Article

Evaluation of Household Preparedness and Risk Factors for Cutaneous Leishmaniasis (CL) Using the Community Assessment for Public Health Emergency Response (CASPER) Method in Pakistan

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Abstract: (1) Background: In endemic areas of Pakistan, local community knowledge and attitudes towards cutaneous leishmaniasis (CL) are critical elements in the effective control and management of the disease. A cross-sectional epidemiologic design was used to assess the disease concern, preparedness, practices, and preventive behavior of the households and to assist the personnel and health care professionals in strengthening their planning efforts and awareness of CL. (2) Methods: A two-stage cluster sampling process, i.e., Community Assessment for Public Health Emergency Response (CASPER) was conducted from September 2020 to March 2021 on present household-level information about community needs and health status regarding CL in a cost-effective, timely, and representative manner. (3) Results: In the current study, 67% of the respondents were aware of CL and its causative agent and showed a low level of pandemic preparedness. The majority (74%) of the respondents mentioned that they did not avoid sandfly exposure areas. The majority (84%) of respondents had unsatisfactory behavior towards using bed nets, sprays, or repellents. (4) Conclusion: In endemic areas of Pakistan, the inadequate concern and low preparedness of the local community toward CL are critical aspects in efficient control and management of the disease.

Keywords: CASPER; cutaneous leishmaniasis; household; sandfly; risk factors

1. Introduction

Leishmaniasis is a neglected tropical disease caused by protozoan trypanosomatidae parasites of the genus Leishmania, which are transmitted naturally through the bite of infected female sand flies [1]. There are more than 20 disease-causing species of Leishmania [2,3] that have different clinical forms including cutaneous leishmaniasis (CL), mucocutaneous leishmaniasis (MCL), diffuse cutaneous leishmaniasis (DCL), and visceral leishmaniasis (VL, also known as kala-azar) [4,5]. Leishmaniasis has been documented in 98 countries, affecting approximately 350 million people globally, making it one of the

world's most frequent and significant neglected tropical diseases [6,7]. CL has a wide range of distribution and presents between 0.7 and 1.2 million cases reported worldwide each year [8]. More than 1.5 million leishmania cases are reported annually with 0.7–1.2 million cases of CL occurring in Afghanistan, Algeria, Iran, Tunisia, Brazil, Pakistan, Iran, and Saudi Arabia [9]. A high rate of poverty, a large population of immigrants, geographic proximity to the endemic regions, and a favorable climate for sandfly life cycle are all crucial variables involved in leishmania transmission [10].

CL is growing rapidly and is one of the most serious public health concerns in Pakistan. CL is extremely endemic in remote areas of Balochistan, Punjab, Sindh, and throughout Khyber Pakhtunkhwa (KPK). It is especially endemic in the Lower and Upper Dir districts, the regions bordering Afghanistan, and localities with the highest number of Afghan refugees [11]. The health authorities of Pakistan have reported 21,000 to 35,000 cases of both anthroponotic (ACL) and zoonotic (ZCL) variants of CL [8,12]. There have been various reports of atypical manifestations of CL disease either owing to unusual lesion sites or their distinct morphology [13]. In Pakistan, information on risk factors in various endemic areas are scarce. There is lack of awareness regarding the sandfly vector and the possibility of scarring despite therapy. The search for traditional therapies for CL treatment and non-reporting to healthcare providers are also included in the risk factors. [14]. Therefore, determining the prevalence of risk variables is one approach to alert public health and healthcare officials to the potential impact of CL in their areas. Although passive surveillance and monitoring of vector population are assisting and guiding policy decision makers in determining priorities, these interventions do not provide a complete picture of Pakistan's current CL disease impact. Therefore, a systemic data collection of the risk factor prevalence, community preparedness, and practices is required to determine the current and potential future burden of leishmaniasis [15].

To achieve these goals, the Community Assessment for Public Health Emergency Response (CASPER) technique was used. CASPER is an epidemiological practice that provides information on preparedness, underlying vulnerabilities, and community attitudes at the household level [16]. Assessing the community's level of preparedness can benefit public health because data gathered can be utilized for financial support and future planning. In response to the potential threat posed by CL, the most significant requirement is the participation of the community in control programs and successful prevention [17]. Therefore, the current study aimed to validate the efficacy of CASPER by assessing the preparedness and prevalence of CL risk factors in Layyah District, Dera Ghazi Khan, Punjab where the epidemic of CL has been reported [18,19] but no exact data on disease endemicity are available. To date, no such study has been conducted to highlight the preparedness and awareness of the population regarding CL and vector despite the endemicity of sandflies in Pakistan.

The present study aims to determine the disease concern, preparedness, practices, and preventive behavior of the households of the Layyah District, Dera Ghazi Khan, Punjab, Pakistan where no such study has been carried out and to date no information is available. This is the first CASPER study regarding CL in Pakistan and the data will fill the gap. The data can be used to make informed decisions, allocate resources, and address vector elimination strategies for livestock owners and residents with specific demographic/household characteristics. This knowledge could help guide future health education activities aimed at reducing leishmaniasis in Pakistan's endemic areas.

