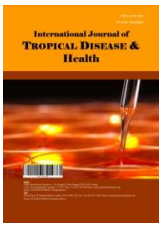

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Evaluation of the Knowledge, Attitudes and Prevention Practices with Regard to Cutaneous Leishmaniasis Caused by *Leishmania aethiopica* in Mount Elgon Focus, Kenya

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Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Leishmaniasis has spread beyond the traditional areas of the Rift Valley and North Eastern provinces. There is more evidence of emergence and spread of leishmaniasis in Western Kenya. However, there is currently no comprehensive study on knowledge, attitude and prevention practices on leishmaniasis among the risk populations in the endemic Mount Elgon region of western Kenya. This has hindered the protocol for understanding the epidemiology of leishmaniasis. The descriptive survey design study was carried out from April to June, 2019 and it sought for information on KAP related to cutaneous leishmaniasis (C.L) in Mount Elgon region. Using stratified simple random sampling technique, a total of 340 household participants were selected in the study area. Structured questionnaire was used to collect the data. Regarding the responses given to knowledge, attitude and practice, a score of 1 was given for each right response and 0 for unsure responses. Data analysis was conducted using IBM SPSS version 23 statistical software. Descriptive statistics that include frequency and percentage were used to analyze the results. Out of 340 individuals were participated in our study 214 (62.9%) of the participants were males and 126 (37.1%) were females. The result of the present study in terms of knowledge showed that most of the respondents scored less than four items out of six correctly, hence described as having poor knowledge of CL. With regard to attitude respondents believed that CL was a problem in their area and had positive attitude towards the treatment of the disease. The

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study also found out that majority of the respondents practiced well, as indicated by scoring positively in more than three items. In terms of plants used in the treatment of the disease, *Olea europaea, Kigelia Africana, Terminial mollis, Croton macrostachyus, Tylosema fassoglense* and *Bridella micrantha* were mentioned. It was concluded that, people were less knowledgeable, had positive attitude towards the treatment especially using plant extracts could act as the basis for future research on alternative drugs against the disease.

Keywords: Cutaneous leishmaniasis; Leishmania aethiopica; knowledge; attitude and practice Mt. Elgon; Kenya.

1. INTRODUCTION

Leishmaniases are major neglected tropical parasitic diseases caused by obligate intracellular protozoan parasites of the genus *Leishmania*. Kenya is one of the endemic areas for leishmaniasis in the world [1]. The major symptom of CL manifest in form of a lesion that appears at the site of sand fly bites. The cutaneous lesions vary in clinical manifestations, severity as well as time of healing. In most of the CL patients, lesions might become chronic resulting in disfiguring of the affected part of body. Cutaneous leishmaniasis (CL) caused by *L. tropica* is endemic only one Nakuru and Laikipia counties where it is transmitted by *P. guggisbergi*. The other form of CL caused by *L. major* is endemic in Baringo county. *Leishmania aethiopica* (Kinetoplastida: Tyrpanosomatidae) has been the only known foci in Kenyan Mt. Elgon slopes at the border of Kenya and Uganda Since 1970 [2-3]. A detailed investigation of the vectors in the old focus of Mt. Elgon has revealed the existence of a cavernicolous anthropophilic species, *Phlebotomus pedifer* (Diptera: Psychodidae) currently known to be the vector of Leshamaniasis [4]. The breeding sites and biology of *Phlebotomus pedifer* was investigated in the caves of the old focus of cutaneous leishmaniasis in Mt Elgon, Bungoma County, Kenya. *Phlebotomus pedifer* were found to rest mainly in the poorly lighted areas of the caves, on the roof, the floor of caves, under the objects, in the cracks and in the crevices inside the caves. The flies also were abundantly found in cracks and crevices outside the caves where hyraxes were found to rest. Immature stages of *P. pedifer* were recovered from wet areas of the floor of the caves [5]. Climate change and unpredictable weather patterns have resulted in shifts in distributions of several species such as that of sand fly [6]. These has seen emergence of sand fly species in areas where there were none in the past [7].

