

## Prevalence of Dog Bites and Risk Factors Among Residents of Maramag, Bukidnon

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### ABSTRACT

Around 2,000 cases of animal bites are reported every year in animal bite centers in Maramag, Bukidnon. The study aimed to determine the prevalence and risk factors associated with dog bite victims in selected barangays of Maramag, Bukidnon, Philippines. A face-to-face interview was carried out using a pre-tested questionnaire among 402 residents in Maramag, Bukidnon, to determine the prevalence and risk factors of dog bite victims of the municipality. Ten barangays were grouped into the rural and urban type of community. The results showed that the apparent prevalence of dog bite victims among residents of Maramag, Bukidnon was 23.6% (95/402). The urban barangays had a prevalence of 26.2% compared to rural barangays with 21%. The gender of victims, civil status, educational attainment, and dog-ownership are the risk factors that are statistically significant in dog bites. The study revealed that dog bite victims of Maramag, Bukidnon are prevalent with 23.6%, and this result does not depend on the type of community. Furthermore, the study shows that being male, single, have low educational attainment, and dog-ownership increases the risks of being bitten by dogs.

*Keywords:* dog bite, prevalence, risk factors

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### INTRODUCTION

Bite injuries to humans, mainly caused by dogs, is a global problem, as it poses a threat to public health because it can lead to infection, disfigurement, incapacity, post-traumatic stress syndrome, and even death. Humans keep canines as a companion and best friend. However, human-canine interaction is not always without friction, and dog bite-related injuries are still considered a public health issue (Seligsohn, 2014). There are many complications of a dog bite, and the most common disease is rabies. Rabies is a fatal but preventable viral infection commonly transmissible to humans through the bite of an infected animal. The World Health Organization (2013) estimates that rabies claims almost 55,000 lives every year. Dog bites cause approximately 99% of these deaths (Yousaf, 2012).

Dog bites can also result in a significant financial burden for treatment, hospitalization, and post-exposure prophylaxis for rabies. More than 15 million people receive rabies treatment due to dog bites and the majority of these cases are in developing countries (Tenzin, 2011).

Animal bites occur whether provoked or unprovoked by the victims (Tenzin, 2011). There are many reasons and causes of dog bites. The dogs may either be scared or threatened, and dogs will bite as a reaction to a stressful situation. Also, when they are sick or startled, and to protect themselves, their puppies, or their owners (Wilson, 2017).

Risk factors for dog bites include several factors such as sex, health, socialization and training, reproductive

status, early experience, and quality of ownership, among others. Chained dogs are 2.8 times more likely to bite than unchained dogs (University of Minnesota, 2006). Children are more at risk of getting bitten by dogs than adults due to lower physical strength and smaller size. Children also have lower awareness and lesser knowledge of safe behavior around dogs. Low-income background and rural areas are well-known risk factors for dog bites (Seligsohn, 2014).

Dogs appear to be more defensively aggressive to men than women (Wells et al., 1999), possibly because men are usually bigger, taller, less gentle, and have lower toned voices than women (Frangakis et al., 2001). Boys engaged in outdoor activities thus more vulnerable to dog attacks (Mcheik et al., 2000).

This study aimed to determine the prevalence and risk factors associated with dog bite victims, including their socio-demographic profile, pet ownership, exposure to a dog bite, and other risk factors.

Poor awareness of dog bite is a hindrance to the elimination of rabies infection. It is essential to determine specific risk factors that can provoke a dog to bite. Furthermore, the data collected from the study will help raise awareness about the disease and a vital step to plan out necessary measures and to generate a more effective

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control program to eradicate rabies in the community.  
Methodology

### Study Area

Ten barangays of Maramag, Bukidnon were used for the conduct of the study. The ten barangays were grouped into two areas according to the location, and a simple random sample was used to determine the barangays included in the study. The five urban barangays selected are North Poblacion, South Poblacion, Dologon, Base Camp, and Camp One, while selected rural barangays are Panalsalan, Dagumbaan, Kisanday, San Roque, and Danggawan. The list of households was based on the records provided by the municipality.

### Determination of Sample Size

The sample size estimation of the prevalence of dog bite victims was computed using the general formula of Canon and Roe (1982) to determine the sample size. The following assumptions were used: an expected prevalence of 50%, a 95% confidence level, and a marginal error of 5%. Three hundred seventy-eight respondents have been determined to comprise the sample size and were later adjusted to 402.