2. Material and Methods

2.1. Study Area

The Layyah District, which is part of the Sindh Sagar Doaba, is a semi-rectangular tract of sandy territory located between the Indus and Chenab rivers to the north and south. It is located between the longitudes of 70°44′ and 71°50′ E and the latitudes of 30°45′ and 31°24′ N. Layyah, Karor, and Chaubara are the three tehsils that makeup Layyah, shown in Figure 1. The research area's northern portion features sandy topography, while the

southern portion is inundated due to summer floods. It is highly hot in the summer and extremely chilly in the winter. The four seasons are summer (May to July), autumn (August to October), winter (November to January), and spring (February to April). June is the hottest month, with a maximum temperature of 51 °C, while December is the coldest, with a minimum temperature of 2 °C. The maximum yearly rainfall in the area is 21 mm. At the lowest point, the relative humidity is 33.4 percent and at the highest point it is 66.6 percent. Farmers' main agricultural ventures are cattle, bullocks, goats, camels, and sheep [20,21].
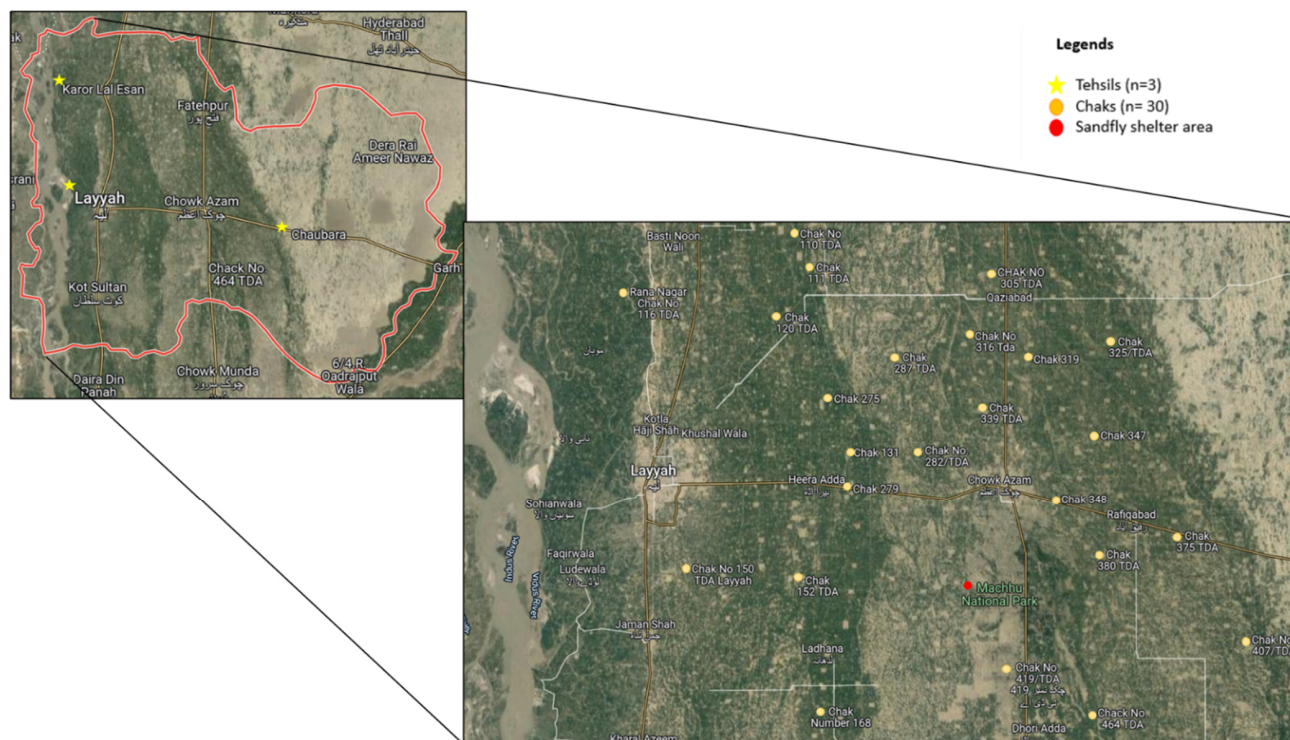

Figure 1. Map of the study area depicting sampling areas where samples were collected.

2.2. Ethical Approval

The study was approved by IRB & Ethics Committee of National University of Medical Sciences (NUMS), Rawalpindi, Pakistan under reference number 06/R&D/NUMS. Before data collection, the respondents were clearly informed about the objectives of study and verbal consent from each head of household was taken.

