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Original Research

## Retrospective Study on Occurrence of Rabies Cases in Human in and Around Jimma Zone, Oromia Ethiopia

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### Abstract

*Rabies, a viral disease that affects all warm-blooded animals, is widespread in many regions of the world. It is one of the oldest known and most feared diseases recognized since the early period of civilization. Human rabies, transmitted by dogs is an important public health issue in Ethiopia. A retrospective study was conducted from November 2015 to May, 2016 in Jimma Town Health Center on recorded rabies suspected cases to assess the status of suspected rabies cases in humans in Jimma zone and surrounding areas since its status after 2012 is unknown in this zone. According to the recorded cases from 2013-May to May 2016 years 2223 suspected humans were used post-exposure prophylaxis for rabies at this Health Center. The highest (62%) and the lowest (0.3%) number of cases were recorded from Jimma town and Xiro afeta districts of Jimma zone respectively. Most of these cases 2155(96.9%) were due to bite of dogs and the majorities 1173(52.8%) of the victims were children with less than 15 years old and 1378 (66.8%) of cases were from town areas. There were statistically significant ( $P=0.00$ ) variation in the occurrence of the cases with respect to religion category, season, source of exposure, affected body part and districts of Jimma zone. Stray dog population increment and lack of control center, lack of awareness about pre-exposure vaccination for owned dog and scarcity of rabies vaccine in the local veterinary service and lack of post-exposure prophylaxis at district health center was the main problem encountered. Therefore, Awareness creation to dog owners concerning pre-exposure vaccination and provision of post exposure prophylaxis to all district health centers is essential to control and prevent this disease from the study area.*

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## INTRODUCTION

Rabies is acute progressive fatal encephalitis, includes seven genotypes (Hayman *et al.*, caused by RNA virus from the family 2011). It is a viral disease that affects all Rhabdoviridae, genus Lyssavirus, which warm-blooded animals, but primarily disease

of terrestrial and airborne mammals including dogs, wolves, foxes, jackals, cats, lions, mongooses, bats, monkeys and humans (Zulu *et al.*, 2009). It is widespread in many regions of the world. It is one of the oldest known and most feared diseases recognized since the early period of civilization (Bernard & Hattwick, 1985). The first suggested written reference about the disease was in the ninth century BC, when Hector was compared to an enraged dog in Homer's Iliad (Debbie, 1988). It is one of the main zoonotic diseases and death nearly always follows once an animal or human has been clinically ill with disease (Bögel & Motschwiller, 1986).

Usually transmission occurs by bite with rabid canine and also under unusual circumstances by inhalation of large amounts of aerosolized rabies virus and through organ transplantation from rabies infected patients (Hellenbrand *et al.*, 2005; Smith & McDonald, 2006). Rabies-infected animals have rabies virus in their salivary glands at high titers which can be even greater than in the brain (Charey and McLean, 1983). Although a number of carnivore and bat species serve as natural reservoirs, worldwide rabies in dogs is the source of 99% of human infections and poses a threat to >3.3 billion people. There are an estimated 60,000 human rabies related deaths worldwide each year. Of these, most cases occur in Asia and Africa (Birhanu *et al.*, 2013).

There is a long and variable rabies virus incubation period in humans and animals which usually last 20 to 90 days but sometimes it takes longer than 1 year (Smith *et al.*, 1991). This disease has three clinical phases called prodromal, furious and dormant/paralytic. The term "furious rabies" refers to animals in which the excitative phase predominant and paralytic rabies" to those in which the excitative phase is extremely short or absent and the disease progresses quickly to the paralytic phase (knobel *et al.*, 2005).

Rabid foxes frequently invade yards or even houses, attacking dogs and people. Bats flying in the daytime are probably rabid (Hampson *et al.*, 2009).

Rabies in Africa constitutes a serious public health problem, as a result is well-known disease by having great economic significance (Kitala *et al.*, 2001). In Ethiopia it is an important disease that has been recognized for many centuries. Rabies in Ethiopia is primarily a disease of dogs. Many people are at increased risk of being exposed to rabies since man-dog contact is very common. In Africa the highest recorded human death rabies for the year 1998 was 43 reported from Ethiopia (Assefa *et al.*, 2010). 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 (EHNRI, 2001). Although, there was retrospective study conducted on occurrence of the disease, associated risks in Jimma zone and the surrounding areas from 2009 up to 2012 (Tadele *et al.*, 2012), currently there is no any information on the status of rabies at the study area.

Therefore, the objectives of this research work were:

To determine the occurrence of suspected rabies cases in humans in and around Jimma zone.