### Selection of Respondents

A simple random sampling procedure was used to select households for this study. The researcher compiled a list of households from the ten chosen barangays of Maramag, Bukidnon. Forty households from each barangay were randomly selected. If the selected household was found closed, their house was not accessible, or the residents are away, the next household in the list was automatically made a substitute for the interview as a selected household. At each household, any of the members who have a history of dog bite within the last five years were included and interviewed for the determination of prevalence and to identify risk factors. If there is an absence of a dog bite victim in the household, the head of the household was automatically selected for the interview. The interview was done upon the approval of the respondent by signing the consent form.

### Study Design

A cross-sectional study was carried out among 402 respondents in ten selected barangays of Maramag, Bukidnon. A quantitative survey was used as a method for the risk factors that targeted the dog bite victim in the household or the household heads in the absence of a dog bite victim. There were 40 households selected from each barangay, with a total of 402 respondents due to the number of victims in the household. The selection of the households was done randomly.

### Determination of Risk Factors

Before the conduct of the study, a permit was sought from the Institutional Ethics Review Committee. The researcher carried out face-to-face interviews using well-structured and pre-tested questionnaires. The

questionnaires included items regarding their socio-demographic profile, dog ownership status, and exposure history to dog bite to assess the potential risk factors of dog bites. The questionnaires were translated into the vernacular. Data collectors were recruited and trained to administer the questionnaires by moving to the selected houses.

### Computation of Apparent Prevalence

The apparent prevalence of dog bite victims in Maramag was computed using the formula:

$$\text{Apparent Prevalence} = \frac{\text{\# of Dog bite victims}}{\text{Total respondents}} \times 100$$

### Statistical Analysis

The Chi-square test was used to analyze the prevalence of dog bites between barangays. Odds ratio and univariate analysis with the Chi-square test were used to determine the potential risk factors. The lowest level risk factor was considered as the no-exposure referent in all analyses.

## RESULTS AND DISCUSSION

### Prevalence of Dog Bite among the Residents of Maramag, Bukidnon

Table 1 shows the prevalence of dog bites among residents in selected barangays of Maramag. Among the barangay population interviewed, the prevalence of dog bites is 23.6% (95/402), in which 95 were victims among 402 individuals interviewed.

The prevalence of dog bites in Maramag, Bukidnon (23.6%) is higher compared to the dog bite victims (2%) reported in Animal Bite Treatment Center at BPH, Maramag in 2017. This result implies that some victims failed to avail of post-exposure treatment at the BPH after a dog bite incident since there was a lower prevalence compared to the survey conducted.

The prevalence estimates among the barangays varied significantly, implying that the prevalence of dog bite is location-dependent. The differences in the prevalence rate of dog bites in the present study could be due to the total population in the barangays who were at risk of dog bites. Philippine Standard Geographic Code (2015) reported that the highest total population among the barangays were in barangay Dologon and barangay North Poblacion. These two barangays had the highest prevalence of dog bites among the other barangays in Maramag.

Also, the Municipal Agriculture Office in Maramag, Bukidnon in the year 2017 reported that the highest number of dog population estimates was in barangay San Roque with 799 dogs and followed by Dologon with 519 dogs. These two barangays have 27.5% and 40%

Table 1. Prevalence of dog bite victims in selected barangays of Maramag, Bukidnon

Barangay	No. of respondents	No. of dog bite victims	Apparent Prevalence (%)
<b>Urban Barangay</b>			
Dologon	40	16	40
North Poblacion	42	16	38.1
San Roque	40	11	27.5
South Poblacion	40	9	22.5
Base Camp	40	4	10
<b>Rural Baranagay</b>			
Danggawan	40	10	25
Kisanday	40	8	20
Dagumbaan	40	8	20
Camp one	40	7	17.5
Panalsalan	40	6	15
Total	402	95	23.6

Legend: CI- confidence interval

Population:

*Dologon-14,093; North Poblacion-14,799; San Roque-3,126; South Poblacion-12,165; Base Camp-7,569; Danggawan-1,680; Kisanday-2,599; Dagumba-an-7,638; Camp I-4,852; Panalsalan-2,344 (Philippine Standard Geographic Code, 2015)*

Table 2. Prevalence of dog bite victims among selected residents in urban and rural barangays of Maramag, Bukidnon

Type of Barangay	No. of respondents	No. of dog bite victims	Apparent Prevalence (%) (95% CI)
Urban	202	53	26.2 <sup>ns</sup> (20.2-32.3)
Rural	200	42	21 (15.4-26.6)
TOTAL	402	95	23.6 (19.5-27.8)

$p= 0.317$ ; ns, not significant; CI, confidence interval

prevalence, respectively, while barangay Base camp with the lowest prevalence (10%) had 244 dogs. Dog population in a particular barangay was considered to be a reason for a higher prevalence compared to the other barangays. According to Buso et al. (2016), due to the high number and extensive contact with dogs, the official number of people bitten by dogs in Brazil reached 424,092. The number of dog bites may rise with an increase in the dog population (Ehimiyein et al., 2014).