2.3. Study Design

A CASPER survey using two-stage cluster sampling was used to highlight the preparedness and awareness of the population of Layyah District, Pakistan regarding CL. The sampling frame was taken from the Layyah District union council. Rural areas were visited during the study duration, and data were collected using questionnaires. To choose a representative sample of families to be questioned, we randomly chose 30 clusters (census blocks) in Tehsil Lal Esan in the first stage with a probability proportional to the number of households within each cluster. In the second stage, systemic random selection was used to select eighteen houses from each of the clusters that had been chosen. The population data are given in Supplementary Table S1.

2.4. CASPER Survey

To collect the data, a detailed questionnaire was developed. After all, participants gave their informed consent, the data were collected using the interview approach. Interviewing, data collecting, and record-keeping were all taught to a team. To ensure data collection and record-keeping, the interview procedure was routinely coordinated with the supervisor.

The participants were informed about the study's purpose before the data collection. The data were collected from September 2020 to March 2021. The CASPER survey of CL was primarily focused on disease concern, preparedness, practices, and preventive behavior of households. The survey was composed of 50 questions and included sections related to demographics, household knowledge including vector concerns, physical and behavioral status, travel history, housing characteristics, prevention, pets, and household needs. In our study population, the data collection technique was also evaluated for consistency and validity. A pilot analysis was carried out in selected areas among 30 participants from study the area before the questionnaire was finalized. These participants were asked to judge the questionnaire's phrasing, appropriateness, and clarity. The structured questionnaire has high internal consistency, with a Cronbach's alpha value of 0.8. The pretest data were excluded from the final analysis. The data were collected through door-to-door visits and by conducting face-to-face interviews with willing participants.

2.5. Participation and Population Size

Generalized populations from different clusters were selected and respondents were also randomly selected from rural areas (locally known as chaks). The WHO sample size calculator was used with the following assumptions: 5% allowed error, 95% confidence interval with a statistical significance (p-value) of 0.05 [22]. The sample size for this study was estimated to be 540 and eligible respondents who resided in the selected household for response were aged 18 years or older. Based on exclusion criteria, 2.7% (15) respondents were below the age of 18 years, and 4.6% (26) questionnaires were incomplete. After exclusion, the sample size of the study was reduced to 500 with a 95% confidence interval and a statistical significance (α-value) of 0.05. As per CASPER criteria, the sample size should be 210 but, in our study, the population size is 500 as our population size is greater and the confidence in our estimate increases, uncertainty decreases, and we have greater precision. The sample size before and after exclusion criteria is given in Supplementary Table S2.

2.6. Data Analysis

A database was created by entering data into a Microsoft Excel worksheet. SPSS (SPSS Inc., Chicago, IL, USA) version 26.0 was used to analyze the data. The respondents' gender's frequency and percentage were reported using the socio-demographic data. The association of the socio-demographic characteristics to disease concern, preparedness, practices, and preventive behavior of the households was analyzed using the chi-squared test. The results were recorded as frequencies and p-values. For all purposes, 0.05 p-values were considered as a level of significance.

3. Results

3.1. Socio-Demographic Characteristics of the Households

In this survey, a total of 500 respondents were included. Missing data were reported in less than 30 participants. The frequency of male participants ($n = 403$) was higher than female ($n = 97$) and most of the respondents were in the age group of 18–28 and 29–38. Approximately 72.8% of the households lived in a nuclear family system, with a majority of the households having a male as the head (72.6%). More than 50% of the households had one or more children aged younger than two years old, and roughly 64% of the households had a family size of 5–8 total members, 14.6% had 1–2 members in their family and only 20.6% had >8 members. The largest ethnicity group of the respondents was native, i.e., Saraiki, followed by Punjabi and then Pathan. The educational characteristics of the surveyed population revealed that a plurality (30.6%) of respondents were illiterate and just (8.4%) were graduated. Only 39.6% ($n = 198$) of the respondents had a monthly income of around 25,000–50,000 PKR. The socio-demographic characteristics of the households are given in Table 1.

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Table 1. Socio-demographic characteristics of the households.

Sr. No	Socio-Demographic Characteristics	Frequency (*n*)	Percentage (%)
1	Gender		
	Male	403	80.6
	Female	97	19.4
2	Age		
	18–28	168	33.6
	29–38	175	35
	≥39	157	31.4
3	Household head		
	Male	363	72.6
	Female	137	27.4
4	Household members		
	2–4	73	14.6
	5–8	324	64.8
	>8	103	20.6
5	No of children in the household		
	1–3	253	50.6
	4–6	219	43.8
	>6	28	5.6
6	Ethnicity		
	Punjabi	181	36.2
	Saraiki	251	50.2
	Pathan	68	13.6
7	Activities followed by children		
	Indoor	160	32
	Outdoor	340	68
8	Education		
	College/University	42	8.4
	High School	81	16.2
	Secondary	77	15.4
	Primary	153	30.6
	Illiterate	147	29.4
9	Family structure		
	Nuclear family	364	72.8
	Extended family	136	27.2
10	Monthly income (PKR)		
	<10,000	45	9
	10,000–25,000	156	31.2
	25,000–50,000	198	39.6
	>50,000	101	20.2

