



Knowledge, Attitude, and Preventive Practice of People about Cutaneous Leishmaniasis in an Endemic Region, Northeastern Iran

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Abstract

Background: Knowing the level of awareness, attitude, and performance of people is an important step in leishmaniasis prevention. This study aimed to investigate the knowledge, attitude, and practice of people in Damghan district about cutaneous leishmaniasis in 2018-2020.

Methods: In this cross-sectional descriptive study, for 500 people living in urban and rural areas, a semi-structured researcher-made questionnaire approved for content validity and reliability was randomly completed by a trained questionnaire and information was recorded and analyzed using SPSS21 software.

Results: The mean age of the subjects was 37.7, and 52.6% of them were in the age group of 20-40 years. 55% of people had poor knowledge, and 61% and 65% had moderate attitudes and performance, respectively. 97.2%, 72%, and 32.4% of the subjects did not know the agent, reservoir, and symptoms of the disease, respectively. To prevent the disease; 44.6% of people did not take any action, 54.2% installed nets on doors and windows, and also 28.5%, 40.2%, and 25.3%, respectively, always used mosquito nets, insecticide sprays, and insect repellent ointments.

Conclusions: Despite being the disease endemic in the region, the level of knowledge, attitude, and practice of the people was weak to moderate. Therefore, raising the KAP levels of the county's people about leishmaniasis is highly recommended.

Keywords: Cutaneous leishmaniasis, Knowledge, Attitude, Practice, KAP survey.

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Introduction

Leishmaniasis is a group of zoonotic parasitic diseases caused by protozoan parasites of the genus *Leishmania* and transmissible by the bites of female sandflies to humans or animals such as canids, rodents, hyraxes, and marsupials¹⁻³. This group of diseases in more than 98 countries especially in the tropics, subtropics, and the Mediterranean basin are endemic^{4,5}. Of the four main clinical forms of the disease, Cutaneous Leishmaniasis (CL) is the most common form with 70 to 75% of cases from ten countries; Iran, Afghanistan, Syria, Algeria, Ethiopia, North Sudan, Colombia, Brazil, Peru and Costa Rica⁴.

The most common form of leishmaniasis in Iran, like in other parts of the world, is Zoonotic Cutaneous Leishmaniasis (ZCL) caused by *Leishmania major*⁵. The disease is endemic in 18 of the 31 provinces of the country⁶.

Cutaneous leishmaniasis, a non-fatal parasitic disease, causes skin lesions mainly on exposed areas of the body such as the limbs and face, leaving lifelong scars with experience of psychosocial issues such as distress, anxiety, serious disability, and stigma⁷.

According to the World Health Organization, cutaneous leishmaniasis affects some of the world's poorest people and is linked to malnutrition, unsuitable housing, population displacement, weak immune systems of human hosts, and lack of financial resources. The disease is also associated with environmental changes such as dam construction, deforestation, urbanization, and irrigation schemes⁸.

The World Health Organization (WHO) Committee of Experts has proposed the following intervention goals for leishmaniasis⁹:

- Vector control; insecticide spray, genetic control, biological and chemical control
- Control of reservoir hosts; use of drugs and vaccines
- Personal protection; use of vaccines and insect repellents
- Early diagnosis and treatment, which is the most common interventions, but this could not reduce the transmission.

Many studies have shown that an effective way to prevent infectious diseases is to improve society's awareness and attitude¹⁰ and also one of the most effective ways to control leishmaniasis is to raise the awareness, attitude, and practice of at-risk groups¹¹.

Several KAP studies on CL, a disease known as "Salak" in Persian and local dialects, have been conducted in Iran. each of which has been in different populations and regions of the country and different results have been reported on people's knowledge, attitudes, and behavior in this field⁸. Considering the nature of the disease and its dependence on various factors, including the reservoir hosts, vectors, various environmental and geographical, economic and social, cultural and political factors, as well as several other factors, these different results are not far from expected. Therefore, this type of study in

different regions of a country seems logical and scientific. Considering that such a study has not been carried out in Semnan province, especially Damghan district, a highly endemic focus of ZCL¹² with an average incidence of 700 cases in three years (unpublished data), this study was designed and implemented for the first time to determine the level of knowledge, attitude, and preventive practice of the people about cutaneous leishmaniasis in Damghan district in 2018-2020.

