

Prevalence of Rabies in Family Owned Dogs Reported with Bite-History within Chitwan District, Nepal

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Abstract

A two-year-round retrospective study was done to determine the prevalence of rabies among owned dogs in Chitwan, Nepal. Total 196 dog bite cases were reported between March-2018 to February-2020 to Veterinary Hospital and Livestock Service Expert Center (VHLSEC, Nepal Government) and Veterinary Teaching Hospital of Agriculture and Forestry University, Chitwan. Cases reported with history of dog bites, suspected behavioral symptoms and confirmed positives to Rapid Rabies Ag Test Kit were thoroughly studied and relevant data were analyzed using MS-Excel 2016 and SPSS v.25. The study revealed a surprisingly overall prevalence of 6.1% of rabies in family owned dogs of Chitwan. Majority of reported cases were of dogs upto 3 years of age (60.7%) with highest prevalence i.e. 58.3% among all rabies positive cases, while eldest dogs (6 years and above) had least positive cases (16.7%). Similarly, 68.7% rabid dogs were found to be males. Furthermore, season-wise study showed the highest prevalence (50.0%) during winter season followed by autumn (25.0%), summer (16.7%) and spring (8.3). Despite being a 100% vaccine preventable zoonotic disease and the fact that the study was done only among family owned dogs, such higher prevalence hints the owner's negligence towards the pets which stands as a threat in achieving our global motto "Zero Rabies by 2030".

Keywords: Rabies; Dogs; Zoonotic disease; Nepal; Retrospective study

Introduction

Dogs are probably the human's best friend and oldest one to be tamed. They are often referred as most trustable friend of humans since thousands of years. In Nepal, most of the families from city areas keep at least a dog either for security, pleasure or sentimental purpose. Despite of increasing trend of adopting dogs in recent years, there is still a large population of stray dogs which are being abandoned by owners. Possible causes behind the abandonment could be the presence of chronic diseases, undesirable breeding or the increase in economic burden. Although the exact population of stray dogs in Chitwan is unknown, there are still more than 6000 abandoned dogs roaming around the streets of Chitwan.

Rabies is an acute, viral, non-suppurative encephalitic disease of all warm-blooded animals which is of major public-health importance. It is caused by a single stranded RNA virus called as Lyssa-virus belonging to family Rhabdoviridae. Rabies is one of the oldest diseases which is believed to be dated back to Period of Vedas (1500-500 BCE) as mentioned in Sanskrit literature. The term 'Rabies' was probably coined back then from the word 'Rabhas' that means 'violence with extreme strength' in Sanskrit. It is also thought to be coined after the latin term 'Rabere' that denotes 'madness or bad temperament'. It is widely distributed in dogs' population and is believed to be major reservoir and vector of the disease. Virus gets transmitted by the bite of an infected animal through the saliva. However, transmission depends upon the presence or absence of virus in saliva, concentration of virus in saliva, site of bite and deepness of wound i.e. near the nerve vicinity. Virus inoculated through saliva into deep wound traverses to the nerve synapse ascending to the brain, where it causes encephalitis. Virus then replicates within brain-stem,

cerebellum and adjacent brain tissues which spreads centrifugally through nerve innervations to different sites especially to salivary gland through glossopharyngeal nerve. Infected animals usually suffer from prickling, tingling or a burning sensation at the site of the bite in early stages which may even go unnoticed in many cases. There are two main forms of disease viz. mad or furious form and paralytic form. Sign and symptoms may vary depending upon the form of disease. On later stages, aerophobia, hydrophobia, unusual howling, anxiety, agitation and depression can be seen observed in rabid animals. Behavioral signs and symptoms usually take 2-3 months to develop after the onset of infection and once an animal gets infected with virus, it is always fatal. Despite being 100% fatal, if vaccinated with anti-rabies on regular basis, it is also 100% vaccine preventable. Although the vaccination have facilitated to minimize the outbreaks, it is yet to be controlled effectively and is grossly underestimated in different parts of the world.