3.2. Disease Concerns of Households

Only 43.6% (*n* = 218) of the respondents had heard of the zoonotic disease and 56.4% (*n* = 282) had not heard about the disease. Likewise, 33% (*n* = 165) had knowledge about CL and 67% (*n* = 335) were unaware of it. The majority of the participants did not know that sandflies carry this disease. Only 17.4% (*n* = 87) of the respondents knew the peak time for sandfly biting is dawn and few 29.8% (*n* = 149) of the respondents were aware that camping in the desert increases the risk of disease spread. When the respondents were questioned about the risk factors, 27.6% (*n* = 138) answered poor hygiene, 35.8% (*n* = 179) said sleeping in an open area, 10.2% (*n* = 51) walking barefoot, and 20.2% (*n* = 101) answered all of these. According to 70.4% (*n* = 352) of the respondents, CL is not a curable disease while 29.6% (*n* = 148) had the opinion that CL was a curable disease. Detail regarding the disease concern of households is given in Table 2.

Table 2. Disease concern of the households.

Variables	Frequency (*n*)	Percentage (%)
Disease Concern		
Have you ever heard about Zoonotic disease?		
Yes	218	43.6
No	282	56.4
Do you know about cutaneous leishmaniasis (CL)?		
Yes	165	33
No	335	67
Did you ever see a leishmaniasis patient or have a history of leishmaniasis?		
Yes	56	11.2
No	444	88.8
Do you think cutaneous leishmaniasis is a lethal disease?		
Yes	31	6.2
No	469	93.8
Do you know about sandflies?		
Yes	235	47
No	265	53
Can you identify/differentiate sandflies from common houseflies/mosquitoes?		
Yes	210	42
No	290	58
Do you think sandflies carry this disease?		
Yes	103	20.6
No	397	79.4
What is the peak incidence time?		
Morning	87	17.4
Evening	101	20.2
Dawn to dusk	170	34
Night	65	13
Do not Know	77	15.4
Do you know about the life cycle of sandflies?		
Yes	59	11.8
No	441	88.2
In your opinion, CL is more common among which gender?		
Male	19	3.8
Female	36	7.2
Both	326	65.2
Don't Know	119	23.8
Who is the at most at risk from CL?		
Pregnant women	16	3.2
Women of childbearing age 15–44	2	0.4
Disable people.	37	7.4
Adolescence 15–24	7	1.4
Children	89	17.8
Older Adult	2	0.4
Everybody	254	50.8
Do not Know	93	18.6

Table 2. *Cont.*

Variables	Frequency (*n*)	Percentage (%)
Disease Concern		
What are the risk factors for cutaneous leishmaniasis?		
Poor hygiene	138	27.6
House architecture	12	2.4
Walking barefoot	19	3.8
Sleeping in an open area	51	10.2
All above	179	35.8
Don't Know	101	20.2
Where do you and members of your household typically get bitten by sandfly/mosquitoes?		
Home	282	56.4
Work	103	20.6
School	49	9.8
Park	58	11.6
Others	8	1.6
Does camping in the desert/farm (in an open area) increase the risk for disease?		
Yes	149	29.8
No	351	70.2
Can this disease be cured?		
Yes	148	29.6
No	352	70.4

3.3. Preparedness of Households

Out of 500 respondents, only 37.8% (*n* = 189) of the respondents' agreed that CL might be treatable with traditional and herbal medicines while 62.2% (*n* = 311) disagreed. Similarly, 36.8% (184) were in favor of the health department taking actions to prevent CL disease and raise public awareness through education. The majority 66.6% (*n* = 333) of the respondents had not heard of these types of surveys. About 7.4% (*n* = 37) of the respondents had known about surveys through social media, 7.8% (*n* = 39) through websites and 18.2% (*n* = 91) heard about it through friends or family. The details are given in Table 3.

Table 3. Preparedness of the households.

Variables	Frequency (*n*)	Percentage (%)
Preparedness		
CL is associated with dusty areas		
Agree	202	40.4
Disagree	298	59.6
CL is a serious health problem in this community		
Agree	59	11.8
Disagree	441	88.2
CL is treated by traditional and herbal preparations		
Agree	189	37.8
Disagree	311	62.2
Does your household have adequate drinking water?		
Yes	500	100
No	0	0

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Table 3. *Cont.*

Variables	Frequency (*n*)	Percentage (%)
Preparedness		
Do you or members of your family hear about this survey prior to us talking to you today? If yes, how did you or your HH member hear about it	37	7.4
Social media	39	7.8
Website	0	0
Press release	91	18.2
Family/friends	333	66.6
No		
What actions do you believe the health department should take to prevent Cutaneous Leishmaniasis disease?	184	36.8
Education/Awareness	173	34.6
Inspection for waste management	143	28.6
Spraying for sandflies		