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Materials and Methods

This descriptive cross-sectional study was performed on 500 people living in rural and urban areas of Damghan County during 2018-2020. Damghan (at about 36°10' N, 54°20' E), with an altitude of 1170 m and arid climate, is located about 340 km northeast of Tehran in Semnan province¹³.

To collect the data, a researcher-made semi-structural KAP questionnaire consisting of four parts; Basic characteristics, knowledge, attitude, and performance assessment questions was used. The questions were designed to be open-ended and less likely to be answered by chance. To validate the questionnaire, the method of determining the validity of the content was used. To do this, a questionnaire was prepared for the members of the scientific board in the field of cutaneous leishmaniasis, and after receiving their opinions, the questionnaire was re-evaluated and the necessary corrections were made. For scoring, some open-ended questions turned into a three-choice Likert scale and some turned true and false. To determine the reliability of the questionnaire, the questions in each structure were examined separately. Cronbach's alpha was used for Likert options and Richardson's Cord test for two-choice (true-false) questions.

In the awareness questions section, for 5 questions with Cronbach's alpha Likert scale, 73% and for 16 two-choice questions (true or false) 76% reliability, and for attitude two-choice questions and questions with a Likert scale, Reliability was 83% and 70%, respectively. Knowledge, attitude, and performance scores were divided into three levels; poor, moderate, and good.

The sample size (500 people) was calculated based on the population of 86908 people and the sampling method was simple. The data gathering was conducted by a trained person almost equally from urban and rural areas. The interviewer interviewed the participants by referring to the different parts of the city and villages, as well as the comprehensive health service center and the health homes. Literate people completed the questionnaire and for illiterate people, the questionnaire was completed by the questioner.

Descriptive statistics were used to organize, describe, and integrate the data to facilitate evaluating the knowledge, attitudes, and performance of the people about CL.

This study was approved by the ethics committee of Semnan University of Medical Sciences with the code IR.SEMUMS.REC.1397.137. After explaining the objectives of the study, the interviewee's satisfaction is obtained and confidentiality of respondents' information is guaranteed.

Results

In this study, 51.2% of respondents were male, and 48.8% were female. 52.6% of people were in the age group of 20-40 years, and 74.6% were married. Similarly, 34.2% of people were with secondary and university education, 13.8% with primary, 13.2% with secondary education, and only 4.4% were illiterate. 46.8% of the participants were employed (28.6% employee and 18.2% worker), and 33.5% were unemployed. 45% have villa-brick houses, and 50.8% and 58% have been living and working in villages, respectively. 13.8% of people had a history of CL, 68.1% of them had been treated (Table 1).

The highest knowledge score in this study was 21 out of 26 and the mean score was 8.5 ± 4.3 (Table 2). The knowledge level of 55% of the subjects was assessed as weak. 77.6% of the people did not know the symptoms of "cutaneous leishmaniasis", and 32.4% did not know the symptoms of "Salak". 97.2% did not know the causative agent of the disease. 74.2% of the subjects were aware of the transmission route, and 71.6% were aware of not directly transmitting the disease. 16.2% of the participants knew that the most time of the vector activity was at night. 52.6% of the respondents did not know where the vectors lived and rested, and 60.2% did not know where they reproduced. 53% of the people stated summer as the highest incidence season of CL, 49.2% of them were unaware of the disease treatment, and 35.2% said that there is a vaccine against the disease. 81.4% considered the disease preventable. In response to the question "Ways to prevent the disease?" 3.8% mentioned the vector, reservoir control, and personal protection. 21.2% of them considered mosquito nets with small holes to be suitable for disease prevention (Table 3).

The highest score in the field of attitude was 28 out of 30 with an average score of 17.5 ± 5.6 (Table 2). 60% and 50% of the participants believed in the possibility of eradicating the disease by killing the insects and rodents, respectively. 84.2% of the people believed that the probability of the disease occurrence in all seasons is not the same and 81.8% believed that the disease is preventable. 50.4% of the respondents believed that there was no effective way to prevent and control the disease and 82.4% of them believed that the use of mosquito nets is the only way to prevent leishmaniasis. 57%, 40.6%, 28%, 39.6%, and 57.6% of the people believed in the role of education, income, gender, age, and occupation in preventing the disease, respectively. 24% believed that the disease is self-healing if untreated, 22.2% thought that using ampoules is the best way to treat the disease, and 28.3% believed that the disease will be fatal if untreated (Table 4).

