



Socioeconomic and behavioural risk factors for infection of visceral leishmaniasis gedaref state – Sudan 2015

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ABSTRACT

Background

Visceral leishmaniasis (VL) (known as kala azar) is associated with low socioeconomic status, and patients are among the poorest. In Sudan visceral leishmaniasis is one of the most important infectious diseases with an estimated 20,000 cases annually; 80% in Gedaref State. The social, economic, and behavioral factors play an important role in establishing both individual and population-wide vulnerability to the disease.

Methods

A descriptive cross-sectional community based study was conducted at Barbar Elfugara village to determine the socioeconomic and behavioral risk factors among head of the households regarding infection with VL. A sample size of 224 heads of households was determined using statistical formula. Data were collected using questionnaire, observation check list and reviewing records. SPSS was used for analyzing data and chi-square test for the association between different variables.

Results

The main risk factors of kala azar were gender {males were affected more than twice females (24.4%:9.1%)}; the age group {<20 yrs (42.9%)}. Other factors were illiteracy (30.1%), occupation mainly farmers (28.2%), poverty (39.1%), large families (31%) and living in one house room (45.5%). The results showed that the respondents were highly aware of kala azar (97.3%), the majority (90.8%) believed that kala azar is transmitted by an insect but only (55.5%) of them were aware of the sand fly. The respondents showed poor knowledge of breeding sites (25.5%) and biting time (34.5%). Consistent use of insecticide treated nets and sleeping inside habit were strongly protective (P=0.01) (P=0.00).

Conclusion

The study showed that the low socioeconomic status and poor knowledge of KA transmission are the major risk factors for KA infection in the area.

Keywords: VL, KA, Socioeconomic, Behavioral, Risk Factors, Gedaref

INTRODUCTION

Leishmaniasis is one of the world's most neglected diseases, affecting mainly very poor people in developing countries. It is prevalent throughout the

tropical and subtropical regions of Africa, Asia, the Mediterranean, Southern Europe (old world) and South and Central America (new world). The form that is deadly is visceral leishmaniasis (VL), caused by *Leishmania donovani* in the old world and *Leishmania*

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infantum in both the old and new world.¹ Globally Leishmaniasis is endemic in over 98 countries worldwide, with an estimated 350,000,000 people at risk of infection. The annual incidence of reported global visceral leishmaniasis cases is 58,200. More than 90% of new cases are reported from six countries Bangladesh, Brazil, Ethiopia, India, South Sudan and Sudan. However, only about two-thirds of countries had reported incidence data for a five-year period, data were sparsest for the foci in Africa.² In Sudan VL is one of the most important infectious diseases with an estimated 20,000 cases occurring annually, 80% in Gedaref State. High incidence villages were clustered around the Atbara and Rahad rivers and in areas of low altitude and high rainfall.³ A number of challenges exist for the prevention and control of leishmaniasis. Socioeconomic and culture factors are crucial and contribute greatly to the maintenance of the disease. VL is associated with low socioeconomic status and VL patients are among the poorest of poor.⁴ Control strategies that do not take into account the socioeconomic context of this disease will be difficult to sustain in the long term.²

MATERIAL AND METHODS

Gedaref State extends over 71,621 km² bordered in East by the Ethiopian Frontier, in the South and the West by Rahad River, and in the Northeast by Atbara River. The selected village Barbar Elfugara is located about 75 km South-East of Gedarif Town and 50 km from the west bank of Atbara River in Al-Guereisha Locality. The principal soil type is vertisols; include a mixture of alluvial clays, and silts. Acacia, *Balanites aegyptiaca*, seyal and other trees are found in the area. There are seasonally flowing watercourses running across the village. The village is surrounded by rain irrigated farms and it is virtually isolated during the rainy season when roads become inaccessible.⁵ Barbar Elfugara was established in early twenties centuries by members of the Masaleet tribe who displaced from Western Sudan. The migration to the village increased dramatically after the drought that hit Darfur in 1984. The total population of the village is 2097 in 513 households. The inhabitants are mainly farm laborers and subsistence farmers and their staple diet is sorghum or millet porridge (asida).