Rabies is enzootic to Nepal where stray dogs and wild foxes are known to be key sources responsible for spread of the disease. In case of developing countries like Nepal, domestic dogs are mostly the vectors of rabies because the owners show negligence to vaccinate their dogs. However, in case of developed countries, wildlife rabies is quiet common. It remains as a sylvatic form in wild population especially in jackals (*Canis mesomelas* and *Canis adustus*) and in herpestids like mongooses and other canids which act as normal carrier of disease. In rural regions with endemicity, dogs alone contribute 99% of the disease transmission which is true in 95% cases of rural regions of Asia and Africa. In Nepal, around 200 people die every year due to rabies among almost 35,000 cases of dog bites whereas around 50,000 Nepalese people are reported annually for

seeking post-exposure prophylaxis of rabies. Dog-rabies remains on the top of this causing around 15 million people to take Post Exposure Prophylaxis (PEP) every year. It has been reported that around 59,000 human deaths occur every year globally with most of cases in developing nations of Africa and Asia where 40% are the children below 15 years of age.

As we are heading towards the global eradication of rabies with the motto of “Zero by 2030”, this study becomes an urge to determine the current status of different parts of developing countries like Nepal. There has not been any documented data regarding current status of rabies in Chitwan district. This study was conducted to determine the prevalence of rabies in owned dogs’ population using clinical data including age, sex and season of bites.

Materials and Methods

Study site

The study was performed at Veterinary Hospital and Livestock Service Expert Centre (VHLSEC) and Veterinary Teaching Hospital (VTH) of Agriculture and Forestry University (AFU) both lying at Chitwan district. It is located in the mid-southern geopolitical zone of Nepal with latitude 27.6892° N and longitude 84.4285° E at an altitude 208 meters from the sea level. As almost cases of Chitwan district are brought to these governmental institutions (VHLSEC and VTH), this study focused them as a prime site of study.

Diagnosis and test for rabies confirmation

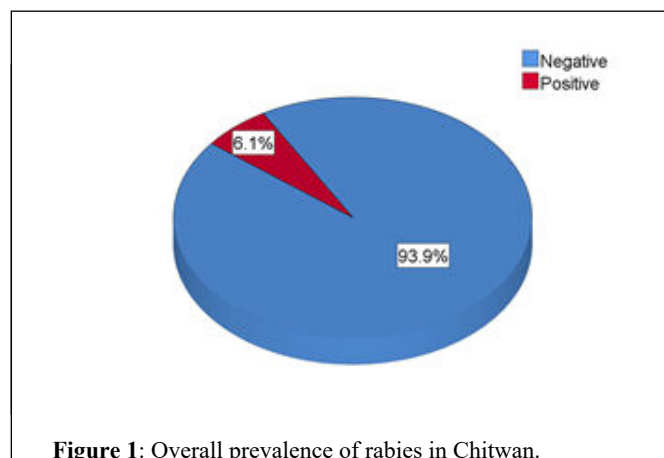
Most of the cases were diagnosed observing the history of bite, sign, symptoms and behavior of dog. Likewise, health status of dogs in 10 days isolation period at owner’s house was also key observation. Brain tissue samples of such dogs were then recovered by veterinarians and brought to VHLSEC where Rapid Kit Tests were performed for confirmation. Kit used for the tests in VHLSEC were Rapid Rabies Ag Test Kit manufactured by Bionote Inc. (Hwaseong-si, Korea). The procedure for rapid kit test was followed as per manual supplied by Bionote Inc. The brain tissue was directly diluted with the supplied media (PBS) at 1:10 dilution which was triturated properly and then a drop of sample was poured in sample loading chamber. Fluid then flowed through the nitrocellulose layer and bands appeared in the device. A single band at control position (C) represented a negative sample, while two lines (at C and T position) represented a positive sample.

Data collection and statistical analysis

- Data from the monthly case files, reported to the VHLSEC and VTH, Chitwan, between March, 2018 to Feb, 2020 were collected, retrieved and analyzed using Microsoft Excel 2016 (Microsoft Corporation, USA) and Statistical Package for Social Sciences (SPSS v.25.0) (IBM Corporation, USA).