The highest performance score was 36 out of 40 with a mean of 23.6 ± 5.5 (Table 2), and 65% of the subjects had moderate performance against the disease. 44.6% of the people did not take any measures to prevent CL, and 24.2% had at least one preventive measure. 51.8% of participants did not take any action to increase their awareness about the disease

and ways to prevent it. In response to the questions "Using a mosquito net while resting and using an insecticide?" 50% and 49.9% of the people chose the answer "sometimes", respectively. To prevent the disease, 75.5% of respondents performed hygienic waste disposal. To prevent insects from entering the house, 54.2% had installed nets in doors and

windows. To treat the disease, 56.3% of the people prefer to go to a health center/physician and 47.6% of them sometimes participated in training courses to increase awareness about ways to prevent the disease (Table 5).

Table 1: Demographic and basic characteristics of participants in cutaneous leishmaniasis KAP survey in Damghan district (n=500), 2018-2020

Characteristics	Categories	Frequency (No.)	Percent (%)
Gender	Male	256	51.2
	Female	244	48.8
Age group	≤20	58	11.6
	20-40	263	52.6
	40-60	133	26.6
	>60	46	9.2
Marital status	Single	127	25.4
	Married	373	74.6
	Illiterate	22	4.4
Educational status	Elementary	69	13.8
	Guidance	66	13.2
	High school	171	34.2
	Collegiate	171	34.2
Occupational status	Unemployed	167	33.5
	Employee	143	28.6
	Worker	91	18.2
	Student	57	11.4
Type of house/materials	Retired	41	8.2
	Villa/Brick	223	45.0
	Villa/Stone	72	14.5
	Villa/Mud	83	16.7
Location	Apartment/Brick	114	23.0
	Apartment/Stone	4	.8
Workplace	Rural	254	50.8
	Urban	246	49.2
History of leishmaniasis	Rural	290	58.0
	Urban	210	42.0
Treatment method of the disease	Yes	69	13.8
	No	430	86.2
Using prescribed drugs	Using prescribed drugs	47	68.1
	Self-treatment	7	10.1
	Self-healing	15	21.7

Table 2: Descriptive statistic of KAP scores related to cutaneous Leishmaniasis in Damghan district, 2018-2020

	Mean±SD	Median	Range	Ranking
Knowledge	8.51±4.30	9	0-21	Weak
Attitude	17.50±5.63	18	0-28	Medium
Practice	23.59±5.56	24	3-36	Medium

Table 3: Knowledge of the respondents related to cutaneous leishmaniasis in Damghan district, 2018-2020

Questions	Categories	Number	Percent
The signs of cutaneous leishmaniasis (CL)	Don't know	388	77.6
	Relatively	90	18.0
	Perfect	22	4.4
The signs of salak	Don't know	162	32.4
	Relatively	300	60.0
	Perfect	38	7.6
Incubation period of CL	1 week to 4 month	258	51.6
	Other	242	48.4
Duration of CL	2-8 month	128	25.6
	Other	372	74.4
The causative agent of CL	Don't know	486	97.2
	Know	14	2.8
Transmission route of CL	Don't know	129	25.8
	Know	371	74.2
Most vector's activity time	Night	81	16.2
	Day	15	3.0
	Around sunset	72	14.4