To identify the associated risk factor for the occurrence of Rabies cases at the study area.

## MATERIALS AND METHODS

### Study area

The study was conducted in Jimma town health center from November, 2015 to May, 2016. Jimma town, which is the capital of Jimma zone, is located in Oromia Regional State at 346 km South West of Addis Ababa.

The town has a latitude of about 7°36' to 8°N and longitude of about 35°52' to 37°37' E, and an elevation ranging from 880 to 3360 m above sea level. The area receives a mean annual rainfall of about 1,530 mm, which comes from long and short rainy seasons. The average minimum and maximum annual temperature ranges between 14.4 and 26.7°C, respectively. This town has a total population of 120,600 (CSA, 2009).

### **Study design and methodology**

A retrospective record review based cross-sectional study design was employed to collect the recorded cases of rabies suspected human came to Jimma town health center. It was conducted by reviewing the recorded data that found in Jimma town health center.

### **Study population**

In this record book, a resident in and around Jimma town as well as victims of rabies and rabid animal bites referred from the surrounding zone found in Oromia regional state, south west Ethiopia and in south nations, nationalities and peoples of Ethiopia were the source of the sampling population.

### **Sample size and sampling method**

Sample size was predetermined. It was the data of rabies suspected human who bitten by rabid animals and came to Jimma town health center for treatment and as a result they were recorded and stored in record office for four years starting from January 2013 to May 2016. From the recorded cases found in this health center for four years 2223 cases were

associated with rabies contact visited the health center due to animal bite. Sampling method was purposively searching the recorded cases of rabies found during January 2013 to May 2016 from total of recorded cases of different diseases that found in Jimma town health center. The recorded data contains information on the following; identification number, date, name of patients, sex, address (region, zone, woreda, kebele, house no.), biting animal, date of bite, site of bite, vaccine given and health institution at vaccine given.

### **Data management and statistical analysis**

The information gathered through searching from recorded data that found in Jimma town health center was entered in to Microsoft Excel program. The data was analyzed by descriptive statistics using SPSS version 20.

## **RESULT**

The total number of recorded rabies suspected cases that came to Jimma health center for post exposure prophylaxis from January, 2013 to May, 2016 were 2223. From total recorded cases the highest numbers of victims were males and religious wise Muslim and mostly came from town (Table 1). Regarding to the source of exposure of dog bite is the major source (2155) while human contact is the least source for this study (Table 2). Majority of rabies suspected cases recorded in Jimma town Health Center were found between age of 1-15 years old (1173) but the least were found at the age of above 50 years old (122).

Table 1. Demographic result of individuals

Variables		2013	2014	2015	2016	Total	P-V	X <sup>2</sup>
Religion	Muslim	278	272	455	135	1140	.027	9.213
	Crystian	241	290	390	162	1083		
	Total	519	562	845	297	2223		
Sex	Male	307	328	484	161	1280	.587	1.929
	Female	212	234	361	135	942		
	Total	519	562	845	296	2223		
Age group	1-15 year	267	308	449	149	1173	.864	6.904
	16-30 year	155	143	233	92	623		
	31-50 year	69	76	120	39	304		
	above 50 year	28	35	42	17	122		
	Total	519	562	845	297	2223		

Table 2. Residence and Source of exposure result

Variables		2013	2014	2015	2016	Total	P-V	X <sup>2</sup>
Jimma and neighbors' zone	Jimma zone	495	545	815	287	2142	.281	17.658
	Ilu abbabor zone	6	5	4	0	15		
	Bench Maji zone	5	2	6	4	17		
	Kefa zone	7	3	11	6	27		
	Dawuro zone	6	6	8	0	20		
Residence	Total	519	562	844	297	2223	.717	1.353
	Town	350	365	568	203	1486		
	Rural	169	197	277	94	737		
Source of exposures	Total	519	562	845	297	2223	.034	26.368
	Dog	497	543	825	290	2155		
	Cat	13	9	17	3	42		
	Bovine	3	3	0	0	6		
	Equine	1	4	1	0	6		
	Human	2	0	0	0	2		
	Fox	3	3	2	4	12		
Total	519	562	845	297	2223			

The major affected body parts of individuals that recorded on rabies suspected record case in Jimma town health center were on their leg (1665) while the least were on their head/face (58) (Table 3).

Table 3. Results associated with affected body part and season

Variable		2013	2014	2015	2016	Total	P-V	X <sup>2</sup>
Affected body parts	Leg	391	431	624	219	1665	.005	23.349
	arm/hand	96	89	176	69	430		
	head/face	11	16	22	9	58		
	Others	21	26	23	0	70		
	Total	519	562	845	297	2223		
Season	Tseday/autumn	106	70	266	189	631		
	Bega/winter	199	163	197	108	667		

Table 3 continued..

