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Research Article

Characteristics of Exposures Presented by Dog Bites and Adherence to Anti-rabies Treatment by Patients Visiting Selected Hospitals in Kisii County, Kenya

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Abstract

Dog bites constitute a substantial public health problem in Africa and Asia. Rabies still remains a lethal infection spread by rabid animals' saliva that damages the central nervous system and is completely 100% fatal. An individual can be infected with the disease via a bit from a rabid dog. In Africa and Asia continents constitute the regions that are highly affected with human rabies fatalities globally. In Kisii County, the emergence of stray dogs has made rabies a significant problem. This study aimed to assess Types and severity of exposures presented by the dog bites patients visiting selected hospitals in Kisii County, Kenya. The research examined. A hospital-based, random cross-sectional descriptive research design was adopted, involving 289 dog bite patients as respondents from the selected hospitals in Kisii County. Dog bite patients were provided with a carefully constructed a survey with both closed- and open-ended questions for quantitative analysis. A chi-square test was utilized to assess the significance of categorical variables. The data was gathered and analyzed using SPSS software version 25. The study revealed that there was no significant correlation between adhering to rabies PEP treatment after a dog-bite and the affected part of the body or severity of exposure (p-value=0.071). Furthermore, the circumstances of the bite did not demonstrate a significant relationship with adherence to post-exposure prophylaxis after a dog bite (p-value=0.641). As a result, the investigation failed to reject the null hypothesis and concluded that there is no association between the type and severity of exposure and adherence to rabies PEP treatment. Regarding the type of exposure, majority of the respondent (50.5%) reported dog bites, 37% scratches and 12.5% with dog licks. Further, 70.9% of the patients had the types of bite indicated in their patient's card. Out of the 70.9% patients; 58.5% were in the first WHO category and 29.3% were in the second category. The Kisii County medical services, public health, and sanitation department have subsidized prices for anti-rabies vaccines and conduct rigorous tracing of rabies PEP treatment defaulters. The veterinary department is responsible for implementing mass dog vaccination in the county. Lastly, the National Social Health Insurance Fund (NSHIF) and Universal Health Coverage (UHC) should ensure that their schemes include the issuance of anti-rabies vaccines for their members.

Keywords

Exposure, Dog Bites, Adherence, Anti-Rabies, Patients, Hospitals, Kisii, Kenya

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1. Introduction

Rabies, an ancient global known viral zoonotic disease spread by the rabies lyssavirus, which is well-recognized but frequently underestimated on a global scale [1]. With an almost 100% mortality rate in both humans and animals, rabies remains a major global health issue, leading to approximately 60,000 deaths annually. In 99% of rabies cases, dogs have been the main transmitters of rabies disease in humans worldwide as a result of bites from infected animals with rabies virus [2]. Majority of human-rabies mortalities, 95% are majorly reported in Africa and Asia, largely due to the rapidly growing dog population and poor adherence to rabies post-exposure prophylaxis. As a result, despite inadequate detection and reporting systems, the number of human rabies cases has been rising [3].

Potential impact of rabies is anticipated to be severe, with a projected increase in cases, heightened risk of the disease becoming entrenched, and chain of infection route between dogs and humans [4]. Recent studies highlight the significant public health threat posed by bites from dogs in both Asia and Africa [5]. Globally, dogs are widely known as the main reservoir of rabies lyssavirus, with almost 99% of rabies human fatalities reported globally as the results [5].

Rabies continues to pose a major public health threat in Africa, though reported mortality rates in humans and dogs may not fully reflect the actual impact of the disease [6]. Globally, rabies is responsible for roughly 60,000 human deaths each year, with around 56% occurring in Asia and 44% in rural regions of Africa [7]. Once contracted, rabies is known to progress rapidly and is almost always fatal [8]. For over a century, post-exposure prophylaxis (PEP) been an effective strategy for promoting and preventing human-rabies mortalities globally [9].

Prompt administration of PEP is critical after contact with a suspected rabid animal to ensure its effectiveness [10]. Research indicates that the cost of rabies PEP influences how dog bite patients perceive and seek treatment, which affects their adherence to the PEP regimen. Many patients delay treatment, some fail to complete the PEP course, and others do not seek medical care at all [11]. In developing countries, factors such as reliance on traditional healers, shortages of anti-rabies vaccines (ARV) in public hospitals, and limited public awareness about rabies significantly impact the health-seeking behaviors of dog bite patients [12].

Rabies disease remains a significant health concern in Kisii County, with numerous dog bite cases reported annually. However, many individuals who are attacked by dogs do not complete their rabies PEP treatment. This non-adherence can be attributed to several factors, including inefficiencies within the healthcare system, socio-demographic influences, patient behaviors regarding healthcare-seeking and treatment continuation, and a lack of knowledge about dog bite management. Understanding these factors is essential to enhance adherence to rabies PEP treatment, ultimately improving health outcomes and reducing deaths related to rabies.