	Around sunrise	2	.8
	Sunrise/Sunset	48	9.6
	Night/Day	4	.8
	Night/Sunset	10	2.0
	No idea	265	53.0
Life and Rest place of CL Vector	Don't know	263	52.6
	Relatively	210	42.0
Reproduction place of CL Vector	Don't know	301	60.2
	Relatively	188	37.6
Bleeding frequency of CL Vector	Don't know	367	73.4
	Relatively	128	25.6
	Spring	22	4.4
	Summer	265	53.0
	Autumn	29	5.8
	Winter	2	.4
Season of CL outbreak	Spring/Summer	71	14.2
	Summer/Autumn	31	6.2
	Autumn/Winter	5	1.0
	Spring/Autumn	18	3.6
	No idea	57	11.4
	Night	163	32.6
	Day	38	7.6
Time of CL Transmission	Around sunset	110	22.0
	Around sunrise	12	2.4
	Other	18	3.6
Reservoir of CL	Don't know	360	72.0
	know	140	28.0
Curability of CL	Yes	450	90.0
	No	7	1.4
	Don't know	43	8.6
CL treatment method	Don't know	246	49.2
	know	254	50.8
Vaccine for CL prevention	Yes	176	35.2
	No	222	44.4
	Don't know	102	20.4
CL direct transmissibility	Yes	82	16.4
	No	358	71.6
	Don't know	60	12.0
Preventability of CL	Yes	407	81.4
	No	33	6.6
	Don't know	59	11.8
	Vector control	14	2.8
	Reservoir control	17	3.4
	Personal protection	180	36.0
CL prevention routes	Vector and reservoir control/ Personal protection	19	3.8
	Don't know	196	39.2
	Vaccination	19	3.8
	Personal protection/ vector control	48	9.6
	Vector and reservoir control	7	1.4
	Net with fine pores	106	21.2
	Poison impregnated net	67	13.4
Suitable net	Fabric net	34	6.8
	Net with fine pores and poison impregnated	19	3.8
	Others	105	21.0
	No idea	169	33.8

Table 4: Attitude of the respondents related to cutaneous leishmaniasis in Damghan district, 2018-2020

Respondents' opinion about:	Answers	Number	Percent
CL causative agent	Protozoa	143	28.6
	Helminthes	13	2.6
	Bacteria	55	11.0
	Virus	69	13.8
	Fungi	37	7.4
	No idea	183	36.6
	Gerbil	134	26.8
CL reservoir host	House mouse	78	15.6
	Dog	11	2.2
	Contaminated soil	10	2.0
	Garbage	15	3.0
	Waste water	10	2.0
	All above mentioned	188	37.6

	No idea	49	9.8
	Yes	94	18.8
CL direct transmissibility	No	369	73.8
	No idea	37	7.4
	Yes	65	13.0
CL indirect transmissibility	No	369	73.8
	No idea	66	13.2
	Yes	86	17.2
CL transmissibility by all types of mosquitoes	No	365	73.0
	No idea	49	9.8
	Yes	86	17.3
CL transmissibility by fly	No	354	71.1
	No idea	58	11.6
	Yes	408	81.6
Role of sanitary disposal of garbage in CL prevention	No	43	8.6
	No idea	49	9.8
	Yes	250	50.0
Role of rodent killing in CL control	No	177	35.4
	No idea	73	14.6
	Yes	300	60.0
Role of vector killing in CL control	No	145	29.0
	No idea	55	11.0
	Yes	86	17.2
The same probability of CL morbidity during day and night	No	326	65.2
	No idea	88	17.6
	Yes	33	6.6
The same probability of CL incidence in all seasons	No	422	84.4
	No idea	45	9.0
	Yes	408	81.8
CL preventability	No	45	9.0
	No idea	46	9.2
	Yes	244	49.6
Existence of effective methods for CL prevention and control	No	248	50.4
	No idea	0.0	0.0
	Yes	436	87.2
The role of health education in CL prevention	No	15	3.0
	No idea	48	9.6
	Yes	58	11.6
The role of using nets in CL prevention	No	412	82.4
	No idea	30	6.0
	Yes	65	13.0
The same effect of all types of nets on CL prevention	No	385	77.0
	No idea	50	10.0
	Yes	285	57.0
The role of personal education in CL prevention	No	172	34.4
	No idea	43	8.6
	Yes	203	40.6
The role of income in CL prevention	No	250	50.0
	No idea	47	9.4
	Yes	140	28.0
The role of gender in CL prevention	No	315	63.0
	No idea	45	9.0
	Yes	198	39.6
The role of age in CL prevention	No	263	52.6
	No idea	39	7.8
	Yes	288	57.6
The role of occupation in CL prevention	No	176	35.2
	No idea	35	7.0
	Yes	120	24.0
CL self-healing	No	338	67.6
	No idea	42	8.4
	Using ampoules	111	22.2
	Using ointment	6	1.2
	Using opium	1	.2
	Visit a doctor	110	22.0
	Don't know	85	17.0
	Vaccination	28	5.6
	Observe hygienic tips	49	9.8
	No idea	103	20.6
	Cryotherapy	7	1.4
	Yes	141	28.3
Mortality of CL if left untreated	No	276	55.3
	No idea	82	16.4

