

Research Article	Pak-Euro Journal of Medical and Life Sciences
DOI: 10.31580/pjmls.v8i1.3173	Copyright © 2025 All rights are reserved by Corresponding Author
Vol 8 No. 1, 2025: pp. 119-126	
www.readersinsight.net/pjmls	Revised: March 10, 2025 Accepted: March 13, 2025
Submission: January 11, 2025	Published Online: March 31, 2025

A STUDY ON KNOWLEDGE, ATTITUDE AND PRACTICES TOWARDS CUTANEOUS LEISHMANIASIS AMONG URBAN ENDEMIC COMMUNITIES

Shubana Kausar^{1*}, Maahdana Riaz², Shahzaib Riaz Baloch³, Riaz Ahmad Baloch⁴

¹Assistant Controller, Bolan University of Medical and Health Sciences, Quetta, Pakistan

²Department of Pharmacy, University of Balochistan, Quetta, Pakistan

³Department of Orthopaedics and Traumatology, School of Clinical Medicine, Hong Kong University, Hong Kong

⁴Faculty of Allied Health Sciences, Bolan University of Medical and Health Sciences, Quetta, Pakistan

***Corresponding Author:** Shubana Kausar. E. mails: missbana7@gmail.com



Abstract

Background: Cutaneous Leishmaniasis (CL) is a tropical disease caused by a parasite from the bite of infected sandflies. It is a major health issue in Pakistan, especially in the Quetta region of Balochistan. Understanding and involving the community is crucial for preventing and controlling this disease. This study aimed to assess what people in Quetta know, believe, and do about CL to find out where more information is needed and help create effective intervention plans.

Methodology: From July to September 2023, we conducted a survey with 100 participants from three MSF CL treatment centers: Bolan Medical Complex, Benazir Bhutto Hospital, and Kuchlak Health Center. We used a structured questionnaire to gather data, scoring answers as 1 for correct and 0 for incorrect or unsure. We analyzed the data using SPSS version 29.0.

Results: The participants were 71% male and 29% female, aged between 11 and 65 years. Most (89%) knew the local name for CL, but only 59% knew sandflies spread the disease, and just 7% knew these insects bite between dusk and dawn. While 80% understood that CL is a public health issue and 88% recognized the social stigma attached to it, more than half (53%) mistakenly thought it could spread from person to person. Preventive actions were lacking—89% used untreated bed nets, and 61% didn't use repellents. On a positive note, 94% preferred modern medical treatment over traditional methods.

Conclusion: The study highlights significant gaps in knowledge and prevention practices about CL among Quetta's residents. There is an urgent need for health education campaigns and localized interventions to increase awareness and reduce disease spread in cities where it is common.

Keywords: Attitudes, Cutaneous Leishmaniasis, Knowledge, Practices, Quetta

INTRODUCTION

Cutaneous Leishmaniasis (CL) is a neglected tropical disease (NTD) caused by protozoan parasites of the Leishmania genus and transmitted through the bite of infected female sandflies. It remains a pressing public health issue in many low- and middle-income countries, where factors such as poverty, limited healthcare infrastructure, and poor sanitation contribute to its persistence and spread (1). The World Health Organization (WHO) estimates 600,000 to 1 million new CL cases annually, with approximately 90% of these occurring in just eight countries—Afghanistan, Algeria, Brazil, Colombia, Iran, Pakistan, Peru, and Syria (1). CL, the most prevalent form of leishmaniasis, is characterized by ulcerative skin lesions that often result in disfigurement, lifelong scarring, and social stigma (2).

In Pakistan, CL is endemic in multiple provinces, including Balochistan, Sindh, and Khyber Pakhtunkhwa, and is the second most common vector-borne disease after malaria (3). Quetta, the provincial capital of Balochistan, is among the most affected regions. The city's arid climate, inadequate sanitation,



poverty, and overcrowded living conditions foster ideal breeding grounds for sandflies — the vectors of the *Leishmania* parasite (4,5). The dominant causative species in Quetta is *L. tropica*, known for its human-to-human transmission, which is increasingly observed in dense urban areas with under-resourced healthcare systems (6). The influx of displaced populations from Afghanistan further intensifies transmission dynamics (7).