3.4. Practices and Environmental Characteristics of Households

A total of 29.6% (*n* = 148) respondents answered that they maintained hygiene at home by proper floor cleaning, whereas 33.6% (*n* = 168) keep their homes dust free and 26% (*n* = 130) used insecticide sprays. A total of 80.6% (*n* = 403) of the respondents did not prefer nets treated with insecticides. Likewise, 92.6% (*n* = 463) of the respondents did not spray their houses and animal shelters with any spray. Moreover, 60.6% (*n* = 219) of the households kept free-range pets whereas 39.4% (*n* = 142) kept their pets tied up. A total of 44.6% (*n* = 223) of respondents preferred natural remedies as repellents, 22% (*n* = 110) considered repellents to be expensive, 17.2% (*n* = 86) declared their unavailability and 15.6% (*n* = 78) experienced rashes or irritated skin due to mosquito repellents. The detail of practices and environmental characteristics of households are given in Table 4.

Table 4. Practices and environmental characteristics of the households.

Variables	Frequency (*n*)	Percentage (%)
Practices and Environmental Characteristics		
How your family disposes waste or garbage every day?		
Throw garbage on the street	325	65
Throw in bins	95	19
Burn it properly	80	16
How do you maintain good hygiene at home?		
Proper floor cleaning	148	29.6
Spray at home	5	0.1
Keeping house dust free	49	9.8
All above	168	33.6
None	130	26
Do you walk barefoot at home?		
Yes	466	93.2
No	34	6.8
Do you have access to the forest?		
Yes	282	56.4
No	218	43.6
Do you prefer spraying your houses and animal shelters?		
Yes	37	7.4
No	463	92.6

Table 4. *Cont.*

Variables	Frequency (*n*)	Percentage (%)
Practices and Environmental Characteristics		
Do you prefer the use of nets treated with insecticides while sleeping?		
Yes	97	19.4
No	403	80.6
From what type of material your house is made up of		
Wood	1	0.2
Bricks	399	79.8
Stones	3	0.6
Mud	97	19.4
The floor of your house made up of		
Bricks	115	23
Sand	172	34.4
Stone	213	42.6
Does the waste present around your house?		
Yes	376	75.2
No	124	24.8
Do you avoid areas of mosquito exposure?		
Yes	130	26
No	370	74
Do you have pets?		
Yes	361	72.2
No	139	27.8
How do you keep your pets?		
Free range	219	60.6
Tied	142	39.4
Do you use skin repellent?		
Yes	80	16
No	420	84
What, if any, are barriers to using mosquito repellent?		
Too expensive	110	22
Product not available	86	17.2
Prefer natural remedies	223	44.6
Rashes or irritated skin	78	15.6
All above	3	0.6
What is your HH current source of drinking water?		
Unfiltered tap	430	86
Filtered tap water	70	14

3.5. Preventive Behavior of Households

A total of 80.4% (*n* = 402) of the respondents did not take any actions to protect themselves while 19.6% (*n* = 98) adopted preventive actions toward CL. Overall, most of the respondents did not adopt any preventive actions toward CL because most of them were impassive when they were asked about preventive practices. However, after obtaining knowledge of CL, 24.8% (*n* = 124) said that they will maintain good hygiene, 6.8% (*n* = 34) responded they well bath daily, 6.2% (*n* = 31) responded they will avoid going outdoor during dawn and dusk, 1.6% (*n* = 8) responded to wear full sleeves, 1% (*n* = 5) said they will stay away from animals and 56.5% (*n* = 282) responded that they would take all measures to prevent themselves from CL. The details are given in Table 5.

Table 5. Preventive behavior of the households.

Variables	Frequency (*n*)	Percentage (%)
Preventive Behavior		
Do you take any actions to protect yourselves?		
Yes	98	19.6
No	402	80.4
Do you wear protective clothing?		
Yes	74	14.8
No	426	85.2
Do you avoid being outside at peak times?		
Yes	45	0.9
No	455	91
Do you use burn mosquito coils or candles?		
Yes	62	12.4
No	438	87.6
After knowing this disease, what preventive measures will you take to prevent yourself from this disease?		
Bath daily	34	6.8
Maintain good hygiene	124	24.8
Stay away from animals	5	0.1
Wear full sleeves	8	1.6
Avoiding going outdoor during dusk and dawn	31	6.2
All above	282	56.4
None	16	3.2

3.6. Association of Sociodemographic Characteristics with Disease Concern, Preparedness, Practices, and Preventive Behavior of Households

The association between sociodemographic characteristics, disease concern, preparedness, and preventive behavior of households were analyzed as shown in Table 6. A significant association ($p < 0.05$) was observed with gender, education, ethnicity, income, activities followed by children, number of children with respect to disease concern. There was no significant association observed for age ($p = 0.51$), gender of head of household ($p = 0.85$), and family structure ($p = 0.17$).

