

## Risk factors for Kala-azar in Wasit province – Iraq A case control study

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### Abstract

**Background:** Visceral Leishmaniasis is a serious parasitic disease; it is highly endemic in developing countries including Iraq.

**Objective:** To identify some possible risk factors for Visceral Leishmaniasis among a sample of infected children in Wasit Province.

**Patients and Methods:** This is a hospital based case-control study that included 120 children (40 cases and 80 controls) admitted to three main hospitals in Wasit Province (Al-Swairra, Al-Aazizya & Al-Zahraa) during the period from first of February 2014 through the end of April 2014. The diagnosis was based on clinical presentation and serological test. All cases and control were interviewed through structured questionnaire which included (socio-demographic, sleeping characteristics, house characteristics) and other environmental related factors.

**Results:** The risk factors in this study are the following: Presence of rodents in houses of patients is an important risk factor associated with Kala-azar OR= 7.071 (95% CI= 2.79-17.926). The study showed that sleeping near animals was an important predictor for Kala-azar and significantly associated with this disease OR= 6.176 (95% CI= 2.681-14.231). Another risk factor that associated significantly with this disease was the presence of insects in the houses of patients OR= 5.697 (95% CI= 2.331-13.922) and the presence of dogs near houses OR= 3.116 (95% CI= 1.316-7.380), another risk factor was found such as sleeping on ground OR=2.935 (95% CI= 1.332-6.469) while sleeping on first floor and using bed nets were found to be protective factors OR= 0.324 (95% CI= 0.089-1.187) OR=0.234 (95% CI= 0.101-0.544) respectively. The signs and symptoms of cases were fever reported in all patients (100%) while anemia in (75.0%), splenomegaly in (57.5%) and hepatomegaly in (45.0%).

**Conclusions:** The most important risk factors that were associated significantly with visceral leishmaniasis in this region of Iraq were presence of rodents in houses of patients, sleeping near animals, insects in houses of patients, dogs near houses and sleeping characteristics like sleeping on ground.

### Introduction

Leishmaniasis refers collectively to various clinical syndromes caused by obligate intracellular protozoan parasite of the genus *Leishmania*, which affect mostly the reticulo-endothelial system.

Infection is acquired through the bite of an infected female sand fly of the genus *Phlebotomus*, and has wide range of symptoms in human being, depending on the species of *leishmania* and the host immunity. Visceral leishmaniasis (VL) have another names (Kala-azar, Dum-Dum fever) which is the severe systemic form of the disease<sup>(1,2)</sup>.

Visceral leishmaniasis, which is fatal if left untreated, has an incidence rate of 0.5 million cases worldwide, causing an estimated 59,000 deaths annually<sup>(3)</sup>.

In Iraq there are no available data on any recent epidemic outbreak of (V.L.) which is considerable a public health threat, (V.L) is disease of childhood, more than 90% of affected children are under five years, about 40% of them are under one year, with a case fatality ratio (CFR) of about 3%<sup>(4)</sup>.

There are many environmental factors are very essential in occurrence and distribution of disease including: living with animals, dogs, rodents and presence of insects in houses of people<sup>(5)</sup>.

Record of Center of Disease Control in Baghdad indicated that this disease is endemic and increasing especially in the last few years<sup>(6)</sup>.

This study was carried out to determine risk factors associated with Visceral Leishmaniasis among Infected Children in Wasit Province.

### Materials and Method:

The study based on a hospital based case control study which was conducted to determine the risk factors associated with contracting Visceral leishmaniasis. The study duration continued from first of February 2014 through the end of April 2014.

The study was carried out at Wasit Province Hospitals (AL-Swairra, AL-Azizya, AL-Zahraa). All cases with visceral leishmaniasis who had been admitted to these hospitals during the time of study implementation (40) cases met the criteria of the study were studied as cases for each one case two age and sex matched control were randomly selected.

Age and sex matched control group of (80) children had been collected at the same time from the same hospitals for comparison.

Data were collected from all the eligible parents of cases and control groups who had given informed consents to participate by using a structured questionnaire.

Diagnosis was done by specialist pediatrician depending on clinical picture and the following Laboratory investigation done for visceral leishmaniasis cases

- 1-Dip stick test.
- 2-Complete blood count.
- 3-ESR (erythrocyte sedimentation test).
- 4-TSB (total serum bilirubin).
- 5-Ultra sound.

Questionnaire form which was prepared to collect information about socio-demographic characteristics including (age, gender, residence, income per month,

Father’s and mother’s education and employment). Sleeping characteristics include (sleeping in first floor, sleeping on ground, sleeping on bed, sleeping near animals and using bed nets). House characteristics include (rodents in the house, insects in the house, dog near the house and previous exposure to insecticide). Clinical manifestations for cases such as (fever, abdominal swelling, splenic enlargement, hepatic enlargement, lymphadenopathy, anemia, jaundice and diarrhea with vomiting).

Statistical analysis was carried out using SPSS version 17. Categorical variables were presented as

frequencies and percentages. Pearson’s chi square ( $X^2$ ) test and fisher exact test were used to find the association between the categorical variables. A  $p$ -value of  $\leq 0.05$  was considered as significant odds ratio and CI were calculated.