Treatment of leishmaniasis should involve targeting the parasites species or reduce the parasite load in the liver and spleen [8]. In general, the first-line treatment against leishmaniasis for more than 70 years is based on pentavalent antimonial drugs, which boost the immune system to fight the disease [9].These drugs include sodium stibogluconate and meglumine antimoniate. Antimonials are toxic drugs with frequent, sometimes life-threatening, adverse side effects, including cardiac arrhythmia and acute pancreatitis [10]. Conventional amphotericin B has replaced antimonials as the first-line treatment for VL in some areas where treatment failure rates for antimonials reached >60% [11].Indeed, some forms of leishmaniasis (visceral and cutaneous) exhibit resistance against conventional drugs and any other treatments [12-13]. Therefore, the most pressing research needs for leishmaniasis control are the search for alternative and cheaper drugs for oral, parenteral or topical administration in treatment cycles [14].

Vector control can only be effective if the knowledge of the determinants of the disease spread is well understood. Consequently the prevention and of leishmaniasis requires evaluation of the disease related knowledge, attitude and performance among the risk population [15]. As yet, there is limited data on knowledge, attitude and performance in relation to these important aspects in Mount Elgon region in Kenya. Thus this study sought information on KAP related to cutaneous leishmaniasis (C.L) in Mount Elgon region. The information obtained should act as baseline data in the study area for future assessment of the impact of future CL interventions in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

This study was carried out in four sites in Mt. Elgon Region in Kenya (Fig. 1). Mount Elgon region covers areas adjacent the extinct volcano in the border of Kenya and

Uganda, in the north of Kisumu and western part of Kitale. The mountain's highest point, named "Wagagai", is located entirely within Uganda. It has been estimated by geologists that Mount Elgon is at least 24 million years old, making it the oldest extinct volcano in East Africa. It covers about 80 km in diameter, rises 3,070 metres above the surrounding plains. Mt. Elgon consists of five major peaks: Wagagai (4,321 m), in Uganda, Sudek (4,302 m) on the Kenya/Uganda border, Koitobos (4,222 m), a flat-topped basalt column in Kenya, Mubiyi (4,211 m) in Uganda and Masaba (4,161 m) in Uganda. There are notable feature such as: The caldera which is the largest in the world, the warm springs by the Suam River, Endebess Bluff (2,563 m) as well as Ngwarisha, Makingeny, Chepnyalil, and Kitum caves: Kitum Cave is over 60 m wide and penetrates 200 m.

The Mt Elgon traverses Bungoma and Trans Nzoia Counties in Kenya. The areas and its surrounding contain the red laterite soils. The mountain act as catchment for the several rivers such as the Suam River, River Nzoia and Lwakhakha River. River Swam flows to Turkwel downstream and drains into Lake Turkana, while Nzoia and Lwakhakha Rivers flow to Lake Victoria. The town of Kitale is in the foothills of the mountain. The area around the mountain is protected by two Mount Elgon National Parks, one on each side of the international border. The study sites were Cheptobot 1and 2 (0°59'43.32"N and 34°49'8.76"E) villages in Trans-Nzoia county and Chemai (0°50'35.43"N and 34°43'14.32"E) and Kimkung' (0°49'53.01"N and 34°42'59.44"E) villages in Bungoma county are as shown (Fig. 1). Annual mean temperature range from 18°C–21°C. Annual average rainfall: 1300 mm-1800 mm. Altitude range: 1500m to 2000 m above sea level.

2.2 Research Design

This study adopted a descriptive survey design. The design describes the characteristics of the population or phenomenon that is being studied. Descriptive survey design enables the researcher to describe the state of affairs as they are and report the findings [16], such design is an efficient method of collecting descriptive data regarding the characteristics of populations to justify current conditions and practices. Moreover, descriptive surveys allowed rapid collection of data from a large sample within the shortest time possible by use of questionnaires. This design was used to collect data on the KAPs with regard to the prevention and control of CL and its sand fly vector among residents of the four sites.