Results

The total of 196 suspected dog-bite cases were reported at VHLSEC and VTH between March, 2018 to Feb, 2020 among which 6.1% of dogs were found positive to rabies (Figure 1)



Age-wise prevalence of rabies

Figure-2 shows that the dogs upto 3 years of age were the most reported dogs (60.98%) whereas the eldest dogs (above 6 years) were least reported (13.55%).

Similarly, Table-1 shows the positive cases of rabid dogs grouped under age categories. It shows that the higher number of positive cases (58.3%) were the dogs upto 3 years of age followed by 3 to 6 years (25.0%) with the least (16.7%) of dogs of 6 years and above.

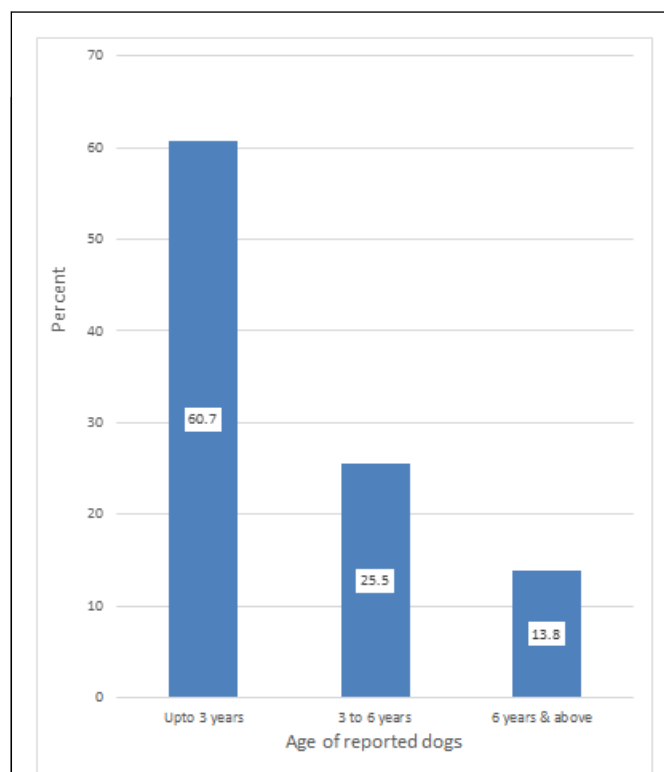


Figure 2: Bar-graph showing age-wise distribution of total number of reported cases.

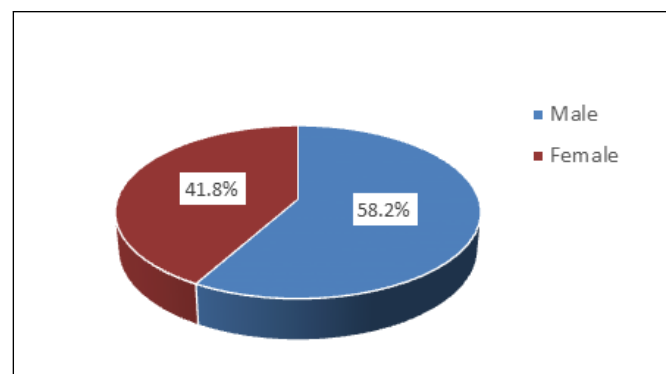
Age	No. of reported dogs	Percentage (%)	No. of positive cases	Prevalence (%)
Upto 3 years	119	60.7	7	58.3
3 to 6 years	50	25.5	3	25
6 years and above	27	13.8	2	16.7
Total	856	100	12	100

Table 1: Table showing age-wise prevalence of rabies.

Season-wise prevalence of rabies

On season-wise analysis, the study revealed that highest number of dog-bite cases were reported during autumn season i.e. 42.3% (n=83) followed by winter, 37.8% (n=74).

