

Occurrence of Suspected Rabies Cases in Humans Jimma Zone and Surrounding Areas, South West Ethiopia

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Abstract: Rabies, an acute viral disease of the central nervous system, is widespread in many regions of the world and affects all warm-blooded animals including humans. A retrospective study was conducted in Jimma Town Health Center recorded rabies suspected cases humans between 2009-2012 to assess the occurrence of suspected rabies cases in humans and associated risk factors in Jimma zone and surrounding areas. From 2009-2012years 2302 suspected human's rabies cases were used post-exposure prophylaxis (PEP) at the Health Center. The highest (20.4%) and the lowest (0.7%) number of cases were recorded from Jimma town and Nonno Benja districts of Jimma zone respectively. Most of these cases (90.4%) were due to bite of dogs; and the majorities (52.6%) of the victims were children with less than 15 years and 71.8% of cases were from rural areas. There were statistically significant ($P=0.001$) variation in the occurrence of the cases with respect to age category, season, residence and districts of Jimma zone. The number of rabies suspected cases in this study may be below the actual magnitude of the cases of study areas in the study areas. To this end, it is of paramount importance to, assess and map the zonal picture of rabies.

Key words: Dog • Jimma • Humans • Rabies • Ethiopia

INTRODUCTION

Rabies is acute, progressive, fatal viral disease of the central nervous system that affects all warm-blooded animals and human. This most feared fatal zoonotic disease is caused by a lyssavirus [1-3]. Moreover, persistent problem throughout the developing world where it spreads primarily by domestic dogs [4]. Canine rabies is geographically widespread and continues to represent a significant public health threat, particularly in developing countries [5, 6] and dog-mediated rabies contributes to more than 99% of all human rabies cases [7].

Rabies is prevalent and endemic in domestic and wild animals and humans in many African countries [8-10]. Most of the global human population especially in the developing world lives in canine rabies-endemic areas and is considered at risk of contracting rabies [7]. Rabies is a prime example of a neglected tropical disease that mostly affects poor communities, children and elderly people suffering from inequitable health care [11].

More than 3 billion people, about half the world's population, are living in countries/territories where dog rabies still exists and are potentially exposed to rabies. Canine rabies remains common in Africa, Asia, the Middle East and Latin America. There are an estimated 55,000 human deaths annually from rabies worldwide WHO [12], with about 31,000 in Asia and 24,000 in Africa in average more than 95% of human deaths were recorded in these continents. However, it is agreed that the disease is grossly under-reported, both in dogs and in human and the extent of underreporting may also be on the increase due to a variety of factors. If rabies is to be effectively controlled in the developing countries, it is important that its occurrence is well- documented, its epidemiology is well-understood and its impact is carefully quantified in order to attract the appropriate level of financial and logistical support from governments, donor agencies and local communities. Nevertheless, it does not attract as much attention as it should either from the government or from the public [13].

In developing countries, where the dog population is increasing at the same rate as the human population, the problem of dog bite from possibly rabid dogs was found to rise with alarming rate [14]. Dog rabies has been reported with apparent increasing incidence in the eastern and southern African region over the past many years and many countries are currently documenting record numbers of confirmed cases [15].

In Ethiopia, rabies is an important disease that has been recognized for many centuries [16] domestic dog being the most important vector of human exposure [17]. The reports of the EHNRI, indicate that a total of 488 human deaths had occurred in years between 1964 and 1975 [18]. In Africa, the highest recorded human death due to rabies for the year 1998 was reported from Ethiopia. Despite the lack of sufficient information to scale the magnitude of rabies in dogs and humans in the country as a whole, during the period 1990-2000, dogs contributed to 95% of the total fatal human rabies cases and 96% of the total animals examined after being incriminated in biting of humans [9]. During the year 2000, a total of 1540 people received post exposure anti-rabies treatment in Addis Ababa and its surroundings of which 1443 (93.70%) were due to dog bites. Hence, dogs are considered as the major biting animals and most important sources of the disease to humans in Ethiopia.