Table 6. Comparison of disease concerns, preparedness, practices, and preventive behavior with socio-demographic characteristics of households.

Socio-Demographic Variables	Disease Concern		*p*-Value
	Adequate *n* (%)	Poor *n* (%)	
Gender			
Male	89 (22.1)	43 (44.3)	$p < 0.05$
Female	314 (77.9)	54 (55.7)	
Age			
18–28	49 (29.2)	119 (70.8)	
29–38	46 (26.3)	129 (73.7)	0.51
≥39	37 (23.6)	120 (76.4)	
Household head			
Male	95 (26.2)	268 (73.8)	0.85
Female	37 (27)	100 (73)	
Household members			
2–4	39 (53.4)	34 (46.6)	
5–8	79 (24.4)	245 (75.6)	$p < 0.05$
>8	14 (13.6)	89 (86.4)	

Table 6. *Cont.*

Socio-Demographic Variables	Disease Concern		*p*-Value
	Adequate *n* (%)	Poor *n* (%)	
No of children in the household			
1–3	93 (36.8)	160 (63.2)	
4–6	38 (17.4)	181 (82.6)	$p < 0.05$
>6	1 (3.6)	27 (96.4)	
Ethnicity			
Punjabi	51 (28.2)	130 (71.8)	
Saraiki	77 (30.7)	174 (69.3)	$p < 0.05$
Pathan	4 (5.9)	64 (94.1)	
Activities followed by children			
Indoor	74 (46.3)	86 (53.8)	$p < 0.05$
Outdoor	58 (17.1)	282 (82.9)	
Education			
College/University	80 (54.4)	67 (45.6)	
High School	35 (22.9)	118 (77.1)	
Secondary	7 (9.1)	70 (90.9)	$p < 0.05$
Primary	6 (7.4)	75 (92.6)	
Illiterate	4 (9.5)	38 (90.5)	
Family structure			
Nuclear family	102 (28)	262 (72)	0.17
Extended family	30 (22.1)	106 (77.9)	
Monthly income			
<10,000	0 (0)	45 (100)	
10,000–25,000	22 (14.1)	134 (85.9)	$p < 0.05$
25,000–50,000	76 (38.4)	122 (61.6)	
>50,000	34 (33.7)	67 (66.3)	
Preparedness			
	Adequate *n* (%)	Poor *n* (%)	
Gender			
Male	77 (19.1)	326 (80.9)	$p < 0.05$
Female	38 (39.2)	59 (60.8)	
Household head			
Male	88 (24.2)	275 (75.8)	0.28
Female	27 (19.7)	110 (80.3)	
Household members			
2–4	39 (53.4)	34 (46.6)	
5–8	65 (20.1)	259 (79.9)	$p < 0.05$
>8	11 (10.7)	92 (89.3)	
No of children in household			
1–3	76 (30)	177 (70)	
4–6	36 (16.4)	183 (83.6)	$p < 0.05$
>6	3 (10.7)	25 (89.3)	
Ethnicity			
Punjabi	53 (29.3)	128 (70.7)	
Saraiki	55 (21.9)	196 (78.1)	$p < 0.05$
Pathan	7 (10.3)	61 (89.7)	
Activities followed by children			
Indoor	56 (35)	104 (65)	$p < 0.05$
Outdoor	59 (17.4)	281 (82.6)	

Table 6. *Cont.*

Socio-Demographic Variables	Disease Concern		*p*-Value
	Adequate *n* (%)	**Poor *n* (%)**	
Education			
College/University	64 (43.5)	83 (56.5)	
High School	29 (19)	124 (81)	
Secondary	9 (11.7)	68 (88.3)	*p* < 0.05
Primary	9 (11.1)	72 (88.9)	
Illiterate	4 (9.5)	38 (90.5)	
Family structure			
Nuclear family	98 (26.9)	266 (73.1)	*p* < 0.05
Extended family	17 (12.5)	119 (87.5)	
Monthly income (PKR)			
<10,000	2 (4.4)	43 (95.6)	
10,000–25,000	21 (13.5)	135 (86.5)	*p* < 0.05
25,000–50,000	64 (32.3)	134 (67.7)	
>50,000	28 (27.7)	73 (72.3)	
Practices			
	Adequate *n* (%)	**Poor *n* (%)**	
Gender			
Male	40 (9.9)	363 (90.1)	0.47
Female	12 (12.4)	85 (87.6)	
Age			
18–28	23 (13.7)	145 (86.3)	
29–38	23 (13.1)	152 (86.9)	*p* < 0.05
≥39	6 (3.8)	151 (96.2)	
Household head			
Male	39 (10.7)	324 (89.3)	0.68
Female	13 (9.5)	124 (90.5)	
Household members			
2–4	13 (17.8)	60 (82.2)	
5–8	31 (9.6)	293 (90.4)	0.07
>8	8 (7.8)	95 (92.2)	
No. of children in household			
1–3	29 (11.5)	224 (88.5)	
4–6	20 (9.1)	199 (90.9)	0.70
>6	3 (10.7)	25 (89.3)	
Ethnicity			
Punjabi	26 (14.4)	155 (85.6)	
Saraiki	24 (9.6)	227 (90.4)	*p* < 0.05
Pathan	2 (2.9)	66 (97.1)	
Activities followed by children			
Indoor	27 (16.9)	133 (83.1)	*p* < 0.05
Outdoor	25 (7.4)	315 (92.6)	
Education			
College/University	35 (23.8)	112 (76.2)	
High School	13 (8.5)	140 (91.5)	
Secondary	2 (2.6)	75 (97.4)	*p* < 0.05
Primary	2 (2.5)	79 (97.5)	
Illiterate	0 (0)	42 (100)	
Family structure			
Nuclear family	35 (9.6)	329 (90.4)	0.34
Extended family	17 (12.5)	119 (87.5)	