**Results**

Table 1 showed the distribution of cases according to clinical manifestations which includes (fever, abdominal swelling, splenic enlargement, hepatic enlargement, lymphadenopathy, anemia, jaundice and diarrhea with vomiting).

**Table 1: Distribution of cases according to clinical manifestation**

Clinical manifestations (n=40)		No. (%)
<b>Fever</b>	Yes	40 (100%)
	No	0 (0%)
<b>Abdominal swelling</b>	Yes	21 (52.5%)
	No	19 (47.5%)
<b>Splenic enlargement</b>	Yes	23 (57.5%)
	No	17 (42.5%)
<b>Hepatic enlargement</b>	Yes	18 (45.0%)
	No	22 (55.0%)
<b>Lymphadenopathy</b>	Yes	2 (5.0%)
	No	38 (95.0%)
<b>Anemia</b>	Yes	30 (75.0%)
	No	10 (25.0%)
<b>Jaundice</b>	Yes	3 (7.5%)
	No	37 (92.5%)
<b>Diarrhea and vomiting</b>	Yes	1 (2.5%)
	No	39 (97.5%)

**Table 2** the association between study groups (Cases Vs controls) and socio-demographic characteristics including (age, gender, residence and income per month). There was no significant association between leishmaniasis and other socio-demographic characteristics.

**Table 3** the association between study groups (Cases Vs controls) and father’s and mother’s characteristics including (education, and employment). There was no significant association between leishmaniasis and father’s and mother’s characteristics.

**Table 2 Odds ratios and Confidence intervals of (Cases Vs controls) and socio-demographic characteristics**

Characteristic	Study group		$\chi^2$	P-value	Odds ratio	(95% CI)
	Cases	Control				
<b>Age Groups</b>						
< 12 months	15 (37.5%)	32 (40.0%)	0.631	0.889	1	-
(12-24) months	13 (32.5%)	26 (32.5%)				
(24-36) months	7 (17.5%)	10 (12.5%)				
$\geq 36$ months	5 (12.5%)	12 (15.0%)				
<b>Gender</b>						
Male	20 (50.0%)	40 (50.0%)	-	-	-	-
Female	20 (50.0%)	40 (50.0%)				
<b>Residence</b>						
Rural area	22 (55.0%)	37 (46.2%)	0.817	0.366	1.42	0.663-3.044
Urban area	18 (45.0%)	43 (53.8%)				
<b>Income per month</b>						
Not enough	23 (57.5%)	41 (51.2%)	0.419	0.518	0.777	0.362-1.670
Enough and more	17 (42.5%)	39 (48.8%)				

**Table 3:-Association between study groups (Cases Vs controls) and father's and mother's characteristics**

Characteristic	Study group		$\chi^2$	P-value
	Cases (%)	Control (%)		
<b>Father's education</b>				
Illiterate	14 (35.0%)	17 (21.2%)	3.212	0.201
Primary	10 (25.0%)	30 (37.5%)		
Secondary and more	16 (40.0%)	33 (41.3%)		
<b>Father's employment</b>				
Employee	15 (37.5%)	24 (30.0%)	0.684	0.408
Not employed	25 (62.5%)	56(70.0%)		
<b>Mother's education</b>				
Illiterate	28 (70.0%)	43 (53.8%)	2.524	0.283
Primary	9 (22.5%)	29(36.2%)		
Secondary and more	3 (7.5%)	8 (10.0%)		
<b>Mother's employment</b>				
Employee	0 (0%)	2 (2.5%)	-	-
Not employed	40 (100%)	78(97.5%)		

**Table 4** the association between study groups (Cases Vs controls) and sleeping characteristics including (sleeping in first floor, sleeping on ground, sleeping on bed, sleeping near animals and using bed nets). There were significant associations between leishmaniasis and sleeping on ground, sleeping on bed, sleeping near animal

and using bed nets, while there was no significant association between leishmaniasis and sleeping on first

**Table 5** the association between study groups (Cases Vs controls) house characteristics including (insects in the house, rodents in the house, dog near the house). There was significant association between leishmaniasis and house characteristics.

**Table 4: Odds Ratios and 95%CI of study groups (Cases Vs controls) and sleeping characteristics**

Sleeping characteristics	Study group		$\chi^2$	P-value	Odds ratio	95% CI
	Cases	Control				
<b>Sleeping on first floor</b> Yes	3 (7.5%)	16 (20.0%)	3.127	0.077	0.324	0.089-1.187
No	37 (92.5%)	64(80.0%)				
<b>Sleeping on ground</b> Yes	26 (65.0%)	31 (38.8%)	7.368	0.007**	2.935	1.332-6.469
No	14 (35.5%)	49(61.2%)				
<b>Sleeping on bed</b> Yes	14 (35.0%)	49 (61.2%)	7.368	0.007**	0.341	0.155-0.751
No	26 (65.0%)	31(38.8%)				
<b>Sleeping near animal</b> Yes	25 (62.5%)	17 (21.2%)	19.94	<0.001**	6.176	2.681-14.231
No	15 (37.5%)	63(78.8%)				
<b>Using bed nets</b> Yes	10 (25.0%)	47 (58.8%)	12.180	<0.001**	0.234	0.101-0.544
No	30 (75.0%)	33(41.2%)				