Despite the efforts of humanitarian organizations such as Médecins Sans Frontières (MSF), which provides free treatment through clinics in Quetta and Kuchlak (8), underdiagnosis, misidentification, and public unawareness remain prevalent (9-11). Risk factors such as malnutrition, poor hygiene, poverty, and immunocompromised conditions are widespread (12).

Although areas like Uthal and Ormara also report CL cases, Quetta consistently sees the highest disease burden (14). Factors including climatic shifts, movement of infected individuals, animal reservoirs, and sandfly vectors contribute to its endemicity (15). However, there is a noticeable lack of KAP studies focusing on CL in this high-burden region (13, 16). This study aims to assess the knowledge, attitudes, and practices regarding CL among patients attending MSF clinics in Quetta and nearby areas to inform future public health strategies.

MATERIALS AND METHODS

STUDY DESIGN

This was a community-based, descriptive cross-sectional study designed to assess the Knowledge, Attitude, and Practices (KAP) regarding Cutaneous Leishmaniasis (CL) among residents of Quetta and surrounding endemic districts. The study was conducted at three Médecins Sans Frontières (MSF) treatment centers that provide primary healthcare services to CL patients in Quetta district.

STUDY AREA AND POPULATION

The study took place in Quetta, the capital of Balochistan province, Pakistan's tenth most populous city with over 1.1 million residents. Quetta is divided administratively into two tehsils (Quetta City and Quetta Saddar) and one sub-tehsil (Panjpai), comprising 67 union councils. Located near the Pakistan-Afghanistan border, the city houses a diverse demographic, including approximately 500,000 undocumented Afghan refugees. The region is characterized by a cold semi-arid climate and socio-environmental factors conducive to sandfly proliferation and CL transmission.

STUDY SETTING AND DURATION

Data were collected from the outpatient departments (OPDs) of three MSF-supported CL treatment centers: Bolan Medical Complex, Benazir Bhutto Hospital, and Kuchlak Rural Health Center. These facilities serve both urban and rural populations from across the Quetta division. The study was conducted over a period of three months, from July to September 2023.

SOURCE POPULATION AND SAMPLING TECHNIQUE

The source population included patients and their attendants (parents, relatives, caregivers) visiting MSF treatment centers for skin lesions, particularly those suspected or confirmed as CL. Each center receives 200–300 daily patients, with 30–50 cases confirmed as CL. Participants were selected through convenience sampling due to time and logistical constraints. While this method facilitated quick data collection, the limitations related to potential selection bias and generalizability are acknowledged.

SAMPLE SIZE SELECTION CRITERIA

The sample size was determined using the Raosoft sample size calculator based on the following formula:

$$n = Z^2 \cdot P \cdot (1-P) / d^2$$

Where:

- $Z = 1.96$ (95% confidence level)
- $P = 0.50$ (assumed prevalence in the absence of prior data)

- $d = 9.08\%$ margin of error

A minimum of 100 participants was deemed sufficient. Equal numbers were recruited from each of the three MSF centers to ensure geographic representation.

The inclusion criteria for the study consisted of individuals aged 11 to 65 years with suspected or confirmed cases of cutaneous leishmaniasis (CL) who were willing to participate and able to provide verbal informed consent. The exclusion criteria included individuals above 65 years of age, those with psychosocial or mental disabilities, patients with skin infections unrelated to CL, and individuals who were unwilling or unable to respond to the questionnaire.

STUDY VARIABLES

The study's dependent variables included participants' knowledge about cutaneous leishmaniasis (CL) as a neglected tropical disease, their attitude toward CL as a public health concern, and their practices related to its prevention and treatment. Independent variables comprised sociodemographic factors such as age, gender, marital status, education level, and occupation, along with access to health education programs and the availability of preventive resources like insecticide-treated bed nets.