Rabies was reported to be one of the public health concerns that need formulation of intervention strategy in Ethiopia. Information on occurrence of the rabies and associated risk factors in a given locality/community is

crucial to plan and implement appropriate control measures. Though, rabies was reported to be endemic in most parts of the country, there is no study conducted on occurrence of the disease, associated risks in Jimma zone and the surrounding areas, by taking these facts in to account a health center based retrospective study was undertaken in Jimma town health center with the following objective:

To assess the occurrence of suspected rabies cases in humans and associated risk factors in Jimma zone and surrounding areas

MATERIALS AND METHODS

Description of the Study Area: Jimma Town Health Center is located in Jimma Zone of Oromia National Regional State of Ethiopia. This is located in the Southwest part of the country. Jimma Town, the capital of Jimma zone is located at 352 Km Southwest of Addis Ababa at latitude of 7°13'-8°56'N and longitude of 35°52'-37°37'E and an elevation ranging from 880 meters to 3360 meters above sea level. The study area receives mean annually rainfall of about 1637mm. The minimum and maximum temperature is 9°C to 30°C respectively with hot and humid weather condition. JTHC is the only center providing services for post exposure prophylaxis for humans bitten by animals suspected of rabies in the Jimma zone and surrounding areas continuously throughout of the year, while the other health centers provide anti-rabies vaccine at time of outbreak of the case.



Fig. 3: Card used for secondary data (2009-2012) study in Jimma Town Health Center.

Study Design and Period: The health center based retrospective study was conducted from July, 2012 to March, 2013. The retrospective study was performed on humans suspected rabies cases recorded in JimmaTown Health Center.

Study Population and Sample Size Determination: A four years data (from January 2009 to December 2012) of suspected human rabies cases recorded in Jimma Town Health Center after exposure to bite of rabies suspected and/or rabid animals was reviewed. Jimma and the surrounding zone who were reviewed. Data like date of bite, address/residence, age and sex of victims, species of the biting animals and site of bite were recorded. The sample size was determined based on the incidence of animal bite and purposive sampling of retrospective record; the review was made on total 2302 suspected cases recorded for anti-rabies vaccine during January 2009 to December 2012.

Data Collection and Analysis: The recorded data on the cases recorded or admitted for post exposure treatment at the JTHC was collected. Review was made on data compiled for each individual: dates of examination (DD/MM/YY), age, sex and address of the patient, source of exposure and site or body part affected and etc was recorded by using checklist developed for this purpose.

The raw data was analyzed after entered into Microsoft excel and using SPSS version 20.0 statistical software package and analyzed by descriptive statistics.

Operational Definition

Rural: All settlers who living outside of the main town of zone and districts were used as rural.

Urban: settler who settled in main town of Zones and districtsadministration were used as urban.

RESULTS

From 2302 human rabies suspected cases recorded between 2009 and 2012 collected from Jimma Town Health Center, 52.6%, 28.5%, 13.9% and 5% were aged between 1-14, 15-30, 31-50 and greater than 50 years old respectively. The majority 1416(61.5%) of the suspected cases were males living in rural 1653(71.8%) areas. From the total 2302 record of suspected cases of human rabies, 2082(90.4%) were due to dog bite. The trend of rabies is fluctuating among these four years. Most of the patients

2015(87.5%) were bitten on their legs compared to the other body parts. There were statistically significant variation ($p=0.001$) between residences and among sources of exposure (Table 1).

Rabies virus is widely distributed in all woredas of Jimma zone, some woredas of Illubabor zone and South Nations, Nationalities and Peoples Regional State of Ethiopia. However, the highest proportion 469(20.4%) of rabies suspected cases were recorded from Jimma town and followed by Limmu Kossa 255(11.1%), where as the smallest cases were recorded in Nonno Benja 15(0.7%) district of Jimma zone (Table 2). There were statistically significant variation ($P=0.001$) among different districts of Jimma zone.

With regard to month of case recorded, more number (35.4%, $N=816$) of rabies suspected cases were recorded in winter (bega), while lower numbers in autumn (tseday) 412(17.9%). There were statistically significant variation ($X^2= 86.27$; $P=0.001$) in seasonal distribution of rabid suspected case. From the total recorded cases, the highest (862) of rabies suspected cases occurred in the year of 2012, while smallest (365) of cases were recorded in the year 2010 as shown in Figure 4.

DISCUSSION

Animals are source of rabies infection to human is mainly through biting and they play crucial role in maintenance and spread of the virus in the areas. This study indicates that dogs were the primary cause (90.4%) for the human rabies post exposure prophylaxis in Jimma zone and surrounding areas. This finding is in agreement with [9, 19] who reported that greater than 90% of humans who received post exposure anti-rabies treatments were due to dog bites in central Ethiopia. Similarly [2, 20] reported that, dogs contributed to 91.6% of the fatal human rabies cases. Moreover [21] reported that, 97% of humans used post exposure treatments were due to dogs bite in Kenya. Furthermore [22] stated that, rabid dog throughout the world affect human being, due to its close association with human and its ability as a carnivore to transmit the virus through bite wounds.