Balg/spring	116	115	235	0	466	.000	454.362
Kirimt/summer	98	214	147	0	459		
Total	519	562	845	297	2223		

The highest cases were recorded in 2015(845) and the Bega/winter season takes the highest cases recorded (667). From 2223 recorded cases, 2142 of them come from Jimma zone while the rest were from other

surrounding zones. The highest number of rabies suspected cases were recorded from Jimma town (1379) followed by Seka woreda (115) and the least recorded case was in Xiro Afata (7) (Table 4)

Table 4. Distribution of the cases

years	Jimma town	Kersa	Manna	Dedo	Gomma	Seka	Gumay	L/kossa	L/seka	Shabe	C/botor	N/benja	Sokorru	O/nadda	Sigmo	Setema	Gera	X/afeta	Total
2013	318	22	25	16	34	18	3	21	9	3	3	0	5	5	2	2	7	2	495
2014	343	11	25	18	28	27	8	24	2	8	1	2	6	20	7	5	6	4	545
2015	519	35	36	46	27	50	8	15	7	8	8	9	13	21	2	2	9	1	816
2016	198	4	17	15	8	20	5	2	6	0	0	0	3	6	0	0	2	0	286
Total	1378	72	103	95	97	115	24	62	24	19	12	11	27	52	11	9	24	7	2142

The cost of post exposure prophylaxis was not constant throughout these four years. In 2013, 2014, 2015 and 2016, cost of the drug for a single person were 78, 78, 95, 130 Ethiopian Birr with respective years. The highest cost per rabies suspected individual was occurred in 2016 which is 130 Ethiopian birr per individual.

## DISCUSSION

Every year, the application of post-exposure prophylaxis provides more than 20 million treatments and has been an effective counter-measure to rabies virus infection for more than 100 years (WHO, 2013). This study result indicates that, there were about 2223 individual with rabies suspected cases that came to this health center for the purpose of PEP in the year of January 2013 up to May, 2016. This result is in agreement with the study conducted by Petros and Yalemtehay (2014). This high number of cases might be

due to the study area were being forest with coffee cultivation and resourced with different types of wild animals that facilitate easily rabies transmission between dog and wild canine.

According to this study result sex wise distribution of cases indicate high exposure of male individuals 1280(57.6%) than females 942 (42.4%) of all age group. Major number of male exposures which was encountered in present study is in agreement with the study conducted previously by Tadele *et al.* (2012). This might be reduced the number of women that work at home who has low chances of contact with dog.

In other side, outdoor activities and close contact of the male with the dogs than females might have increased the risk of exposure. Since the facts of Jimma town resident are mostly Muslim followers, this may be the reason that the numbers of affected females by rabies cases were lower and also

most of the affected humans are males of Muslim followers (1140) (51.3%).

In the present study, cases of rabies were more frequent among the children aged between 1-15 years 1173(52.8%). This study result is in agreement with the WHO report which indicates the most (30 to 50%) of the victims of rabies reported from Africa and Asia is children's (WHO, 2005). The study conducted in Addis Ababa and its surrounding by Assefa *et al.* (2010) and in Jimma Town by Tadele *et al.* (2012) is in agreement with this finding. This might be due to several reasons.

Some of these reasons could be, children take message from one family to others where they come across rabid dog, they also spent more of their time playing on the road and may encountered by rabid dogs. Additionally, they are unable to protect them self from dog bite and could be due to immaturity to identify rabid animals from the normal.

From the total 2223 cases, 2142 (96.4%) were from the Jimma zone while the rest 81 (3.6%) were from the surrounding zones like Ilu Ababor 15 (0.7%), Bench Maj zone 18 (0.8%), Kefa zone 28 (1.2%) and Dawuro zone 20 (0.9%). From the case that recorded in Jimma zone, the highest was Jimma town 1379 (62%) which followed by Seka district 115 (5.2%) and the least number of cases were from Xiro Afeta 7 (0.3%). This study result is in line with the Asefa *et al.* (2010) finding who reported great number of cases from Oromia regional state than any other region and also in agreement with Tadele *et al.* (2012) who reported rabies in all district of Jimma zone. As the distance from Jimma town increase the number of case record were decreases. This may probably due to long distance travel and also as their distance increase from the town, awareness of the society on post exposure prophylaxis

decrease so as a result they may use traditional medicine.