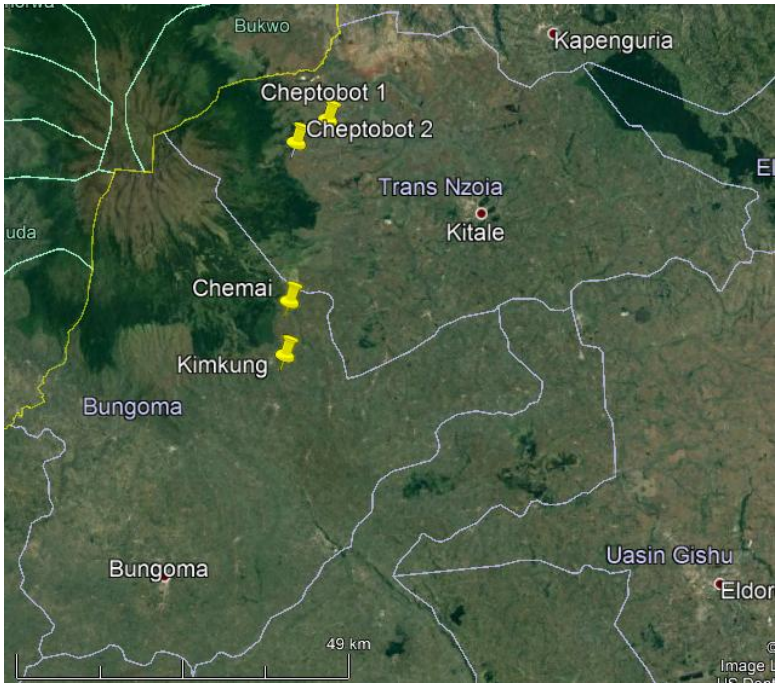

Fig. 1. Map of Bungoma and Trans-Nzoia County showing the position of the sampling sites (Courtesy of Google maps)

2.3 Sample Size and Sampling Techniques

The main factor to consider in determining the sample size is the need to keep it as manageable as possible. This enabled the researcher to derive from it data at an affordable cost in terms of time and finance [17]. The sample size employed for the identification of target population was scientifically computed as follows;

$$nf = \frac{n}{1 + \frac{n}{N}}$$

Where,

nf = Sample size (when the population is less than 10,000).
n = Sample size (when the population is less than 10,000); 384.
N = Estimate of the population size; 2960

Therefore, the sample size of the study for the respondents was calculated as follows

$$nf = \frac{384}{1 + \frac{384}{2960}}$$

= 340

A total of 340 households (Cheptobot1 71, Cheptobot2 73, Chemai 99 and Kimkung' 97) were recruited into the study. Households were selected from each of the four villages by using stratified simple random sampling. The list of households for each village was obtained from the ward administrators and was used as a sampling frame. Simple random sampling method was employed to select households from each village from household registry using a table of random numbers. Household heads of each randomly selected household who lived for at least six months in the study area were included. And where the household head did not consent to take part study, the households before or after the selected one was sampled to replace it.

2.4 Data Collection

The study instrument was an interviewing questionnaire. Structured questionnaires were administered to 340 household heads. The head of each household was interviewed to assess his KAPs related to cutaneous leishmaniasis. It comprised of four parts; Part A related to study subjects socio-demographic background, Part B on knowledge regarding CL, Part C on attitude scale towards CL, and Part D on prevention practices related to CL control. Knowledge was assessed using a 6-item questionnaire including whether they have heard about CL, infectiousness of CL, cause of the disease, sign and symptoms, location of the lesions and outcome if left untreated. Attitude was assessed using a 6-item questionnaire including CL a health problem in the area, treatability of the disease, who should control CL, treatment preference, complete cure of the disease and sand fly breeding habitats. Meanwhile practice had 5 items related to prevention practices against the disease such as prevention of sand fly, treatability of CL, treatment methods, plants used in treatment of CL and work time preference when temperature is high.