Need to visit a doctor in case of CL	Yes	438	87.8
	No	31	6.2
	No idea	30	6.0
Using traditional treatment in case of CL	Yes	68	13.6
	No	365	73.0
	No idea	66	13.2
The most effective way to control of CL	Observe hygiene tips	82	16.4
	Fighting against rodents	35	7.0
	Fighting against vectors	18	3.6
	Personal protection	48	9.6
	Treatment	63	12.6
	Fighting against rodents and vectors/personal protection	33	6.6
	Vaccination	8	1.6
	Health education	10	2.0
	Fighting against rodents and vectors/health education	6	1.2
Nest destruction is the most effective way to fight against CL	No idea	197	39.4
	Yes	232	46.4
	No	153	30.6
Destroying rodents nests and spending money on it	No idea	115	23.0
	Yes	286	57.3
	No	96	19.2
The role of chance in CL morbidity	No idea	117	23.4
	Yes	102	20.4
	No	312	62.4
	No idea	86	17.2

Table 5: Protective practice of the respondents related to cutaneous leishmaniasis in Damghan district, 2018-2020

Questions	Practice	Number	Percent
Preventive measures taken to prevent CL	Net installation to the doors and windows	23	4.6
	Using mosquito net	36	7.2
	Using insecticide spray	26	5.2
	Using insect repellent ointment/lotion	12	2.4
	Don't attend to mosquito and rodent activity sites	55	11.0
	Net installation to the door and window + Don't attend to mosquito and rodent activity sites	3	0.6
	Using mosquito nets + insecticide spray and insect repellent ointment/lotion	11	2.2
	Using mosquito nets + Don't attend to mosquito and rodent activity sites	6	1.2
	Net installation to the doors and windows and Using mosquito nets	24	4.8
	Using mosquito nets and insect repellent ointment/lotion	15	3.0
	Using mosquito nets and insecticide spray	22	4.4
	Other	24	4.8
	Do nothing	223	44.6
Using a mosquito net while resting and sleeping	Never	106	21.5
	Sometimes	247	50
	Always	141	28.5
Sanitary disposal of garbage	Never	17	3.4
	Sometimes	104	21.1
	Always	373	75.5
Don't attend to CL areas	Never	86	17.6
	Sometimes	245	50.1
	Always	158	32.3
Using insect repellent ointments	Never	113	22.9
	Sometimes	256	51.8
	Always	125	25.3
Using insecticide spray	Never	49	9.9
	Sometimes	246	49.9
	Always	198	40.2
Measures taken to increase awareness	Referring to the health house	95	19.0
	Reading books	14	2.8
	Reading journals	2	.4
	Using media (radio/television)	3	.6
	Nothing	259	51.8
	Reading books and journals	35	7.0
	Reading books, journals and listening radio, watching television	11	2.2
	Using internet	26	5.2
	Studying the instructions	27	5.4
	Participating in training courses	12	2.4
Referring to health centers to increase awareness	Studying the instructions and participating in training courses	16	3.2
	Never	79	16
	Sometimes	214	43.3