In the present study, cats were the second most important sources of rabies for human although other domestic animals (cattle and equines) were also involved. In addition, wildlife (hyena and foxes) and humans were some of the incriminated source of exposure. This is agreement with [9,23, 24] who reported that rabies can infect and be maintained by several different host species.

Table 1: Frequency of suspected cases of human rabies with associated risk factors in Jimma zone and surrounding areas between the years 2009 and 2012.

Variables	Numbers (%) of suspected cases by years of registration				Total	P -V	X ²
	2009	2010	2011	2012			
Age groups							
[1-14]	279(12.1)	188(8.2)	297(12.9)	446(19.4)	1210(52.6)		
[15-30]	166(7.2)	110(4.8)	126(5.5)	254(11.0)	656(28.5)		
[31-50]	71(3.1)	47(2.0)	78(3.4)	124(5.4)	320(13.9)	0.001	9.97
>50	26(1.1)	20(0.9)	32(1.4)	38(1.7)	116(5.0)		
Sex							
Male	337(14.6)	225(9.8)	337(14.6)	517(22.5)	1416(61.5)	0.65	1.62
Female	205(8.9)	140(6.1)	196(8.5)	345(15.0)	886(38.5)		
Address (zone)							
Jimma	454(19.7)	314(13.6)	486(21.1)	703(30.5)	1957(85.0)		
Illuababor	44(1.9)	20(0.9)	11(0.5)	33(1.4)	108(4.7)		
Keffa	29(1.3)	14(0.6)	28(1.2)	54(2.3)	125(5.4)		
Dawurro	13(0.6)	8(0.3)	6(0.3)	28(1.2)	55(2.4)		
Bench Majji	2(0.1)	8(0.3)	2(0.1)	25(1.1)	37(1.6)		
Yemmi special woreda	0(0.0)	1(0.0)	0(0.0)	19(0.8)	20(0.9)		
Residence							
Urban	94(4.1)	136(5.9)	196(8.5)	223(9.7)	649(28.2)	0.001	68.01
Rural	448(19.5)	229(9.9)	337(14.6)	639(27.8)	1653(71.8)		
Source of exposure							
Dog	484(21.0)	343(14.9)	477(20.7)	778(33.8)	2082(90.4)		
Cat	27(1.2)	12(0.5)	45(2.0)	44(1.9)	128(5.6)		
Wildlife (fox and hyena)	12(0.5)	2(0.1)	5(0.2)	13(0.6)	32(1.4)	0.001	40.0
Bovine	12(0.5)	6(0.3)	2(0.1)	10(0.4)	30(1.3)		
Equine	6(0.3)	2(0.1)	2(0.1)	5(0.2)	15(0.7)		
Human	1(0.0)	0(0.0)	2(0.1)	12(0.5)	15(0.7)		
Body part affected							
Leg	471(20.5)	340(14.8)	477(20.7)	727(31.6)	2015(87.5)		
Arm/hand	49(2.1)	20(0.9)	45(2.0)	106(4.6)	220(9.6)	0.001	24.63
Others	23(1.0)	5(0.2)	11(0.5)	29(1.3)	68(3.0)		
Overall Total	542(23.5)	365(15.9)	533(23.2)	862(37.4)	2302(100)		

Others: Multiple sites bitten of the body
P-V= P-value

Table 2: Distribution of suspected cases of rabies in different districts of Jimma zone, South West Ethiopia between 2009 and 2012

Years	Numbers (%) of suspected cases by district distribution													Total					
	Jimma							Omo-											
	Town	Mana	Goma	Gumay	Gera	Sigimo	Sentema	L.Kosa	L. Seka	N. benja	C.Botor	TiroAfata	Sokoru	Nada	Kersa	Dedo	Seka	Sh.Sombo	
2009	57(2.5)	40(1.7)	32(1.2)	14(0.6)	28(1.2)	9(0.4)	12(0.5)	44(1.9)	26(1.1)	7(0.3)	7(0.3)	11(0.5)	10(0.4)	36(1.6)	49(2.1)	23(1.0)	23(1.0)	24(1.0)	452(19.3)
2010	116(5.0)	16(0.7)	18(0.8)	5(0.2)	10(0.4)	4(0.2)	6(0.3)	19(0.8)	15(0.7)	4(0.2)	3(0.1)	8(0.3)	10(0.4)	28(1.2)	13(0.6)	13(0.6)	14(0.6)	12(0.5)	314(13.6)
2011	155(6.7)	31(1.3)	43(1.9)	10(0.4)	11(0.5)	3(0.1)	18(0.8)	101(4.4)	27(1.2)	0(0.0)	2(0.1)	7(0.3)	7(0.3)	30(1.3)	20(0.9)	10(0.4)	9(0.4)	11(0.5)	486(21.1)
2012	141(6.1)	86(3.7)	57(2.5)	10(0.4)	15(0.7)	7(0.3)	8(0.3)	91(4.0)	41(1.8)	4(0.2)	10(0.4)	5(0.2)	13(0.6)	48(2.1)	89(3.9)	10(0.4)	30(1.3)	38(1.7)	703(30.6)
Total	469(20.4)	173(7.5)	150(6.5)	30(1.3)	64(2.8)	23(1.0)	44(1.9)	255(11.1)	109(4.7)	15(0.7)	22(1.0)	31(1.3)	40(1.7)	142(6.2)	171(7.4)	56(2.4)	76(3.3)	85(3.7)	1955(84.9)