DATA COLLECTION AND ANALYSIS

A structured questionnaire comprising 15 close-ended questions was developed and translated from English to Urdu. It included four sections: Sociodemographic data (5 questions), Knowledge (5 questions), Attitudes (5 questions) and D: Practices (5 questions). The local terms "Saldana/Kaldana" were used during interviews to refer to CL.

Trained interviewers conducted face-to-face interviews in private areas of the OPDs. Verbal informed consent was obtained from all participants or guardians (for those <18 years). Each interview lasted approximately 15–20 minutes.

- Knowledge, Attitude, and Practice questions were each scored out of 5.
- Scores ≥ 3 were considered "good/favorable/optimal," while < 3 indicated "poor/unfavorable/suboptimal."

STATISTICAL ANALYSIS

Descriptive statistics (frequencies, percentages, means, SDs) were generated. Chi-square tests were used to assess associations between sociodemographic variables and KAP levels using SPSS version 29.0.

ETHICAL CONSIDERATIONS

Ethical approval was obtained from the MSF and participating hospitals. Verbal informed consent was secured from all participants, and confidentiality was strictly maintained. For participants under 18 years, consent was obtained from their parents or guardians.

Participants were informed that the survey was anonymous and part of an undergraduate thesis project at Alhamd University, Quetta. No identifying information was collected, and results were shared only with study supervisors and relevant health authorities for community mobilization planning.

RESULTS

SOCIODEMOGRAPHIC CHARACTERISTICS OF RESPONDENTS

A total of 102 participants were initially approached for this study at three MSF Cutaneous Leishmaniasis (CL) treatment centers: Bolan Medical Complex, Benazir Bhutto Hospital, and Kuchlak Health Center. Of these, 100 participants (98%) completed the survey. All participants were either undergoing treatment for CL or accompanying someone receiving treatment.

Among the respondents, 71% ($n=71$) were male, and 29% ($n=29$) were female. The majority of participants (72%) were under 40 years of age, with the age range spanning from 11 to 65 years. Regarding educational status, 57% ($n=57$) had attained only primary education, while 43% ($n=43$) were uneducated. In terms of occupation, 34% ($n=34$) were laborers, 22% ($n=22$) were students, 20% ($n=20$) were housewives, 14%

(n=14) were unemployed, 6% (n=6) were government employees, and 4% (n=4) were teenage girls. Concerning marital status, 59% (n=59) were married and 41% (n=41) were unmarried (Table I).

Table I. Distribution of socio-demographic characteristics of study participants Quetta

Variables	Response	Frequency	Percentage
Age	<40 years	72	80%
	>40 years	28	20%
Gender	Male	71	71%
	Female	29	29%
Marital status	Married	59	59%
	Unmarried	41	41%
	Widowed	0	0%
	Divorced	0	0%
	Other	0	0%
Qualification	Non-educated	43	43%
	Primary	57	57%
	Secondary	0	0%
	Bachelor	0	0%
Occupation	Student	22	22%
	Business	0	0%
	Employee	6	6%
	Unemployed	14	14%
	Labor	34	34%
	Farmer	0	0%
	Housewife	20	20%
	Girl	4	4%

KNOWLEDGE ABOUT CUTANEOUS LEISHMANIASIS

A significant portion of the participants (89%) reported having heard about CL, locally known as "Kaldana" or "Saldana," referring to a prolonged skin disease. When asked about symptoms, 81% correctly identified the hallmark lesion or ulcer associated with CL, while 19% were unable to recognize the main symptoms.

Regarding transmission, 59% of respondents correctly identified the sandfly (locally referred to as "Reggie Much" or "Makhi") as the vector responsible for transmitting CL. However, 41% believed mosquitoes or germs were the cause. As for seasonal prevalence, 58% stated that CL cases were more common in summer, while 42% believed the incidence was higher during winter.