	Always	200	40.6
	Never	75	15.2
Watching TV to raise awareness	Sometimes	261	52.8
	Always	158	32
Reading books, magazines, and other publications to increase awareness	Never	100	20.3
	Sometimes	254	51.5
	Always	139	28.2
Using smoke to prevent CL	Never	28	5.7
	Sometimes	154	31.4
	Always	308	61.6
	Net installation to the door and window	271	54.2
	Other	7	1.4
	No idea	88	17.6
Measures taken to prevent insects entering to house	Closing doors and windows	6	1.2
	Using insecticide	37	7.4
	Net installation to the door and window and using insecticide	85	17.0
	Net installation to the door and window and closing doors and windows	6	1.2
Installing net on doors and windows to prevent CL	No	31	6.3
	Yes	459	93.7
Helping destroy rodent's nests to prevent the spread of CL	Never	187	39.1
	Sometimes	183	38.3
	Always	108	22.6
Prefer individual protection to collective health measures to prevent the spread of CL	Never	184	39.1
	Sometimes	192	40.8
	Always	95	20.2
Avoid keeping dogs to prevent the spread of CL	Never	88	18
	Sometimes	45	9.2
	Always	355	72.2
	Visit a physician	190	38.2
	Self-medicate	8	1.6
	Traditional treatment	11	2.2
Type of action to treat CL	Refer to health center	90	18.1
	Do nothing	15	3.0
	Don't know	55	11.0
	No idea	129	25.9
	Never	84	17.9
Dressing the wound if getting CL	Sometimes	116	24.8
	Always	268	57.3
Participating in training courses to raise awareness	Never	90	18.4
	Sometimes	233	47.6
	Always	166	33.9
Don't go out at night to prevent CL	Never	157	32.2
	Sometimes	270	55.4
	Always	60	12.3
Don't communicate with infected people to prevent CL	Never	141	29.5
	Sometimes	186	38.9
	Always	151	31.6
Authorities action to prevent and control CL	Take the necessary steps	309	62.9
	Don't take the necessary measures	73	14.9
	No idea	109	22.2
To control and eradicate CL, I am ready to do whatever the authorities want	Never	42	8.6
	Sometimes	145	29.6
	Always	303	61.8

Discussion

According to the data, the level of knowledge of the individuals about the disease was poor and their attitude and practice level were similarly assessed as moderate.

In this study, most of the participants (55%) had a poor level of knowledge. In a study in Isfahan, Hejazi et al. reported that 40% of the people had poor knowledge¹⁴, and in the study of Zeinali et al. in three provinces of Iran; East Azerbaijan, Khorasan Razavi, and Ilam, the awareness of 63.4% of health staff were assessed in average level¹⁵. In another study, Hosseini et al. reported that most of the people (86.6%) in

Esfarayen had a moderate level of knowledge about CL³. Kavousi et al. also reported the knowledge of about one-third of the participants as very poor¹⁶. In a study in Saudi Arabia, Moussa et al. reported an awareness of 69.4%, and also about 98% of knowledge around CL was reported by Koirala et al. in Nepal, Singh et al. in India, and Gama et al. in Brazil¹⁷⁻²⁰.

In the present study, most of the people (77.6%) were unaware of the symptoms of "leishmaniasis". When the Persian term, Salak, was used instead of "leishmaniasis", 67.6% of the respondents produced skin ulcers as a sign of the disease. The reason for the increase in participants' awareness is that the disease is known as "Salak" among the people of the region.

This finding is higher than the findings of Nasiri et al. with 62.8%³ and lower than the findings of Saberi et al. Sarkari et al., and Mousa et al. with 97.8%, 91%, and 73% awareness respectively^{17,21,22}. These statistical differences can be due to the geographical diversity and different characteristics of the studied population.

Unfortunately, 97.2% of the people did not know the agent of the disease. This finding conflicted with the findings of Nasiri et al. by 72.7% awareness³. In the study of Droudgar et al. in Kashan, 69.8% of the teachers did not know the agent of the disease¹¹. In Abazid et al. study in Syria, more than 85% of people introduced insects as the agent/source of the disease²³. In a study by Moussa et al. (2019) in Hill, Saudi Arabia, only 6.4% of the participants knew the agent of CL¹⁷. These differences also can be due to the differences in the studied population and the type of questions (open or closed).

Regarding the "transmission route" of the disease, 74.2% of the people correctly stated the sandfly bites. Saberi et al.²¹, and Hosseini et al.² have similarly reported a 97.9% awareness of the students about the transmission route of the disease, and Nasiri et al.³ have reported a 72.7% of the student's knowledge in this case. In a study by Sarkari et al., 63.5% of the people considered mosquitoes to be vectors of the disease²². In Vahhabi et al. and Dehghani et al. studies, 39.5% and 27% of the respondents named the sandflies as vectors of the disease, respectively^{24,25}. In similar studies in Colombia by Pardo et al.²⁶, and in Nepal by Koirala et al.¹⁸, 35% and 2.2% -1% of the participants stated the sandflies as the vectors of the disease, respectively. Akram et al. reported that 57.6% of different cities residents in Pakistan are unaware of the disease vector²⁷. In Abazid et al. study in Syria, 72.7% of the people considered the route of transmission to be insect bites (not just sandflies)²³. In separate studies in this case in Saudi Arabia, Moussa et al. and Amin et al. reported a 5.4% and 37.4% of the awareness, respectively^{17,28}. Alexander et al. reported that 23.1% of the people in Brazil were aware of the role of sandflies in the transmission of CL²⁹.