The main goal of the investigation is to gather baseline information on PEP adherence and its influencing factors among individuals bitten by dogs. The findings from this study will offer valuable data for both zoonotic disease and medical services and public health and sanitation departments.

2. Materials and Methods

The descriptive cross-sectional study took place in a hospital located in Kisii County, Kenya. Both patients who had experienced dog bites and a selected group of medical professionals took part in the study. A representative sample of individuals who had suffered dog bites was obtained from a specified list of healthcare facilities and was then utilized to identify patients in the hospital. The hospitals were selected based on the documented instances of individuals bitten by dogs.

The investigation focused on the uptake and adherence to rabies post-exposure prophylaxis as the dependent variable. According to WHO guidelines, the vaccination should be administered either intradermal or via injection (0.5 ml) on days 0, 3, 7, and 21. It is mandatory to receive all required antigens for post-exposure prophylaxis compliance.

Participants included dog bite patients visiting the selected hospitals as well as medical experts who were thought to be the main information sources from the selected hospitals in County of Kisii.

The investigation applied specific criteria for inclusion, focusing on all clients were bitten or attacked by dogs and were receiving treatment, as well as those who had consented to participate in the research from a variety of healthcare facilities. Additionally, the study included patients who had been treated for dog bites and subsequently discharged. The researcher chose hospitals that were classified as level 4 and 5 facilities that had the capability to order or procure anti-rabies vaccines, storage of anti-rabies vaccines in cold chain, and had reported highest number of dog bite cases on the KHIS platform, and healthcare workers who were trained to manage patients bitten by dogs.

Questionnaires were utilized to gather quantitative data. The well trained study research assistants located within Kisii County administered the questionnaires to the patients of dog bites. Healthcare professionals and selected patients who had suffered from dog bites were given well-structured key informant interviews (KII) and focused group discussions (FGD) guidelines, respectively. We questioned the main informants about their professional opinions on dog bite patients' adherence to rabies post-exposure prophylactic therapy and related variables. This was necessary in order to gather trustworthy information from affected patients and to assist the county government of Kisii and its various stakeholders in reducing rabies epidemic in Kisii County. The themes covered in the KIIs and FGDs were suitable to the main objective of this particular study.

3. Results

3.1. Socio-Demographic Characteristics of the Study Participants

There were more than half (57.8%) of female dog bite incidents. The most of the patients (22.8%) were in the 22–32 age range. Of the 156 people, 54.0% lived in semi-urban settings. In terms of education, it was observed that 112 (38.8%) of the respondents were self-employed and 79 (27.3%) had finished their secondary school. 23.5% of the patients' monthly income was less than KES 4500. Table 1 provides further information in the following manner.

Table 1. Description of socio-demographic factors of dog bite patients.

Variable		Frequency (n=289)	Percentage (%)
Gender	Male	122	42.2
	Female	167	*57.8
Age	0-10	33	11.4
	11-21	63	21.8
	22-32	66	*22.8
	33-43	59	20.4
	44-54	32	11.1
	above 54	36	12.5
Marital status	Divorced/Widowed	40	13.8
	Married	132	*45.7
	Single	117	40.5
Education level	No formal education	57	19.5
	Primary	53	18.3
	Secondary	79	*27.3
	Tertiary	64	22.6
	University	36	12.3
Settlement type	Rural	93	32.2
	Semi-urban	156	*54.0
	Urban	40	13.8
Employment status	Not employed	96	33.2
	Self employed	112	38.8
	Employed	68	23.5
Religion	Christian	252	*87.2
	Muslim	33	11.4
	None	4	1.4
Monthly Income	Below KES. 4500	68	*23.5
	4500-6500	23	8.0
	6501-8500	57	19.7
	8501-10500	52	18.0
	Above KES. 10500	43	14.9

3.2. Characteristics of Exposure

Regarding the type of exposure, majority of the respondent (50.5%) reported dog bites, 37% scratches and 12.5% with dog licks. Further, 70.9% of the patients had the types of bite indicated in their patient's card. Out of the 70.9% patients; 58.5% were in the first WHO category and 29.3% were in the second category. Moreover, a stray dog was reported as the attacking animal by 68.2% of the study participants, while 31.8% identified a pet dog as the attacker. The study also revealed that 43.3% of the dog bite patients were aware of the attacking dog's status, with 56.7% being unaware of the status. Among those who knew the status of the attacking dog, 73 individuals (68%) were aware of the vaccination status of attacking dog. Additionally, the majority of study participants (70.2%) experienced an unprovoked attack by a dog, while 29.8% provoked the attacking dog. Regarding the affected body parts, about 42.9% of the patients were attacked on the upper limbs, 42.2% lower limbs, 11.4% on the neck and 3.5% was on the head as illustrated in Table 2.