NB: C=Cora; L= Limmu; N=Nonno; Sh=Shabe

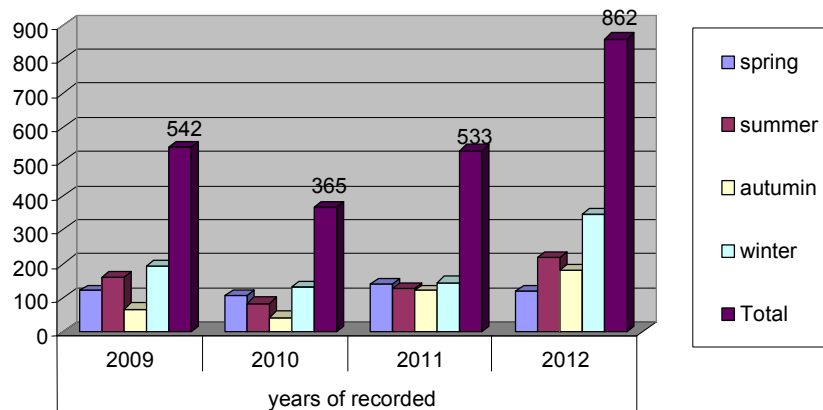


Fig. 4: Temporal trend of rabies occurrence in the years of 2009-2012.

The same authors also argued that domestic dogs are the most important source of infection to these animals due to uncontrolled contact among dogs, other domestic and wild animals.

The occurrence of rabies in other domestic and wild animals could be due to spillover of infection from canine rabies and domestic animals might get infected with rabid wild life at grazing site. This study indicated that there is rabies in both domestic and wildlife in Jimma zone and its surrounding. This may be due to the fact that the Southwestern part of Ethiopia covered by forest and consist different species of wild life especially foxes, which might play crucial role in maintenance and spread of the virus among pets, other domestic animals and wildlife in the areas.

Suspected human rabies cases bitten or contacted by rabid humans were also recorded in this study. This finding was in line with the work of Fekadu *et al.* [25] who reported possible human-to-human transmission of rabies in Ethiopia. The report by Beteleheim *et al.* [26] also indicated 12 human rabies cases and two percent of PEP given due to contacts made with rabid human subjects.

In this study, more number of rabies cases (35.4%) was recorded from December, to February and few (17.9%) cases recorded from September to November inclusive. Of the total recorded cases, the highest (862) of rabies suspected cases occurred being in the year of 2012, while smallest (365) of cases were recorded in the year 2010. There was statistically significant ($P=0.001$) variation in the seasonal (monthly) distribution of rabid suspected case. This finding is in agreement with Ali *et al.* [27] who reported a statistically significant difference in mean number of confirmed rabies cases among 12 months in and around Addis Ababa. The results is explained by the proportion of dogs bite case and human rabies cases were fluctuating during the recorded period and probably related to the breeding season of dogs and also due to the peoples prefer to killing the free roaming dogs (either bite or not) as intervention method at the time of disease outbreak. Contrary with our reports, [9, 28] stated that there was no significant variation in the incidence of rabies with regard to months in Namibia and central Ethiopia respectively.