2.5 Scoring

With regard to knowledge, each correct response was given a score of 1, while a wrong or unsure response was scored 0. Total knowledge scores ranged between 0 – 6. Knowledge scores from 0 to 4 were regarded as poor knowledge, while knowledge scores more than 4 were considered as good knowledge regarding CL. Attitude towards CL was assessed using a 6-item questionnaire: attitude scores of between 0 and 3 was considered as negative, whereas scores from 3 to 6 were considered as positive. Practice was assessed using a 5-item questionnaire, and a score of more than 2 was rated as good prevention practice for CL control.

Table 1. Sample size and sampling procedures

Households per village	Number	Percentage	Sample size
Cheptobot 1	620	20.9	71
Cheptobot 2	634	21.4	73
Chamai	864	29.2	99
Kimkung'	620	28.5	97
Total	**2960**	**100**	**340**

2.6 Data Management and Analysis

The raw data were coded, sorted, summarized and statistical operations were carried out using International Business Machines Statistical Package for Social Science Version 23. Descriptive statistics such as frequency and percentage were used to assess the level of community member's knowledge, attitudes and prevention practices with regard to the disease.

3. RESULTS

3.1 Socio-demographic Characteristics of Study Subjects

A total of 340 individuals were involved in this study, 214 (62.9%) of the respondents were males and 126 (37.1%) were females. The mean age of participants was 38 year. More than half of the participants (194, 57.1%) were married, majority (172, 50.6%) had secondary education, hence were able to read and write. Most of them (142, 41.8%) were self employed and protestant Christianity was the dominant religion 282 (81.5%) in the area. Regarding the year of residency, the majority 312 (90.2%) lived in the area since more than 3 years (Table 2).

3.2 Knowledge on Cutaneous Leishmaniasis among Study Subjects

Among the total participants, 114 (33.5%) had heard of the disease, 112 (32.9%) knew that the disease is infectious, and 38 out 112 (33.9%) responded that the main way of transmission was by flies. The majority of the respondents (226, 66.5%) knew that if the disease is left untreated will to disfiguring. Majority (173, 50.9%) said that the main sign and symptom of

Table 2. Socio demographic characteristics of study participants in Mt. Elgon region

Characteristic	N	Percentage
Age(years)		
15-30	86	25.3
31-45	152	44.7
Above 45	102	30.0
Sex of household head		
Male	214	62.9
Female	126	37.1
Marital status		
Married	194	57.1
Single	76	22.4
Widowed	40	11.8
Divorced	30	8.8
Education level		
Primary or less	105	30.9
Secondary	172	50.6
Tertiary	63	18.5
Occupation		
Salaried	78	22.9
Self employed	142	41.8
Casual	62	18.2
Unemployed	58	17.1
Years of residence		
< 1 years	104	30.6
1-2 years	138	40.6
>2 years	98	28.8
Religion		
Catholic	88	25.9
Protestant	131	38.5
Muslim	54	15.9
Others	67	19.7
Total	**340**	**100**

the disease was development of lesions. With regard to location of the lesions on the body, majority (141, 41.5%) gave more than one location. From the 214 male participants who heard about Cutaneous leishmaniasis, 98 (47.8%) were knowledgeable; on the other hand, from the 126 female participants who heard about the disease, 107 (52.2.7%) were knowledgeable. Generally, according to scoring results, 205 (89.4%) participants were knowledgeable (Table 3).

3.3 Attitude towards CL among Participants in Mt. Elgon Region

From the total of 340 respondents who heard about the disease, the majority (182, 53.5%) indicted that cutaneous leishmaniasis was a health problem in the study area. In terms of disease treatability, majority (191, 56%) indicated that it is treatable. A half of respondents (170, 50%) believed that the community should control the disease. Regarding their treatment preference the majority (241, 70.9%) preferred to be treated by traditional healers. More than half (239, 70.3%) of respondents believed that a complete cure from the disease is possible. More than half of the respondents (127, 37.4%) believed that caves are major sand fly breeding habitats. Overall, 178(87.1%) of respondents have favorable attitude towards the disease management (Table 4).