Table 2. *Characteristics of exposure.*

Variable		Frequency (n)	Percentage (%)
Type of exposure	Bite	146	*50.5
	Scratches	107	37
	Licks	36	12.5
Type of bite indicated in the patient's card	Yes	205	*70.9
	No	84	29.1
WHO bite categorization	1st category	120	*58.5
	2nd category	60	29.3
	3rd category	25	12.2
Type of attacking animal	Stray dog	197	*68.2
	Pet dog	92	31.8
Knowledge on animal status	Yes	125	43.3
	No	164	*56.7
Animal vaccination status	Vaccinated	17	13.6
	Unvaccinated	23	18.4
	Unknown	85	*68.0
Affected body part	Head	10	3.5
	Neck	33	11.4
	Upper limbs	124	*42.9
	Lower limbs	122	42.2
Circumstance of bite	Provoked	86	29.8
	Unprovoked	203	*70.2

The investigation aimed to assess the correlation between the types and severity of exposure and the adherence to rabies post-exposure prophylaxis (PEP) among individuals bitten by dogs. Based on the findings presented in Table 2, the type of exposure demonstrated a significant association with adherence to PEP treatment (p-value=0.011). In terms of the WHO's classification of the animal bite exposure, there was a statistically significant difference. Compared to the first category used as the reference, individuals in the second category had significantly higher odds of adhering to rabies PEP treatment (OR = 3.239, 95%CI (0.062-0.919), p = 0.037). Likewise, individuals in the third category also displayed significantly

higher odds of adhering to PEP compared to the first category (OR = 5.385, p = 0.009). These results suggest that as per WHO guidelines, an increase in the severity of exposure corresponds to a higher likelihood of adhering to PEP. This indicates that persons are more have a tendency to follow PEP protocols when they perceive the exposure to be more serious or potentially harmful, as categorized by WHO guidelines.

The type of animal that carried out the attack was found to have a significant link with adherence to rabies post-exposure prophylaxis (PEP) following a dog bite (p-value=0.008). Individuals who were bitten by a pet dog were less likely to follow PEP after a dog bite compared to those who were bitten by stray dogs (OR=0.100, 95%CI [0.039-0.259], p = 0.008). Understanding the animal's status was significantly related to adherence to post-exposure prophylaxis after a dog bite (p-value=0.011). Individuals with no knowledge of the animal's status were more likely to adhere to PEP after a dog bite compared to those who had knowledge of the animal's status (OR=2.285, 95%CI [1.323-3.947], p = 0.031).

The investigation findings indicate a significant association between animal vaccination status and adherence to post-exposure prophylaxis following a dog bite (p-value=0.019). Individuals who were aware that the animal was unvaccinated (OR=3.864, 95%CI (1.729-8.635), p = 0.001) were more likely to comply with PEP after a dog bite compared to those who knew the animal was vaccinated or unvaccinated. The location of the bite did not show a significant correlation with adherence to post-exposure prophylaxis after a dog bite (p-value=0.071), although there was a notable relationship between individuals bitten on the head and their adherence to rabies PEP treatment (p=0.001). Furthermore, the circumstances surrounding the bite did not demonstrate a significant association with adherence to post-exposure prophylaxis after a dog bite (p-value=0.641) as seen in Table 3 below.

Table 3. *Characteristics of Exposure and Adherence to Post-Exposure Prophylaxis.*

Variable	Adherence to Post-Exposure Prophylaxis n (%)	Non-Adherence to Post-Exposure Prophylaxis n (%)	OR(95%CI)	*p* value
Type of exposure				.011
Bite	55(51.4)	52(48.6)	*ref.*	
Scratches	24(66.7)	12(33.3)	10.164(6.231-15.599)	.001
Licks	89(61.0)	57(39.0)	2.285(1.323-3.947)	.002
WHO bite categorization				.023
Category one	97(58.1)	70(41.9)	*ref.*	
Category two	71(58.2)	51(41.8)	3.239 (0.062-0.919)	.037
Category three	78(63.9)	44(36.1)	5.385(0.187-0.791)	.009
Type of attacking animal				.001
Stray dog	79(59.3)	54(40.7)	*ref.*	
Pet dog	89(55.2)	72(44.8)	.100 (0.039-0.259)	.008
Knowledge on animal status				.001
Yes	72(57.6)	53(42.4)	*ref.*	
No	96(58.5)	68(41.5)	2.881(1.323-3.947	.031
Animal vaccination status				.019
Vaccinated	35(57.4)	26(42.6)	*ref.*	
Unvaccinated	37(58.7)	26(41.3)	3.864(1.729-8.635	.001
Unknown	96(58.2)	69(41.8)	4.421(1.898-10.298)	.001
Affected body part				.071
Head	6(60.0)	4(40)	*ref.*	
Neck	19(57.6)	14(42.4)	.222 (0.082-5.607)	.001
Upper limbs	69(55.6)	55(44.4)	.029 (0.08-1.100)	.090