**Table 5 Association between study groups (Cases Vs controls) and house characteristics**

House characteristics	Study group		$\chi^2$	P-value	Odds ratio	(95% CI)
	Cases	Control				
<b>Rodents in house</b> Yes	33 (82.5%)	32 (40.0%)	19.401	<0.001**	7.071	2.79-17.926
No	7 (17.5%)	48(60.0%)				
<b>Insects in house</b> Yes	32(80.0%)	33 (41.2%)	16.129	<0.001**	5.697	2.331-13.922
No	8(20.0%)	47(58.8%)				
<b>Dog near house</b> Yes	31(77.5%)	42 (52.5%)	6.995	<0.001**	3.116	1.316-7.380
No	9(22.5%)	38(47.5%)				

**Discussion:**

Iraq has been reported to be one of the endemic areas of Kalaazar<sup>(7,8)</sup>.

The majority (39.1%) of cases of VL in this study presented in the age of less than one year. This was in agreement with the findings of other

studies<sup>(9,10)</sup> which showed that 40% of VL cases were <1 year of age, and in contrast to other researchers<sup>(11,12)</sup> who showed that most of the cases are from 1-2 years of age. This suggests that infants are at higher risk of VL probably because of low immunity.

The majority of cases came from rural area this finding is in agreement with the finding of other studies<sup>(13,14)</sup> which showed that rural area had the highest sero-positivity rate for VL compared with urban areas. These results reflect a lower standard of living in the rural area than in urban area, with high humidity of the soil and there is dense vegetation, these factors probably provide a suitable environment for breeding of sand flies it and leads to an increase risk of transmission of the disease in the rural areas. This can be attributed to the life style and the house building material that had an effect of increasing transmission of the disease<sup>(14)</sup>.

All our patients presented with fever 100% or, and the majority with hepato-splenomegaly which is similar to other studies done in Iraq<sup>(15,16)</sup>, while it is lower than the incidence of organomegaly recorded in Saudi Arabia<sup>(17)</sup> So this may indicate that parents of our patients may seek early medical advice and Iraqi medical staff are with high awareness to kala-azar, hence earlier diagnosis, was noticed in Iraq.

The main hematological findings in this study were anemia 75%. It is well-known that Anemia is one of the most striking features of visceral leishmaniasis<sup>(18,19,20)</sup>.

In our study we found that the presence of rodents is an important predictor of the disease between VL and rodents and this finding is in agreement with the finding of other studies<sup>(14,15)</sup>.

The presence of rodents had direct effects on the infection with V.L.

So the rodents played as a reservoir of the leishmania, the negligence of eradication of the rodents led to the increase of infection<sup>(14,21)</sup>.

having animals sleeping in the house increased significantly the risk of kala-azar and this agrees with the finding of other studies<sup>(22,23)</sup> but in contrast with other studies<sup>(24)</sup>, which explain ownership of large domestic animals such as cattle and water buffalo was strongly protective even after adjustment for house size and landholdings. Alternative explanations are that large animals indicate higher socioeconomic status, or that their ownership may be associated with better nutritional status among household members, and through this mechanism, may prevent the progression from subclinical infection to clinical VL<sup>(25,26)</sup>.

In our study we found highly significant relationship between presence of insects in houses

and the occurrence of disease this finding agreed with the findings of other studies<sup>(27,28,29)</sup>.

In the current study we found a strong significant relationship between visceral leishmaniasis and the presence of dogs near patients houses and this finding is in agreement with finding of other studies<sup>(27,30)</sup>, sleeping near dogs was associated with nearly 7-fold increased risk. Although transmission is thought to be predominantly anthroponotic in these settings, infected dogs have been found by serology or PCR in several studies in Ethiopia as well as Sudan, however, the role of the dog as an epidemiologically important infection reservoir host is not yet clear<sup>(31,32,33)</sup>.

In our study we found sleeping on the first floor sleeping and sleep on a bed were protective, presumably by decreasing contact with sand flies.

Increase risk during sleeping on first floor and sleeping on ground and this finding is in agreement with other finding of other studies<sup>(34)</sup>.

In our study we found that the strong protective effect with use of bed nets and number of sand flies caught and human bite was reduced by using bed nets and this finding is in agreement with other finding of other studies<sup>(21,35)</sup>.

In our study we found that poverty is not a risk factor for kala-azar, but it can lead to malnutrition, poor housing conditions, lack of preventive measures in the form of sanitation and bed nets, and illiteracy this finding is in agreement with other finding of other studies<sup>(7,36)</sup>.

In conclusion the most important risk factors that were associated significantly with visceral leishmaniasis in Iraq were presence of rodents in patients, presence of insects in houses of patients, sleeping near animals, presence of dogs near houses and sleeping characteristics like sleeping on ground, using bed nets and sleeping on first floor were found to be protective.

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