In the present study, only 9.6% of the subjects were aware of the daily peak of the sandflies' activity, and more than half of the subjects did not know the place of residence, and the rest of the vector and 60.2% did not know their reproduction places. In Nasiri et al. study, 73.7% of the students did not know the activity times of sandflies³. Saberi et al. reported that 76.3% of the subjects were aware of the gathering place of sandflies and 72% were unaware of their reproduction place²¹. In total, more than half of the people considered night (from sunset to sunrise) as the time of disease transmission. In the studies of Nasiri et al., Hosseini et al., and Saberi et al., 46.1%, 15%, and 9.3% of the participants expressed the night as the time of sandflies bite, respectively^{2,3,21}. In a study in India, Singh et al. reported that 46.8% and 39.7% of the people mentioned sunset and midnight as the time of the disease transmission, respectively¹⁹. Akram et al. reported that in Punjab, Pakistan, about 54.8% of people did not know the time of sandflies bites²⁷.

In our study, 28% of the respondents knew the reservoir of the disease, and most (53.0%) considered the summer as the

outbreak season. In the study of Dehghani et al., 70% of the people introduced dogs as the reservoir of leishmaniasis (visceral and cutaneous)²⁴.

Most of the respondents considered the disease to be treatable (90%) and preventable (81.4%) and about half of them (50.8%) knew the usual method of CL treatment (Glucantime injection or Cryotherapy) and more than half (57%) knew the ways of the disease prevention. Sarkari et al. and Hejazi et al. achieved similar results in Fars and Isfahan provinces, respectively^{14,22}. Moussa et al. and Abazid et al. reported that 19.3% and 62.2% of the people in Saudi Arabia and Aleppo, Syria, respectively, were aware of the preventability of CL^{17,23}.

In this study, most of the subjects (61%) obtained a moderate score in the field of attitude. Hosseini et al. reported that most of the people (93.9%) in Esfarayen city had the desired level of attitude towards CL and Hejazi et al. reported a moderate level of attitude in 50% of the mothers. Rakhshani et al. and Zeinali et al. also reported the attitudes of the participants as moderate^{2,14,15,30}.

More than 70% of the people had a low level of knowledge and attitude about the agent and reservoir of CL. 18.8% and 13% of the people believed that the disease is contagious and able to be transmitted indirectly through common objects and devices, respectively. Moussa et al. reported that 18.6%, 17.61%, 7.4%, 8.2%, and 9.3% of the studied people in Saudi Arabia, mistakenly believed that CL is transmitted by houseflies, raw or undercooked food, sneezing or coughing, unwashed vegetables or fruits, and physical contact, respectively¹⁷.

In our study, most people (81.8%) believed that CL is preventable. This rate was 69% and 62%, respectively, in the case of Sarkari et al. in Fars province, and Abazid et al. in the Syrian alopecia^{22,23}. Most of the people believed in the positive role of hygienic waste disposal in disease prevention. Also, half and more than half (60%) of them believed that killing rodents and insects, respectively, would eradicate the disease. Most of the respondents (87.2%) believed in the role of health education in disease prevention. Also, most of them (82.4%) did not believe in the role of mosquito nets in preventing the disease. More than half of the participants agreed with the role of education and occupation, and more than half of them disagreed with the role of income, gender, and age in preventing the disease. A relatively small percentage of people (24%) believed that CL is self-healing. In Moussa et al. study, 33.7% of respondents had such an opinion¹⁷.

In the present study, 56.8% believed that the best way to treat the disease is to use ampoules, visit a physician, refer to a health center, cryotherapy, and use an ointment, respectively. Moussa et al. in Saudi Arabia reported that 90.9% of the people mistakenly thought that there was no cure for the disease¹⁷.