In this study, there is a higher prevalence of dog bites in urban than rural barangays in Maramag due to the higher population living in urban barangays - 56,264 - compared to rural barangays - 14,601 (Philippine Standard Geographic Code, 2015). Other factors such as the population density of the residential areas of each barangay, number of homeowners with dogs (Love & Overall, 2001), and the socio-demographic factors peculiar to each barangay, in particular men and children which are more likely to be bitten by dogs (Vinay et al., 2014; Samanta et al., 2016), can also influence the prevalence of

dog bites in each barangay.

#### **Prevalence of Dog Bites among the Residents of Maramag, Bukidnon based on the type of community**

The type of community, classified as rural or urban, was also assessed. Ten barangays were grouped into two areas according to the location, and a simple random sample was used to determine the barangays included in the study. The five barangays selected were North Poblacion, South Poblacion, Dologon, Base camp, and Dagumbaan were the urban barangays. In comparison, the other five barangays were Panalsalan, Camp 1, Kisanday, San Roque, and Danggawan were rural barangays. The urban barangay had a prevalence of 26.2% (53/202) as compared with the rural barangays with 21% (42/200) as shown in Table 2. However, there was no significant difference between the two. According to Pattanayak et al. (2017), animal bites, particularly dog bites possesses a public health problem in the urban area. In urban settings, dogs and cats are the most commonly involved animals

compared to rural areas where most people focus on farm animals.

The results of this study do not agree with the other researchers, which shows the majority of dog bites are from rural areas. Consequently, Ehimiyein et al. (2014) argued that a substantial increase in rabies transmissions and associated deaths may happen in rural areas where dogs are unvaccinated, unleashed, and have free movement, increasing the risk of exposure of man to dog bites. Mehndiratta (2012) added that the higher density of dogs and the higher number of stray dogs increased the exposure to dogs for residents in the rural area. Some people living in rural areas and low-income societies are more exposed and affected by the disease than those living in town and cities (Masthi et al., 2014). However, in a similar study in Delhi covering 500 households in a slum area, dog bite incidence is higher in urban than rural slums (Sharma et al., 2016).

### Risk Factors Associated with Dog Bite Victims

The potential risk factors for dog bite are shown in Tables 3 and 4. Among the risk factors evaluated, the gender of the victim, civil status, educational attainment, and dog-ownership were found to be statistically significant. The majority of the victims were males with 31.8% compared to females with 18.7% based on the prevalence. These results conform to the study of Lakestani (2007) and Mcheik et al., (2008). It was reported that in most countries, men are more likely to be bitten than women (Lakestani, 2007). According to Mcheik et al. (2008), this may be due to more

engagement of males in outdoor activities and they are more vulnerable to dog attacks. The higher prevalence of animal bites in males than in females can be attributed to their more frequent exposure, conscious risk-taking, and a more considerable amount of time spent outside the home. Sharma et al. (2016) have a similar report justifying that males are the main earners in the family and have longer exposure to stray dogs outside their homes.

The single respondents had a prevalence of 46.94% (46/98). The group of respondents who are single were five more times at risk of being bitten by dogs than those that are married. In terms of employment status, most respondents who do not have work had mostly been bitten by the dogs (27%).

The group of single and unemployed respondents in the study were mostly children and teenagers that are very active in school and other activities. A meta-analysis of 1215 studies in Iran agreed with the results of the present study and revealed that the incidence of dog bites is highest in students as compared to other occupations (Abedi et al., 2019). This is supported by the results of Evangelio et al. (2020) which shows that age group 5-14 have the highest incidence of dog bites.

The elementary and high school level respondents were mostly the victims of dog bites. The odds of the elementary level respondent being bitten by a dog are 3 times higher than the college graduates. This was maybe due to a lack of awareness and knowledge about the disease and also have a lack of knowledge regarding the behavior

Table 3. Risk factors associated with 95 dog bite victims of Maramag, Bukidnon.

Risk Factors (household respondent)	Number of Respondents	No. of Victims	Prevalence (%)	Odds Ratio (95% CI)
<b>Gender of Victim</b>				
Male	151	48	31.8	2.02 (1.27, 3.23)
Female	251	47	18.7	
<b>Civil Status</b>				
Single	98	46	46.94	4.60 (2.79, 7.60)
Married	304	49	16.1	
<b>Employment</b>				
None	215	58	26.98	1.50 (0.94, 2.39)
Employed	187	37	19.79	
<b>Education</b>				
Elementary level	122	43	35.25	2.8 (1.53, 5.25)
High School level	162	33	20.37	1.33 (0.72, 2.48)
College level	118	19	16.10	
<b>Monthly Income</b>				
16,000-32,000	20	6	30	2.71 (0.75,9.83)
Less than 8,000	338	83	24.6	2.34 (0.95,5.73)
8,000-16,000	44	6	13.6	
<b>Dog-ownership</b>				
Owners	297	80	26.9	2.21 (1.21, 4.05)
Non-owners	105	15	14.3	

CI, confidence interval

Table 4. Risk factors associated with dog bite victims among dog-owners of Maramag, Bukidnon.