In this finding, major numbers (52.6%) of human rabies cases, were recorded in children aged 1-14 years, while small numbers in adult above 50 years old. This is in agreement with Deressa *et al.* [2] who reported that the most fatal cases (42%) were from the age group 0-14 category and the least (15.54%) were recorded in 50 years and above age category. Moreover [19] reported that,

majority of the dog bite victims that sought the treatment were children less than 15 years of age. The WHO also reported that, most (30 to 50%) of the victims of rabies reported from Africa and Asia are children [12, 29]. Mostly deaths occurred in children under 15 years of age and on average 40% of post-exposure prophylaxis regimens are given to children aged 5–14 years. This may be due to the fact that children usually enjoy handling and playing with dogs and at time, they may aggravate them in to biting. In addition, children usually play on streets roads in our country where they can easily be exposed to rabid dogs and are not able to protect themselves. Elders are relatively well aware of the danger of rabies and may be curious if they saw for any behavior change of animals.

In this study, 61.5% of the people who used post-exposure treatment of rabies were males, suggesting that male were more affected than female in the area. This is in line with previous works [30, 9, 29, 2 and 31] in other parts and outside of the country who reported the majority of cases and deaths in males as compared to females. This probably related to the males outdoor activities and their close contact with the dogs might have increased the risk of exposure.

In current study, 87.5% of the injured patients were bitten on their legs compared to the other body parts. This is in agreement with the reports of [11], where bites on legs were the commonest in rabid animals. The report of [31,19] show that the majority of victims were bitten on their lower limb.

Majority (71.8%) of recorded cases were from rural areas. This is agreement with report of different countries [32] in China the number of dog-mediated rabies cases and human deaths has been increased exponentially over long period, primarily in poor, rural communities. The Karen *et al.* [33] reported that significantly more people in rural than urban areas had seen animals with the disease. Another report also indicated that, people most at risk live in rural areas [12]. There was statistically significant ($P=0.001$) variation in the incidence of rabies in different residence. This high numbers of cases might be due to absence of preventive interventions particularly vaccination and irresponsible dog ownership performed rather than inhumane killing of the dogs. The other explanation could be due to the high contact rate between domestic dogs and wildlife leading to increased risk of rabies occurrence and spread to the rural community. In most of these rural communities rabies is a well known as a killer disease but the treatment option most commonly available to the people in these remote areas is herbal therapy with unknown efficacy and mostly not effective in preventing the development of the disease in humans.

A clear difference was observed between Jimma and neighboring zones in the number of individuals who took post exposure prophylaxis. About 85% recorded cases were from Jimma zone, while 15% of them were from the surrounding zones. This may be, the communities in Jimma zone relatively can easily get anti-rabies vaccine continuously from Jimma Town Health Center but the lower number of cases recorded from other zone could be due to the fact that they only come to JTHC when the vaccine is finished from their nearby health centers.

Rabies virus is widely distributed in all districts of Jimma zone. Of the total 85% cases recorded from the zone, the highest (20.4%) suspected cases were recorded from Jimma town, where as the smallest cases in NonnoBenja (0.7%) district of Jimma zone. There were statistically significant variation ($P=0.001$) in the incidence of the disease among different districts of Jimma zone. Overall, the remotest districts from JTHC were registered small numbers of rabies suspected cases than the nearest woredas. These explain that as people from distant areas prefer to seek services from traditional healers instead of traveling long distance to Jimma Town, as a result, cases recorded at health center might underestimate the really figure of the disease in those areas. The deep rooted traditional practice of pretending to treat rabies in the Ethiopia interferes with getting the real magnitude of the problem [2].

In general, the result of this retrospective study presents the first preliminary investigation of health center based occurrence of suspected rabies cases in human in Jimma zone and its surrounding. Though this result clearly showed the existence of public health risk of rabies, actual magnitude of the problem might be higher than the current report. As stated by Jimma zone health office, sometimes human's rabies cases may be vaccinated in other nearby health centers and also some victims of dog bite in the rural area have access to traditional healers prior to the rabies post exposure prophylaxes in modern health center and died in the communities. In addition, such health center cases may not represent all rabies cases zonal picture because of the record filling and keeping problems in developing countries.

CONCLUSION AND RECOMMENDATION

Rabies, a viral disease that affects all warm-blooded animals and humans is widespread in many regions of the world. Rabies appears to be endemic in Jimma zone southern western Ethiopia. The sources of exposure to humans were dogs, as most post-exposure anti-rabies

treatments given to humans were primarily due to dog bites. The risk of Dogs' bite appears to be continuously throughout the year; and children were more exposed than other age groups. The fact that herbal remedy practiced in the community's may lead to the underestimation of the burden of the disease, as most of these cases remain unreported to the health centers. It is of a paramount importance if a nation based rabies control strategy is to be initiated, an adequate human post exposure vaccine distribute to different health centers in different districts of Jimma zone, further epidemiological surveillance is essential to assess and map the zonal picture of rabies.

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