaccination yielded a controlled disease [27]. In order to specifically interrupt the animal-human transmission cycle of rabies, mass vaccination of dogs is essential. According to the WHO, at least 70% vaccination coverage of the canine population should be reached in order to break this cycle. This further complemented the need of higher awareness among community members, specifically dog owners, about the importance of dog vaccination [14, 28].

In the highlight of this study, the significant difference between knowledge and attitudes and practices may be related to current public educational programmes that are mainly focused on prevention, vaccination, and initial management after exposure to an animal bite. Low media involvement of clinical manifestation of rabies in man and animal may have negatively impacted in this regard [29]. Therefore, appropriate programmes should be designed to increase the knowledge of the community in faith to subsequently improve the translation into positive attitudes and good practices regarding rabies.

The fight against rabies in Indonesia, in particular Bali, is on the right track. The Provincial Government of Bali has made several attempts to control rabies incidence through the implementation of local rules and regulations, annual mass dog vaccination, and selective dog elimination. Nevertheless, it has not been optimal because the cases of rabies are still present. Several gap analysis has been published reporting and further strengthening the One Health approach that is essential: 1) a good continuing surveillance system will benefit the approach as it can portray the real situation of the number of dogs vaccinated, FRDs, and unvaccinated dogs, 2) scheduled mass vaccination system with community engagement, risk area mapping, and case estimation, 3) educating the community members and visiting tourists of preventive measures towards every dog bite cases, 4) the importance of dog vaccination and schedule should be informed to family, schools, and communities, and 5) integrated, continuous, and collaborative measures among stakeholders should be reinforced [30].

Inevitably, there were some limitations of the present study. First, this study could not determine how all the reported practices were translated into actual practice. Second, this study only provided the primary data on KAP regarding rabies, particularly in Songan Village and may not be generalized to other parts in Bali. Lastly, the survey did not address all the questions related to KAP. To our best knowledge, this is the first study to report KAP regarding rabies in the Songan Village, Bangli District, Bali, Indonesia.

CONCLUSIONS

Albeit community members demonstrated some level of KAP regarding rabies, overall, this study revealed critical gaps in their fundamental knowledge of rabies, the prevention in dogs, and the local rules and regulations concerning rabies. In accordance with the One Health approach, further enforcement on the collaborative efforts for comprehensive education programmes, scheduled mass vaccination for dogs, and promotion for healthier attitudes and practices are recommended.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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