3.4 Practice of Respondents towards CL Prevention and Control in Mt. Elgon Region

From the total 340 who heard about the disease, 82 (24.1%) indicted that in order to prevent the disease, people should not enter into the caves. The majority (312, 91.8%) said that the disease is treatable. In terms of treatment methods, 296(94.9%) preferred plant extracts. Regarding work time preference when the temperate is high, majority 194 (57.1%) preferred day time. More than half of respondents (197, 57.9%) were practiced properly for the prevention and control of leishmaniasis (Table 5).

Table 3. Knowledge on VL among study participants in Mt. Elgon region

Variables			Frequency	Percentage (%)
Heard about CL n = 340	Yes		114	33.5
	No		226	66.5
Infectiousness of CL n = 340	Yes		112	32.9
	No		84	24.7
	I don't know		144	42.4
Cause of the Disease n = 112	Malaria mosquito		6	5.4
	Rodents		17	15.2
	Witchcraft		22	19.6
	Flies		38	33.9
	Sand fly bite		21	18.8
	Others		8	7.1
Sign and symptoms n = 340	Fever		16	4.7
	Pruritis		34	10.0
	Lesion/scar		173	50.9
	Emaciation		51	15.0
	Swellings		46	13.5
	I don't know		20	5.9
Location of the lesions n = 340	Face		103	30.3
	Forearm		96	28.2
	Mixed		141	41.5
Outcome if left untreated n = 340	Disfiguring		226	66.5
	Self cure		33	9.7
	Don't know		81	23.8
Knowledge on CL (overall)	Knowledgeable	Male	98	47.8
		Female	107	52.2
	Total		**205**	**89.4**
	Not Knowledgeable	Male	116	85.9
		Female	19	14.1
	Total		**135**	**10.6**

Table 4. Attitude towards CL among study participants in Mt. Elgon region

Variables		Frequency	Percentage (%)
CL a health problem in the area n = 340	Yes	182	53.5
	No	117	34.4
	I don't know	41	12.1
Treatability of the disease n = 340	Yes	191	56.2
	No	112	32.9
	I don't know	37	10.9
Who should control CL n = 340	Community	170	50.0
	Health authorities	127	37.4
	I don't know	43	12.6
Treatment preference n = 340	Traditional healer	241	70.9
	Health center	67	19.7
	Holy water	32	9.4
Complete cure of the disease n = 340	Yes	239	70.3
	No	56	16.5
	I don't know	45	13.2
Sand fly breeding habitats n = 340	Water	26	7.6
	Vegetation	72	21.2
	Houses	49	14.4
	Caves	127	37.4
	I don't know	14	4.1
	Mixed answers	52	15.3
Attitude (overall)	Positive attitude	178	52.4%
	Negative attitude	162	47.6%

Table 5. Practice of respondents towards CL prevention and control in Mt. Elgon region

Variables		Frequency	Percentage (%)
Prevention of sand fly n = 340	Bed net	68	20.0
	Insecticides	43	12.7
	Cleanliness	51	15.0
	Isolation of patients	75	22.1
	Not entering the caves	82	24.1
	I don't know	10	2.9
	More than one answer	11	3.2
Treatability of CL n = 340	Yes	312	91.8
	No	28	8.2
Treatment methods n = 312	Conventional drugs	16	5.1
	Plant extracts	296	94.9
Plants used in Treatment of CL n = 296	One	175	59.1
	More than one	121	40.9
Work time Preference when temperature is high n = 340	Day time	194	57.1
	night time	76	22.4
	Both	70	20.5
Practice (overall)	Good practiced	197	57.9%
	Not Good practice	143	42.1%

4. DISCUSSION

Leishmania aethiopica is the causative organism of cutaneous leishmaniasis in this focus [18]. This represents a newly identified focus of cutaneous leishmaniasis due to *L. aethiopica.* Community participation is a key factor in the prevention and control of diseases. Every individual disease requires specific knowledge, attitude, prevention and treatment practices by

the population at risk. Thus this study sought information on KAP related to cutaneous leishmaniasis (C.L) in the new Mount Elgon focus.