On the contrary, summer and spring had relatively much lower number of reported cases i.e. 12.8%(n=25) and 7.1% (n=14) respectively which is shown in Table-3.



Seasons	No. of reported dogs	Percentage (%)	Positive Cases	Prevalence (%)
Summer (Jun to Aug)	25	12.8	2	16.7
Autumn (Sep to Nov)	83	42.3	3	25
Winter (Dec to Feb)	74	37.8	6	50
Spring (Mar to May)	14	7.1	1	8.3
Total	856	100	12	100

Moreover, among all positive cases, 50.0% of dogs were reported during winter season followed by 25.0%, 16.7% and 8.3% during autumn, summer and spring respectively (Figure-4).

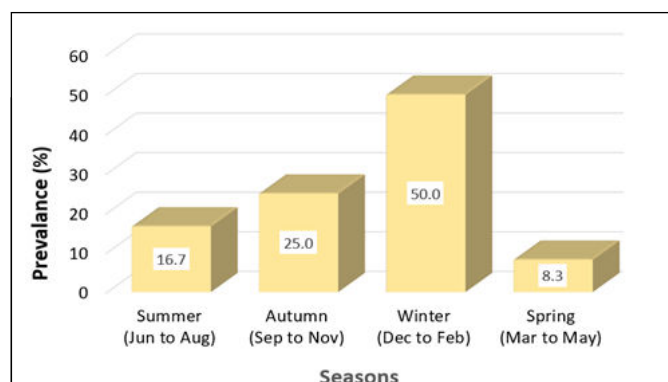
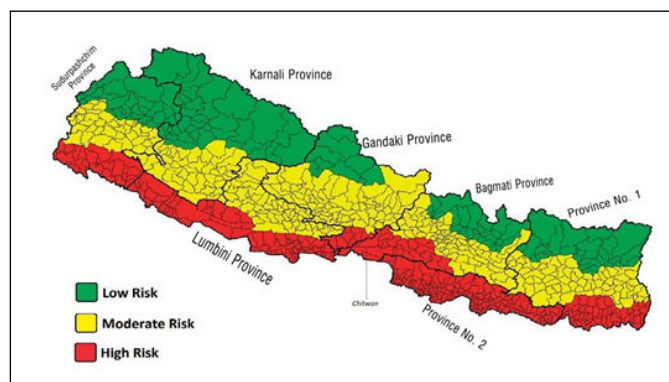


Figure 4: Bar-chart showing the prevalence of rabies case of rabies in different seasons

Discussion

The overall prevalence of rabies in owned dogs from this study was found to be 6.1% which is actually a higher rate considering the fact that this research was only focused to family owned dogs. This prevalence rate is above par in comparison to other developing countries where Bata et al. (2011) reported 2.4% prevalence of rabid dogs in Bukuru, Nigeria and found the prevalence of rabies to be 1.7%.

Around 30,000 rabies cases are reported in pets (majority being dogs) and more than 100 people die every year with Terai-belt being the most risky one (DoHS, 2019) (Figure-5). In 2018, Veterinary Epidemiological Centre (VEC) reported highest number of outbreaks of rabies in animals at Lumbini Province and least at Gandaki Province. The possible reason behind such higher prevalence in Chitwan could be due the fact that Chitwan itself lies in the high-risk zone in close proximation to dense terai forests of Lumbini Province which is being encroached day by day pushing wild ecosystem very close to human settlement areas. It also shares an open border with India which is our neighboring nation which alone contributes about 60% of fatalities of Asia and 35% globally.



The age-wise study suggests that dogs upto 3 years of age have relatively higher prevalence (58.3%) than other age groups. Also reported highest prevalence in dogs between 1-3 years of age. However, a study in Plateau State Nigeria reported a surprisingly higher prevalence of 53.5% in puppies below 6 months of age which is in fact the age at which most puppies have maternal antibodies against rabies. It could be due to the reason that mothers were left unvaccinated which failed to pass the antibodies to puppies. Likewise, higher positive cases in overall dogs below 3 years clearly hints that owners are still unaware of vaccinating their pups against rabies at early months of pup's life i.e. 3 months of age and booster them annually. This could be due to lack of awareness or ignorance by owners or due to poverty.