More than a quarter of people (28.3%) believed that the disease would lead to death if left untreated. In Moussa et al. and Akram et al. studies, this rate was reported to be 50.1% and 42%, respectively^{17,27}.

Most of the people (87.8%) believed that they should refer to a physician if they had the disease, and a small percentage (13.6%) of them believed in using traditional therapies. In a study by Sarkari et al., 21% of the people in the southern regions of Iran believed in traditional CL treatment and 48% of them believed that the disease could be treated with medication²². In Moussa et al. study, 65.1% of the people thought that CL could be treated with herbal ingredients. In the study of Nandha et al. in India, 90.2% of the people had a similar opinion^{17,31}.

The most effective way to control the disease according to the respondents was referring to health centers, disease treatment, personal protection, rodents control, fighting rodents / vectors / and personal protection, vector control, health education, vaccination, and fighting rodents / vectors / and health education. Also, less than half of the people (46.4%) agreed with the destruction of rodent nest as the most effective way to control the disease. More than half of them were positive about rodents' nests destruction and spending money on it. 20.4% of the people believed that luck plays a role in CL morbidity. In Saberi et al. and Mazlumi et al. studies, 30% of the students and 60% of the people in Yazd had the same opinion, respectively^{21,32}.

The results of this study showed that most people (65%) have a moderate level of performance in CL prevention. In the study of Hosseini et al., 32.6% of the people had a moderate level of performance². Zeinali et al. reported a performance level of near moderate in health personnel and Hejazi et al. reported that 32.5% the mothers of had poor performance against leishmaniasis^{14,15}. Rakhshani et al. in Shiraz and Alemu et al. in a study in northwestern Ethiopia reported a poor performance on CL prevention^{30,33}.

In this study, less than half of the subjects (44.6%) did not take any preventive measures against CL and only 25% always used mosquito nets. In Sarkari et al. study, 37% and in Nasiri et al. study, 28.1% of the students of medical and health schools and 5.3% of the students of rehabilitation schools used mosquito nets^{3,22}. In the studies of Saberi et al. and Singh et al., 22.1% and 23.9% of the people used mosquito nets, respectively^{19,21}.

To prevent the spread of the disease, most of the people (75.5%) always used hygienic waste disposal and to prevent the disease, 25.3% and 40.2% of the people always used insect repellents and insecticide sprays, respectively. In the study of Hejazi et al., 12.1% of the respondents used insect repellent spray indoors and 8.7% of them used insect repellent on skin¹⁴. Saberi et al. (2012) and Dehghani et al. reported 28.9% and 4% use of insect-repellent pens and repellent ointments, respectively^{21,24}.

About half of the people (51.8%) did not take any action to increase their awareness about CL. In this case, 19% of them referred to the health center and also 43.3% occasionally and 40.6% always referred to the health center. In Hosseini et al. study 53.4% of the population stated that the staff of health centers was their priority in gaining knowledge about leishmaniasis².

To prevent the disease, the participants predominantly (93.7%) installed nets on doors and windows. This rate is much higher than the findings of Dehghani et al. with 10.5% and Moussa et al. with 33.8% performance^{17,24}.

In total, more than half of the people (56.3%) stated that they will refer to a physician and health center if they have the disease. In Nasiri et al., only 6.2% of students and in the study of Moussa et al. In Hill, Saudi Arabia, 40.7% of respondents expressed that they refer to the hospital for treatment^{3,17}.

In this study, the knowledge level of more than half of the people was assessed as weak. About one-third of the people did not know the symptoms of CL, and surely they will be referred to medical centers later if they get sick, as a result, their disease may become worse and not easily respond to treatment. Most of the people were not aware of the vector's activity peak and biting time. Therefore, the possibility of being exposed to the bite of sandflies and getting CL was higher. About half of the people believed that there is no effective way to prevent CL, which unfortunately causes people not to try to prevent the disease. Despite most of the people knew the way of CL transmission and believed that the use of mosquito nets is the only way to prevent the disease, about half of them did not take any action in this matter. In general, the findings showed that despite the endemicity of the disease in the county, the level of knowledge, attitude, and performance of the people is not optimal and it is necessary to plan and take appropriate action to raise the level of their awareness and improve attitude and as a result, their optimal performance to prevent CL.

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Conflict of Interest

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