The result of the present study in terms of knowledge showed that most of the respondents scored less than four items out of six correctly, hence described as having poor knowledge of CL. Many of the respondents (82%) knew that it is caused by flies indicating that they do not know the actual vector responsible for the disease transmission. This finding is consistent with another study conducted in Iran [19]. This implies that there is need for proper health education in order for the community members to participate fully in protecting themselves from the disease. How this result is lower than that from a study conducted Pokot community in Uganda, where 95% participants had knowledge of the disease [20]. The variability between studies might be due to a lack of community health education, community awareness, socioeconomic status of the different areas, and the fact that cutaneous leishmaniasis is a recently established disease in the Mt. Elgon region. With regard to cutaneous leishmaniasis being an infectious disease the respondents had poor knowledge because the disease is new in the study area. However in terms of the sign and symptoms of the disease they respondent positively. This is similar to a study conducted in rural areas of Bihar state India (16.1%) [21]. More than half of the respondents (62%) in the study knew at least more than one sign and symptoms of the disease. The majority of the participants (96.7%) knew that if the disease is left untreated the outcome will lead to disfiguring of the affected body parts, and a few of the respondents indicated that the outcome will be self cure.

In regard to attitude, most of the respondents scored above four out of six questions asked on attitude. This implies that the respondents have a positive attitude toward the disease. This finding is very important because a positive attitude means that the community members would participate actively in future prevention and control programs against CL in the area. The majority of the respondents were aware that the disease can be treated using herbal remedies. The majority of the respondents believed that a complete cure of the disease is possible. This might be due to different reasons like community awareness, and the use of plant extracts for treatment. Approximately 80% of the respondents believed that kala-azar could be controlled through community participation, whereas 7.6% of the respondents didn't believe. Only few of the respondents (3.6%) preferred to seek treatment from Holy Water, whereas of the respondents preferred to seek for treatment from traditional healers. This result is inconsistent with the study conducted in a highly endemic rural area of India [22].

In terms of prevention practices, the present study it was found that majority of the respondents practiced well, as indicated by scoring positively in more than three items out of five. For the prevention of sand fly bites, most of the respondents suggested that people should avoid entering the caves because they are breeding habitats for sand flies. In terms of plants used in the treatment of the disease, *Olea europaea, Kigelia Africana, Terminial mollis, Croton macrostachyus, Tylosema fassoglense* and *Bridella micrantha* were mentioned. This finding may form a basis of herbal treatments upon evaluation for efficacy and safety, since the conventional antileishmanial drugs are expensive, requiring inpatient treatment, toxic [10] and exhibit parasite resistance [12-13]. Most of the respondents preferred to work during the day even with high temperatures. This might be due to socioeconomic status of the population, low electrical light supply, and people's tradition to work at day time [23].Therefore in order to prevent the spreading of disease to non-endemic areas away from Mt. Elgon foci, the results of this study provided baseline information for future behavior change intervention strategies.

5. CONCLUSION

The findings showed that people knowledgeable about the disease and its vector was low, but had considerable knowledge about sign and symptoms. In terms of disease control, the people's attitude towards complete cure of the disease, treatability of the disease and control of the disease through community participation were favorable. Even though the people's knowledge about the disease was good, their overall practice about prevention and control of the insect vector (sandflies) indicates that there is still a gap in implementation of their knowledge.

CONSENT AND ETHICAL APPROVAL

This community-based study was carried out in accordance with ethical guidelines of Maseno

University. Written informed consent was also sought from the respondents after discussing the purpose and method of the study.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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