Risk Factors	No. of Respondents	No. of Dog bite Victims	Prevalence (%)	Odds Ratio (95% CI)
<b>Duration of dog-owning</b>				
Less than a year	53	17	25.8	1.36 (0.71, 2.58)
More than a year	244	63	32.1	
<b>Number of dogs per household</b>				
6 dogs above	14	5	35.7	1.55 ( 0.50,4.84)
3-5 dogs	82	22	26.8	1.02 (0.57,1.83)
1-2 dogs	201	53	26.4	
<b>Dogs being kept</b>				
Free-roaming	138	41	29.7	1.63 (0.66, 4.04)
Leashed/Caged	125	32	25.6	1.33 (0.53, 3.34)
Fenced-in	34	7	20.6	
<b>Dogs Vaccinated</b>				
No	117	35	29.9	1.28 (0.76,2.15)
Yes	180	45	25.0	

CI, confidence interval

of dogs, which made them more at risk. Respondents with high educational levels may have a higher level of knowledge on rabies control and prevention than those who only finished primary school, high school, and those who had never reached college.

There was no significant difference in the monthly income of dog bite victims. In the study, the majority of the victims belong to the highest income level, 16,000-32,000 pesos. The results of the study revealed that dog-owners had a higher chance of dog bite (84.2%) compared to non-dog owners (15.8%). Among 80 dog owners, there were 62.5% bitten by their dogs while only 20.1% were bitten by other dogs. Around 80% to 90% of dog bites are caused by a dog familiar to the victim, and in about 30% of the cases, the injuries were caused by the family pet (Lakestani, 2017). Moreover, this factor had a significant difference. Among the 30 victims bitten by their dogs, 65% were bitten only once, and 55% of the victims were bitten many times. The Center for Disease Control and Prevention (2018) stated that owning a dog increased the likelihood of being bitten than not having a dog. According to Seligsohn (2014), owning a dog is significantly correlated with being bitten as well as displaying unsafe behavior when engaging with dogs. Pet ownership was shown to be a strong risk factor for pet-related injuries.

The study also revealed that the duration of owning a dog, the number of dogs in the household, and how they were kept did not matter in the likelihood of being bitten. The increased odds of being bitten for new pet owners, having more than 6 dogs, and having a dog that is a free-roaming or caged/leashed did not reach statistical significance.

Most biting dogs that were owned are vaccinated (56%), but there were still unvaccinated (43.7%), although this risk factor had no significant difference. Ehimiyein et al. (2014) explained that most of the owned dogs were unvaccinated, which may be due to a lack of awareness of

the disease or due to poverty.

#### SUMMARY, CONCLUSION AND RECOMMENDATIONS

From the barangays selected in Maramag, the apparent prevalence of dog bites is 23.6%. Urban barangays had a higher prevalence of 26.2% as compared to rural barangays with 21%, however, there is no significant difference between the types of community. Among the identified risk factors, the socio-demographic profile such as the gender of the victim, civil status, educational attainment, and dog-ownership are associated with dog bites.

In conclusion, the results indicate that there is a prevalence of dog bites in Maramag, Bukidnon which is 23.6%, and the type of community {whether rural or urban} do not affect dog bite incidence. There is a direct correlation between the increase in dog population in the barangays and the incidence of dog bites. Furthermore, factors such as being male, single, low educational attainment, and dog-ownership increases the risks of being bitten by dogs. In this study, the prevalence of dog bite victims of Maramag, Bukidnon was higher compared to the dog bite victims who were administered with Post-exposure prophylaxis in Animal Bite Treatment Center in the year 2017. The results implied that several dog bite victims failed to avail post-bite treatment in the appropriate office.

Based on the results of the study, it is therefore recommended that local government and concerned agencies should continue the vaccination for dogs and proper post-exposure management in its health policy. This should, however, be coupled with information campaigns on responsible dog ownership, dangers of rabies, and proper actions needed to be taken following dog bites. Public awareness should be strengthened through the Information, Education, and Communication (IEC) campaign among the vulnerable population, and Responsible Pet Ownership shall be promoted.

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