Similar observations were reported in Santa Cruz, Bolivia in Chennai, India. This also matches with the findings of Gershman who concluded that the male and unneutered dogs are more likely to be aggressive as compared to female and neutered dogs. Likewise, it also agrees with the results obtained by. This could be due to the fact that males are generally more aggressive and violent than females in nature.

Chitwan is the home to thousands of wildlife indwelling largest and oldest national park of Nepal, i.e. Chitwan National Park. Most parts of Chitwan come under buffer zone area of national park. So, frequent touch with carrier animals like jackals, wild foxes and other wild animals is common here. This contact of wild carriers with stray dogs and domestic animals is the major source of rabies transmission. This study reveals that higher number of dogs were reported between autumn (83 out of 196) and winter season (74 out of 196) corresponding higher confirmed positive cases. A similar research by Yadav (2012) also reported the highest number of outbreaks during winter (February) and the least at spring (May).

Similarly, a four-year research conducted by Veterinary Epidemiological Centre (Department of Livestock Services, Nepal) also reported higher outbreak of rabies in autumn and cold winter season. More reports on this period might be due to the fact that dogs are seasonal breeders and autumn corresponds the breeding season of dogs in Nepal. Their temperament also fluctuates due to hormonal changes and intense desire to mate in this season. Also, one of the utmost reasons behind such higher prevalence is the fact that winter is the season of natural unavailability of enough food resources in wild habitat which enforces shifting of wild animals to villages at buffer zones of Chitwan. It increases the risk of getting bitten of dogs and domestic animals by wildlife which plays vital role in rabies transmission. Also, owners are more likely to take their children and dogs for housebreaking especially during morning walks, jogging and

sunbathing at parks in winter season which increases the chances of getting contact of children and owned dogs with street dogs. At such amusement periods, running past dogs or starting the dog are often common which can trigger back a possible attack.

Due to endemicity of rabies in Nepal, owners bringing their dogs to VHLSEC are thoroughly interrogated for the history, dog's daily routine and its recent behavioral change. Owners coming into possible attacks or bites by their dogs are suggested to move under PEP at the day 0, 3, 7 and at 14 or 21 as recommended by WHO along with concurrent administration immunoglobulin (WHO, 2005, 2007).

It should be taken into consideration that the actual prevalence of rabies is obviously higher than the prevalence shown in this research. This is because owners still hesitate to report governmental institutions like VHLSECs and Veterinary Teaching Hospitals unless those dogs harm human or domestic lives. Even within these few days, dogs may spread the disease to stray population preparing more carriers for future and deaths within those population will remain unnoticed and unreported. Hence, proper knowledge of ecological patterns, frequency of virally infected animals and extent of their movement is of paramount importance in prediction of the spread of disease.

Conclusion and Recommendations

The study concludes that rabies is still endemic to Chitwan and prevalence is highest among male dogs and in winter season. The study was done only among the family owned dogs but such prevalence of rabies still hinted the negligence of owners towards their dogs. The main question that this study has raised is, why is rabies being escalated in developing countries despite the fact that it is 100% vaccine preventable disease?

While the World Health Organization (WHO) and OIE (World Organization for Animal Health) are busy campaigning "Zero By 2030" and the fact that the estimated deadline is impending, are we being prepared to eliminate this preventable disease from our local and inner society level? This has been a serious challenge especially in case of developing countries like Nepal.

Policy makers should be made aware of this and there is intense need of prioritizing resources for national rabies control programs. Owners need to be aware of disease and it is their sole responsibility to vaccinate their pets in time and take proper care of them. Similarly, mass vaccination to dogs is must and is a very cost-effective way of reduction in number of fatality cases. Also, to control rabies among wild population, annual oral vaccinations as bait-vaccine can be used for raccoons, monkeys, wild foxes, jackals and possible carriers around the inner core and especially at the buffer zone areas of Chitwan National Park.

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