Knowledge about the sandfly's active biting time was particularly poor. While 9% correctly identified the period from dusk to dawn as the biting time, 91% believed the bites occurred during the day, midnight, or at any time. Based on a scoring system (range 0–5), only 38 participants (37.2%) demonstrated "good knowledge" (scoring ≥ 3), while 62.8% (n=64) had "poor knowledge" (scoring < 3) (Table II).

Table II. Knowledge of participants about cutaneous leishmaniasis as a disease

Variables	Response	Frequency	Percentage
Do you know about cutaneous	Yes	89	89%
Leishmaniasis is a skin disease?	No	11	11%
Do you know signs and symptoms of	Yes	81	81%
cutaneous Leishmaniasis?	No	19	19%
Do you know causative agent of	Yes	57	57%
Cutaneous Leishmaniasis?	No	43	43%
Do you know peak season in which CL	Yes	59	59%
Sand-Flies remain active?	No	41	41%
Do you know the biting time of Sand-	Yes	7	7%
flies?	No	93	93%

ATTITUDES TOWARD CUTANEOUS LEISHMANIASIS

The majority of participants (80%) acknowledged CL as a major public health problem in Quetta and neighboring areas. Additionally, 63% believed that untreated CL could result in permanent disfigurement or even death. In contrast, 37% did not perceive the disease as dangerous. Social stigma associated with CL was widely recognized: 88% of respondents agreed that the disease causes social discomfort due to its disfiguring effects, and 79% expressed feeling hesitant or uncomfortable interacting socially due to visible lesions. When asked about the potential for household transmission, 47% believed that living with an infected person posed a risk, while 53% disagreed (Table III).

Table III. Attitude of the participants towards cutaneous leishmaniasis Quetta

Variables	Response	Frequency	Percentage
Is CL being current health problem in your area?	Yes	80	80%
	No	20	20%
Do you think Cutaneous Leishmaniasis can be fatal if not treated?	Yes	63	63%
	No	37	37%
Is Cutaneous Leishmaniasis a stigmatize disease?	Yes	88	88%
	No	12	12%
Do you feel bad while meeting other people in the community?	Yes	79	79%
	No	21	21%
Do you think risk of infection of getting the Cutaneous Leishmaniasis increase while living with infected person?	Yes	47	47%
	No	53	53%

PRACTICES RELATED TO CL PREVENTION AND TREATMENT

In terms of treatment preference, 94% of respondents sought modern medical care for CL, while 6% relied on traditional healers. Most participants (76%) reported the absence of any community-level CL control measures implemented by public health authorities. Preventive practices were found to be suboptimal. While 89% reported using bed nets, these were not insecticide-treated. Furthermore, 61% did not use any form of topical repellents. Indoor residual spraying was practiced by 76% of respondents, whereas 24% were unaware of this preventive method (Table IV).

Table IV. Practices of the participants toward cutaneous leishmaniasis

Variables	Response	Frequency	Percentage
Which treatment a patient should receive for cutaneous leishmaniasis?	Medical	94	80%
	Herbal	6	20%
Is there any community base safety intervention from public health department of Quetta Balochistan?	Yes	76	76%
	No	24	24%
Do you use impregnated bed nets?	Yes	89	89%
	No	11	11%
Do you use topical repellent on yourself?	Yes	39	39%
	No	61	61%
Do you spray chemical insecticide on your household?	Yes	76	76%
	No	24	24%

STATISTICAL ANALYSIS AND KEY FINDINGS

Statistical analysis using SPSS version 29.0 revealed that younger participants (<40 years) and those with at least primary education demonstrated better knowledge about CL. However, gender did not show any significant association with knowledge levels.

Educational status and occupation significantly influenced attitudes toward CL. Government employees and educated individuals exhibited greater awareness of CL as a health concern. Participants who perceived CL as a stigmatized disease were more likely to practice preventive behaviors, such as using repellents and promoting indoor spraying.