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Table 6. *Cont.*

Socio-Demographic Variables	Disease Concern		*p*-Value
	Adequate *n* (%)	Poor *n* (%)	
Monthly income			
<10,000	0 (0)	45 (100)	
10,000–25,000	3 (1.9)	153 (98.1)	*p* < 0.05
25,000–50,000	31 (15.7)	167 (84.3)	
>50,000	18 (17.8)	83 (82.2)	
Preventive behavior			
	Adequate *n* (%)	Poor *n* (%)	
Gender			
Male	55 (13.6)	348 (86.4)	*p* < 0.05
Female	22 (22.7)	75 (77.3)	
Age			
18–28	41 (24.4)	127 (75.6)	
29–38	25 (14.3)	150 (85.7)	*p* < 0.05
≥39	11 (7)	146 (93)	
Household head			
Male	58 (16)	305 (84)	0.56
Female	19 (13.9)	118 (86.1)	
Household members			
2–4	19 (26)	54 (74)	
5–8	54 (16.7)	270 (83.3)	*p* < 0.05
>8	4 (3.9)	99 (96.1)	
No of children in household			
1–3	45 (17.8)	208 (82.2)	
4–6	29 (13.2)	190 (86.8)	0.30
>6	3 (10.7)	25 (89.3)	
Ethnicity			
Punjabi	33 (18.2)	148 (81.8)	
Saraiki	43 (17.1)	208 (82.9)	*p* < 0.05
Pathan	1 (1.5)	67/98.5	
Activities followed by children			
Indoor	32 (20)	128 (80)	*p* < 0.05
Outdoor	45 (13.2)	295 (86.8)	
Education			
College/University	48 (32.7)	99 (67.3)	
High School	19 (12.4)	134 (87.6)	
Secondary	6 (7.8)	71 (92.2)	*p* < 0.05
Primary	4 (4.9)	77 (95.1)	
Illiterate	0 (0)	42 (100)	
Family structure			
Nuclear family	60 (16.5)	304 (83.5)	0.27
Extended family	17 (12.5)	119 (87.5)	
Monthly income			
<10,000	0 (0)	45 (100)	
10,000–25,000	12 (7.7)	144 (92.3)	
25,000–50,000	42 (21.2)	156 (78.8)	*p* < 0.05
>50,000	23 (22.8)	78 (77.2)	

There was also a significant association ($p < 0.05$) of age, ethnicity, activities followed by children, education, monthly income with respect to practice. In the case of preventive behavior, there was a positive association ($p < 0.05$) between gender, age, household members, ethnicity, education, and monthly income. However, non-significant associations

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between the gender of the household head ($p = 0.56$), number of children in the household ($p = 0.30$), family structure ($p = 0.27$), and preventive practices were observed.

4. Discussion

CL is becoming more endemic and disseminating in previously infection-free areas of Punjab, raising the probability that disease-free areas near CL endemic areas are also at risk [13]. Due to their proximity to other CL endemic foci, such as federally managed tribal areas of KPK and Afghanistan, the Upper and Lower Dir Districts are high-risk locations for CL infection [14,23]. The current study attempted to determine the community evaluation of CL among the people of Layyah District, Pakistan and is the first community assessment of leishmaniasis to our knowledge. This household data could be used as a starting point for evaluating and implementing CL control strategies in these or comparable areas. Furthermore, the current study is one of the greatest in terms of sample size (total of 500 respondents), with representative samples from across the Layyah.

In the conducted survey, 33% of the respondents were aware of CL, but their level of concern was so low that 79.4% said they did not know enough about the disease's causative agent. In contrast to our study, in Saudi Arabia general awareness of CL was satisfactory, with 76% of respondents at least knowing of the disease's infectious nature [24]. The majority of the respondents in the current study were either illiterate or had a low level of education, which could explain their lack of disease concern regarding CL. As an outcome, it must be emphasized that using health educational written material has little benefit in terms of CL prevention; however, using alternative approaches such as interviews is more useful. According to studies conducted in India, Nepal, Bangladesh, and Brazil, the vast majority of responders (98%) have significantly improved their knowledge and preparedness for leishmaniasis [25]. This high awareness and concern for CL in these kinds of areas is likely due to the fact that they are endemic areas with many cases of the disease.