Urban rabies is essentially maintained by dogs wherever it is endemic world-wide. It is estimated that the dog/human population is one to six in urban areas and one to eight in rural areas (EHNRI, 2011). Also, this study result is in line with this statement as majority of people bitten by rabid animals and recorded on data of JTHC PEP were urban resident. The number of rabies suspected human came to this health center and treated with anti-rabies were two times more than those came from rural area 1486 (66.8%). This is probably due to the migration of dogs from rural to town and increment number of stray dogs in urban which similarly, reported by Abraham *et al.* (2010).

Rabies in Ethiopia is primarily a disease of dogs. However right now so many people are at increased risk of being exposed to rabies since, man-dog contact is very common (Assefa *et al.*, 2010). This is also in agreement with this study result, in Jimma town health center majority of the recorded cases of rabies suspected human were suffered from dog bite. From total cases recorded from 2013 to May, 2016, 2155 (96.2%) humans were exposed to rabies case via dog bite. This might be due to different reasons; while the major one is increment number of stray dogs which is in agreement with Abraham *et al.* (2010). In 2016 around third and fourth month the number of rabid dogs was increased and as a result the number of bitten people by rabid dogs also increased by alarming number.

The second line source of exposure was the Cat, all most all of the individuals that were bitten by cats were affected on the hand/arm of body parts. This finding is similar to that of study carried out by Eshetu *et al.* (2012). This is probable due to humans fighting with hand when they become excited and tried to scratch and bite, also during feed

provision they may bite hand. The third source of exposure were fox which is wild life and while the Bovine and Equine were the fourth source of exposure and human being self is the source of rabies transmission in this study.

In current study, 1665 (74.9%) of the injured individual were bitten on their legs compared to the other body parts. This is in agreement with the reports of Agarwal, and Reddaiah (2003). Where bites on legs were the commonest in rabid animals. This might be due to most source of case is dog which has close proximity only to the lower body part and the left percent that affected around shoulder, back and head/neck region has close proximity to animals like equine, bovine and human being self. This finding was in line with the work of Fekadu *et al.* (1996) who reported possible human-to-human transmission of rabies in Ethiopia.

In this study, number of cases encountered in Dry season is more than any other season but the least was recorded in wet season. More number of rabies case 667(30%) was recorded from December, to February and 631(28%) cases recorded from September to November. This result is in agreement with the previous reports of Tadele *et al.* (2012). In-contrary to this finding Reta *et al.* (2014) found highest number of rabies cases from June to September. This may probability due to the month found from September to November are included in the breeding season and the rabies case start to occur reach the peaks of outbreak in the month found between December to February. In this study, seasonal variation was statistically significant ( $p=0.00$ ). This finding is in agreement with Abraham *et al.* (2010) who reported a statistically significant difference in mean number of confirmed rabies cases among 12 months in and around Addis Ababa.

In present study there is a great economic burden as the cost of drug were increasing throughout the consecutive three years and as the number of victims were enormous. Highest price was seen in the 2016 year which is 130 ETB per individual. Totally those people who got post exposure prophylaxis expend 203,203ETB in the last consecutive four year at the study area. This great economic loss due to post exposure prophylaxis is indicated in report of WHO (2013).

## CONCLUSIONS

In Jimma zone due to coffee cultivation practice disease transmission between domestic animals like dog and wild animals like fox which is natural reservoir of the rabies virus is common. The high population of stray dog in this area make the children the highest vulnerable to this disease, in this study areas, while the most affected body part was lower limb. Winter is the seasons of highest number of cases recorded with scarcity of post exposure prophylaxis to bitten human at district health center. Generally, the rabies case suspected human recorded in Jimma town health center were enormous in number and also there were high economic loss due to this case. In addition to economic loss due to Post exposure prophylaxis cost there is also economic loss during this treatment follow up for the consecutive 17days and transport cost because some of the individual where from long distance. In contrast, the other society that found in distant area might be use traditional medicine that may lead them loss of their life. In addition, there was also lack of awareness about post exposure prophylaxes and isolated from the society as soon as the bitten by stray dogs and live alone in separated class for 3 months. They may die before arriving 3 month

or psychologically diseased without rabies virus case.

## RECOMMENDATIONS

Therefore, based on the above conclusion the following recommendations are forwarded.

- Awareness creation to the society in order to reduce contact with wild animal is very important.
- Providing pre-exposure vaccine to all local veterinary service/clinic.
- Provision of post exposure prophylaxis to all district health centers is essential.
- It is better to eliminate those homeless and unvaccinated dogs in order to reduce dog population, to minimize rabies burden from this area.

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