These findings highlight critical gaps in public awareness and underscore the urgent need for targeted health education interventions to improve knowledge and preventive practices in CL-endemic communities.

DISCUSSION

The current study investigated the knowledge, attitudes, and practices (KAP) of the public in Quetta and surrounding endemic areas regarding cutaneous leishmaniasis (CL), a serious and neglected public health problem in the region. The findings reveal that while the community is generally familiar with CL, significant gaps in knowledge and preventive practices persist, highlighting the need for targeted public health interventions.

The study found that CL is widely recognized by the local population, with 89% of participants aware of the disease, often referred to by its local names, "Saldana" or "Kaldana," meaning a lasting wound that leaves scars and causes social stigma. This high level of awareness is consistent with findings from other endemic regions, such as Ethiopia's Walta zone, where CL is also well-known due to its high prevalence and visible impact on affected individuals (17). The familiarity with CL in Quetta is likely a direct consequence of its endemicity, as many participants reported having family members or neighbors affected by the disease.

Most participants were able to identify the primary symptoms of CL, such as skin lesions, which align with findings from Ghana, where 82% of respondents in an endemic area recognized skin lesions as the main symptom (18). However, the study also revealed critical gaps in knowledge, particularly regarding the transmission and prevention of CL. While 57% of participants correctly identified sandflies (locally known as "Reggie Much" or "Makhi") as the vector, a significant proportion (42%) were unaware of the peak season for sandfly activity, and 91% did not know the specific time (dawn to dusk) when sandflies are most active. This lack of specific knowledge about transmission dynamics and preventive measures underscores the need for targeted health education campaigns (19).

Comparatively, studies from Nepal, Brazil, and Iran have reported higher levels of knowledge about CL transmission and prevention, which may be attributed to differences in sociocultural factors and the effectiveness of public health interventions in those regions (20–22). In contrast, the low level of knowledge in Quetta reflects the lack of prioritization and resource allocation for CL control by local public health authorities. This knowledge gap is particularly concerning given the high endemicity of CL in the region and its potential to cause outbreaks if left unaddressed.

The study revealed generally positive attitudes toward CL, with 80% of participants acknowledging it as a serious public health problem. This finding is consistent with studies from Ethiopia, where CL is also perceived as a significant health concern due to its disfiguring and stigmatizing effects (23, 24). A majority of participants (88%) recognized the mental health impact of CL, including social stigma and psychological distress, particularly among young, unmarried individuals. This awareness highlights CL's profound social and emotional burden, which extends beyond physical health to affect individuals' quality of life and social interactions.

Despite this awareness, the study identified a concerning trend: while participants recognized the severity of CL, their knowledge of preventive measures was inadequate. For example, many respondents were unaware of the importance of using impregnated bed nets or the risks associated with living close to infected individuals. This disconnect between awareness and actionable knowledge underscores the need for comprehensive health education programs that not only inform communities about the risks of CL but also empower them with practical strategies for prevention.

The study revealed significant gaps in preventive practices, with most participants lacking knowledge about effective measures to protect themselves from CL. For instance, the use of impregnated bed nets, a proven method for reducing sandfly bites, was virtually unknown among respondents. This finding is particularly alarming given the high prevalence of CL in Quetta and the availability of free treatment at MSF clinics. The lack of awareness about preventive measures suggests that current public health efforts are insufficient to address the root causes of CL transmission.

The study also highlighted the role of socioeconomic factors in shaping preventive practices. Poverty, overcrowding, and limited access to healthcare services were identified as key barriers to effective CL control. These findings are consistent with global evidence showing that neglected tropical diseases (NTDs) like CL disproportionately affect marginalized populations with limited access to education and healthcare (25). Addressing these structural barriers will require a multisectoral approach that integrates CL control with broader efforts to improve living conditions and healthcare access in endemic areas.