The sandfly has been proven to be anthropophilic, feeding on animals, rats, and poultry in addition to human blood [26]. The majority (65%) of respondents of the surveyed houses disposed of or throw the garbage on the street every day. Waste has been thought to be a breeding ground for sand flies. Reported studies agreed that inadequate dwelling conditions and poor waste management were believed to be suitable for sandfly reproduction [27,28]. When asked about their knowledge of the route of transmission, a large proportion of respondents (74%) did not avoid sandfly-infested locations, whereas 60.6% kept free-range animals. In our study, the low awareness of the sandfly vector as a carrier of CL is consistent with previous research conducted in Al-Ahsaa, Saudi Arabia, where only 37.4% of respondents could identify the sandfly as a carrier of CL. Contrary to our result, in Isfahan knowledge regarding CL was very high, with 97.9% of respondents knowing that sand flies carry the disease [29]. The present study's uncertainty regarding vector transmission is similar to a study in Nepal's rural areas, which indicated that most villagers believed that the mosquitoes, not the sand flies, were responsible for illness transmission [30].

Amongst the respondents of the present study, a majority (70.2%) used to sleep outside or camping, which are two possible risk factors for encountering CL. On the other hand, a study conducted in the Al-Ahsaa region, 60% of the respondents were well aware of risk factors associated with CL [24]. Furthermore, sleeping outside in the open air raised the risk of human CL, most likely due to sandfly bites while sleeping. Sleeping outside in open space during the summer months (May–September) is prevalent in Pakistan, and many people, particularly in rural areas, choose to do so. Sandfly activity increases in June and July, reaching a peak in August. Furthermore, entomological studies show that sand flies' nocturnal activity begins early in the evening and is significantly linked to relative humidity rather than temperature [31].

Regarding prevention of CL, the majority (92.6%) of respondents living in houses had no knowledge of suitable preventive measures and they did not prefer to spray in their animal shelters or houses. A total of 85.2% of respondents mentioned that they did not wear protective clothing for prevention whilst 80.4% declared that they did not take any

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preventive measures to protect themselves from disease. Only 12.4% mentioned that the use of mosquito coil is necessary for the prevention of disease. In the Al-Ahsaa region, 33.1% of the respondents assumed the relevance of protective gear, 13.4% recognized the use of protective netting, and 11.8% recognized the preventive role of insecticide spraying, similar to the current study [24]. Only 11.8% of our respondents thought CL was a major health issue. Although the indoor personal prophylactic measures utilized by respondents in our study were not sufficient, 19.4% of them used insecticide-treated nets when sleeping. This is in line with Hejazi's study conducted in Isfahan, which discovered unsatisfactory behavior among the community they surveyed when it came to preventive measures like utilizing a bet net or repellents [32].

Furthermore, few respondents assumed that CL can be treated medically whereas 62.2% responded that CL is a self-limited disease and 37.8% of them thought CL is can be treated by herbal preparations, which is incorrect [33]. Furthermore, in southern Iran, a significant percentage of the respondents (21%) believed in rational medicine as a treatment for CL [34]. Unfortunately, our study showed that 70.4% of respondents wrongly believed that CL cannot be cured, which concurs with another study in Pakistan that reported that 42% of respondents considered it to be a fatal disease [10]. The communities in underdeveloped nations, such as Pakistan, must be educated and informed about leishmaniasis and its vectors through radio, television, surveys, and educational programs. The low perceived preparedness and unsatisfactory practices of the study population highlight the need for health education, awareness campaigns, and future disease research to design appropriate policies to guide government and stakeholders in reducing the risk of cutaneous leishmaniasis outbreaks in such areas [34,35]. Due to the case-control nature of this study, the findings have certain limitations as it is difficult to prove temporal causation in case-control studies. Furthermore, selection and recollection biases are common in these study designs. To determine the causal association between risk factors and outcome, future studies based on cohort study design would be more appropriate.

5. Conclusions

The current study proposed that the population of Layyah has inadequate preparedness as well as a lack of requisite preventive behavior and practices against CL infection, making them prone to disease. The respondents also have limited knowledge related to etiology, risk factors, and treatment facilities for CL. Hence, this study emphasizes the importance of educating this community on preparedness and preventative steps that are necessary to avoid infection, with a focus on vector management. Furthermore, people should be educated through face-to-face education and the use of instructional aides, as written material may not be effective to overpass this gap. CL has developed as a challenging infection in Pakistan, requiring the development of large-scale preventative measures and public awareness to restrict disease spread.

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