Variable	Adherence to Post-Exposure Prophylaxis n (%)	Non-Adherence to Post-Exposure Prophylaxis n (%)	OR(95%CI)	*p* value
Lower limbs	74(60.7)	48(39.3)	.046(0.015-1.136)	.612
Circumstance of bite				
Provoked	43(50.0)	43(50)	*ref.*	
Unprovoked	125(61.6)	78(38.4)	1.233(0.511-2.976)	.641

4. Discussion

Characteristics of Animal Exposure

As per the investigation results, the majority (68.2%) of the assaults were carried out by stray dogs, with pet dogs accounting for 31.8%. A research conducted in South Bhutan found that patients were most exposed to domestic dogs (45%), followed by stray dogs (23%). This discovery contradicted the research results, which demonstrated that the majority of the patients were exposed to human rabies through stray dog bites.

The study additionally discovered that 50.5% of the patients who came for rabies PEP in the chosen hospitals in Kisii County had dog bite wounds, 37% had dog scratches, and 12.5% had dog licks. According to the study, the majority of patients who arrived with animal bites had bites 82.1%, scratches 16.2%, and animal licks 1.7%. Another investigation done in Madagascar by Malavika [13]. established that the high number of patients (82.9%) had bites and 22.9% had scratches.

The findings of this study show that 42.9% of individuals had wounds on their upper limbs, 42.2% had wounds on their lower limbs, 11.4% had neck wounds, and 3.5% had head wounds from animal attacks. These results are comparable to those of an investigation done by [13] in Madagascar, where 48.6% had upper limb wounds, 22.9% had lower limb wounds, and 5.7% had neck and head wounds. However, an investigation by Penjor *et al*., 2018 [14] contradicts the findings from this present study, as it discovered that the most highly affected site of attacks were on the lower limbs at 69.74%, followed by the upper extremities at 20.5%. Similarly, [14] also does not align with the outcome of the present study, has demonstrated that the highly usual affected site of bites was the lower limbs at 52%, upper limbs at 40%, and head and neck at 4% each.

In terms of biting circumstances, the majority of bites were unprovoked (70.2%), while 29.8% were provoked. This finding are in line with those conducted by [13] and [14]. However, contradictory investigations have shown that the majority of patients presenting for rabies PEP encouraged the attacking animal [14]. Other studies have found that rabies post-exposure prophylaxis is more commonly obtained during the non-rainy season (54.1%) than during the rainy season (45.9%).

5. Conclusions

The study revealed that there was no significant correlation between adhering to rabies PEP treatment after a dog-bite and the affected part of the body or severity of exposure (p-value=0.071). Furthermore, the circumstances of the bite did not demonstrate a significant relationship with adherence to post-exposure prophylaxis after a dog bite (p-value=0.641). As a result, the investigation failed to reject the null hypothesis and concluded that there is no association between the type and severity of exposure and adherence to rabies PEP treatment.

6. Recommendations

Conduct mass campaigns targeting the most susceptible populations through consolidated efforts of both the Kisii County department of health, agriculture, fisheries and livestock and other key stakeholders in the county in order to reduce severity and manage characteristics of dog bites and also manage non-adherence.

Abbreviations

ARV	Anti Retroviral Virus
FGD	Focused Group Discussion
NSHIF	National Social Health Insurance Fund
PEP	Post Exposure Prophylaxis
SPSS	Statistical Package for Social Sciences
UHC	Universal Health Coverage
WHO	World Health Organization

Author Contributions

Nickson Ogugu: Conceptualization, Investigation. Resources, Writing – original draft, Writing – review & editing

Alex Ontiri Ondieki: Data curation, Formal Analysis, Methodology, Resources, Writing – original draft, Writing – review & editing

Medrine Yator: Investigation, Supervision, Writing – original draft, Writing – review & editing

Conflicts of Interest

The authors declare no conflicts of interest.

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Biography

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Research Field

Nickson Ogugu: Epidemiology, Public Health, Community Health

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Medrine Yator: Epidemiology, Public Health, Community Health, Occupational Health and Safety