The findings of this study have important implications for CL control and prevention in Quetta and similar endemic regions. First, the high level of awareness about CL symptoms and their social impact provides a strong foundation for health education campaigns. However, these campaigns must go beyond raising awareness to address specific knowledge gaps, such as the timing of sandfly activity and the use of preventive measures like impregnated bed nets.

Second, the study highlights the need for community-based interventions that engage local stakeholders, including healthcare providers, community leaders, and educators. Such interventions could include door-to-door education campaigns, school-based programs, and community mobilization efforts to promote preventive practices and reduce stigma associated with CL.

Finally, the study underscores the importance of integrating CL control into broader public health initiatives. Given the overlap between CL and other vector-borne diseases, such as malaria, there is an opportunity to leverage existing infrastructure and resources for CL prevention. For example, insecticide spraying programs and bed net distribution campaigns could be expanded to include CL-specific interventions.

CONCLUSION

The study reveals considerable gaps in community knowledge and preventive behaviors concerning CL in Quetta. There is a pressing need for targeted health education campaigns and locally tailored interventions to raise awareness and curb disease transmission in endemic urban areas.

Recommendations:

The changing environmental and climatic conditions may expand the geographic range of sandfly vectors, potentially increasing the risk of CL transmission. Effective control of sandflies requires reducing breeding habitats and increasing public awareness through preventive education. It is essential to enhance public knowledge by initiating health education and community mobilization programs in endemic areas. These programs should focus on educating people about sandfly breeding habitats, biting times, peak seasons, and preventive measures to reduce human-vector contact and prevent cross-transmission, as this study highlighted a lack of awareness regarding these key aspects.

Study limitations:

While this study provides valuable insights into the KAP of CL in Quetta, it has several limitations that should be acknowledged. First, the use of convenience sampling may have introduced selection bias, as participants were recruited from MSF clinics and may not be representative of the broader population. Second, the small sample size ($n = 100$) limits the generalizability of the findings. Third, the reliance on self-reported data may have introduced recall bias or social desirability bias, particularly regarding sensitive topics like stigma and mental health.

Conflict of interest:

There is no conflict of interest among authors regarding this review article.

Authors' contribution:

SK Conceptualized and performed research work; MR Literature review and methodology; SRB Analyzed data; RAB wrote the manuscript and Statistical analysis.

References:

1. Control of Neglected Tropical Diseases. World Health Organization. Geneva: WHO; 2020. 2.
2. Burza S, Croft SL, Boelaert M. Leishmaniasis. *Lancet*. 2018;392(10151):951–70.
3. Ergonul O, Tulek N, Kayı I, Irmak H, Erdem O, Dara M. Profiling infectious diseases in Turkey after the influx of 3.5 million Syrian refugees. *Clin Microbiol Infect*. 2020;26(3):307–12.
4. Ozaras R, Leblebicioglu H, Sunbul M, Tabak F, Balkan II, Yemisen M. The Syrian conflict and infectious diseases. *Expert Rev Anti Infect Ther*. 2016;14(6):547–55.
5. McGwire BS, Satoskar AR. Leishmaniasis: clinical syndromes and treatment. *QJM Mon J Assoc Physicians*. 2014;107(1):7–14.
6. Ashford RW, Bray MA, Hutchinson MP, Bray RS. The epidemiology of cutaneous leishmaniasis in Ethiopia. *Trans R Soc Trop Med Hyg*. 1973;67(4):568–601
7. Alemayehu B, Alemayehu M. Leishmaniasis: A Review on Parasite, Vector and Reservoir Host. *Health Sci J*. 2017;11(4).
8. Munir MA, Rab MA, Iqbal J, Ghafoor A, Khan MA, Burney MI. A Review of the Status of Leishmaniasis in Pakistan from 1960–1986. In: Hart DT, editor. *Leishmaniasis: the current status and new strategies for control*. Boston: Springer US; 1989:47–56.
9. Durrani AZ, Durrani HZ, Kamal N, Mehmood N. Prevalence of cutaneous leishmaniasis in humans and dogs in Pakistan. *Pak J Zool*. 2011;43(2):263–71.
10. Khan SJ, Muneeb S. Cutaneous leishmaniasis in Pakistan. *Dermatol Online J*. 2005;11(1):4.
11. Hussain M, Munir S, Khan TA, Khan A, Ayaz S, Jamal MA, et al. Epidemiology of cutaneous leishmaniasis outbreak, Waziristan, Pakistan. *Emerg Infect Dis*. 2018;24(1):159–61. 12. Shakila A, Bilqees FM, Salim A, Moinuddin M. Geographical distribution of cutaneous leishmaniasis and sand flies in Pakistan. *Turkiye Parazitol Derg*. 2006;30(1):1–6.
13. Asmatullah K, Bilqees FM, Kakar JK. *Rhabdochona kharani* sp. n. (Nematoda: Rhabdochonidae) from the fish *Labeo gedrosicus* Zugmayer, 1912 from Garruk, District Kharan, Baluchistan, Pakistan. *Turkiye Parazitol Derg*. 2006;30(1):62–7. Erratum in: *Turkiye Parazitol Derg*. 2006;30(2):167, 169. PMID: 17106860.
14. Kassi M, Kassi M, Afghan AK, Rehman R, Kasi PM. Marring leishmaniasis: the stigmatization and the impact of cutaneous leishmaniasis in Pakistan and Afghanistan. *PLoS Negl Trop Dis*. 2008;2(10):e259 .
15. Government Organization – Government of Baluchistan. [Balochistan.gov.pk](http://www.balochistan.gov.pk). Available from: <http://www.balochistan.gov.pk>. Accessed 6 Sep 2016.
16. Mongabay - Environmental Science and Conservation News. Archived from the original on 4 Mar 2016.
17. Winter destinations – Mesmerizing places in Pakistan. *Bol News*. 2020.
18. Alemayehu B, Kelbore AG, Alemayehu M, Adugna C, Bibo T, Megaze A. Knowledge, attitude, and practice of the rural community about cutaneous leishmaniasis in Wolaita zone, southern Ethiopia. *PLoS ONE*. 2023;18(3):e0283582 .
19. Doe ED, Egyier-Yawson A, Kwakye-Nuako G. Knowledge, attitude and practices related to cutaneous leishmaniasis in endemic communities in the Volta region of Ghana. *Int J Healthcare Sci*. 2019;7:33–43.
20. Abuzaid AA, Abdoon AM, Aldahan MA, Alzahrani AG, Alhakeem RF, Asiri AM. Cutaneous leishmaniasis in Saudi Arabia: a comprehensive overview. *Vector Borne Zoonotic Dis*. 2017;17(10):673–84.
21. Saleh F, Khan MF, Kabir MR. Awareness of residents about kala-azar and its related practices in two endemic areas of Bangladesh. *PLoS ONE*. 2019;14:e0219591 .
22. Koirala S, Parija SC, Karki P, Das ML. Knowledge, attitudes, and practices about kala-azar and its sand-fly vector in rural communities of Nepal. *Bull World Health Organ*. 1998;76(5):485–90.
23. Sarkari B, Qasem A, Shafaf MR. Knowledge, attitude, and practices related to cutaneous leishmaniasis in an endemic focus of cutaneous leishmaniasis, southern Iran. *Asian Pac J Trop Biomed*. 2014;4(7):566–9.
24. Alemu A, Alemu A, Esmael N, Dessie Y, Hamdu K, Mathewos B. Knowledge, attitude and practices related to visceral leishmaniasis among residents in Addis Zemen town, South Gondar, Northwest Ethiopia. *BMC Public Health*. 2013;13:382.
25. Govil D, Sahoo H, Pedgaonkar SP, Das KC, Lhungdim H. Assessing knowledge, attitudes, and preventive practices related to kala-azar: a study of rural Madhepura, Bihar, India. *Am J Trop Med Hyg*. 2018;98:857–63.