A sample size of 224 head of households in the area was determined using statistical formula; $n = t^2 \times p \times q / d^2$. Where: n = estimate of sample size, t = confidence (for 95% use 1.96), d = precision (0.05), p = prevalence (0.2) and $q = 1-p$.⁶ Data were collected using questionnaire, observation check list and reviewing records and analyzed using Statistical Package for Social Science (SPSS) and the association between different variables were checked using Chi-square test, at a level of significance was taken of 0.05.

RESULTS

Concerning socio-demographic characteristics (sex, age, education, occupation, family members and income) were have a significant relationship with VL infection, male were infected more than twice female ($P.V=0.03$), VL infection is high in the age groups <20 yrs (42.9%), the highest VL infection was among illiterate head of the households ($P.V=0.00$), most of head of the households are farmers, the highest proportion of VL infection was founded among farmers ($P.V=0.03$), and the high VL infection associated with large families (more than 6 member) ($P.V=0.01$). A group (28.5%) of head of the households monthly income is less than 450 SDG, a group (39.1%) out of them were infected with kala azar and (66.1%) of head of the households earn 450 SDG, a group (14.9%) out of them were infected with kala azar. There is a significant relationship between Kala azar infection and the respondents' monthly income. ($P.V=0.05$).

The majority (97.3%) of head of the households aware about kala azar disease, the majority (93.6%) of them aware that kala azar is an infectious disease. Also the majority (90.8%) of head of the households knew that the disease is transmitted by an insect and more than half (55.5%) of them knew the vector is sand fly. A group (34.5%) of head of the households aware that the time of biting is dusk and the majority (74.5%) of them showed poor knowledge about the breeding site.

Table 1 Socio-Demographic Variables

Risk Factors	Group		Total	Chi-Square	P. Value
	+ve	-ve			
Gender					
Male	44 (24.4%)	136 (75.6%)	180 (80.3%)	4.950	0.03
Female	4 (9.1%)	40 (90.9%)	44 (19.4%)		
Age Group					
<20	3 (42.9%)	4 (57.1%)	7 (3.1%)	20.397	0.00
20-40	37 (31.7%)	80 (68.3%)	117 (52.2%)		
41-60	7 (10.0%)	63 (90.0%)	70 (31.3%)		
>60	1 (3.4%)	29 (96.7%)	30 (13.4%)		
Education					
Illiterate	32(30.1%)	74(69.9%)	106 (47.3%)	9.842	0.04
Khalwah	9(12.0%)	66(88.0%)	75 (33.5%)		
Basis	4(16.0%)	21(84.0%)	25 (11.2%)		
Secondary	3 (18.8%)	13(81.2%)	16 (7.1%)		
Occupation					
Farmer	40 (28.2%)	142 (63.4%)	102 (71.8%)	10.846	0.03
Herdsmen	1 (16.7%)	6 (2.7%)	5 (83.3%)		
Employee	1 (12.5%)	8 (3.6%)	7 (87.5%)		
Free Work	5 (8.2%)	61 (27.2%)	56 (90.8%)		
Dealer	7 (3.1%)	6 (85.7%)	1 (14.3%)		
Monthly Income					
<450	64 (28.5%)	39 (60.9%)	25 (39.1%)	6.054	0.04
450	148 (66.1%)	126 (85.1%)	22 (14.9%)		
>450	12 (5.4%)	11 (91.7%)	1 (8.3%)		
Family Size					
<6	78 (34.8%)	70 (89.7%)	8 (10.3%)	9.314	0.01
6	104 (46.4%)	77 (74.0%)	27 (26.0%)		
>6	42 (18.8%)	29 (69.0%)	13 (31.0%)		

The study indicated that the majority (91.1%) of head of the households knew the ITNs, but only (17.4%) of them use it. Also the study showed that only (4.5%) of head of the households provide ITNs for all family members. When looking for the reasons (36.5%) of head of the households said it is expensive, (28.9%) said it is not priority, (4.7%) said it is valueless and (29.9%) said no reason. The majority (78.6%) of head

of the households prefer KA Treatment Centres. Most of the cases of Kala azar were found in the household having fewer numbers of rooms. The result showed a significant relationship between ITNs users and nonusers (P.V=0.01), the number of rooms and kala azar infection. (P.V=0.00) and between sleeping habits and VL infection (P.V=0.01).

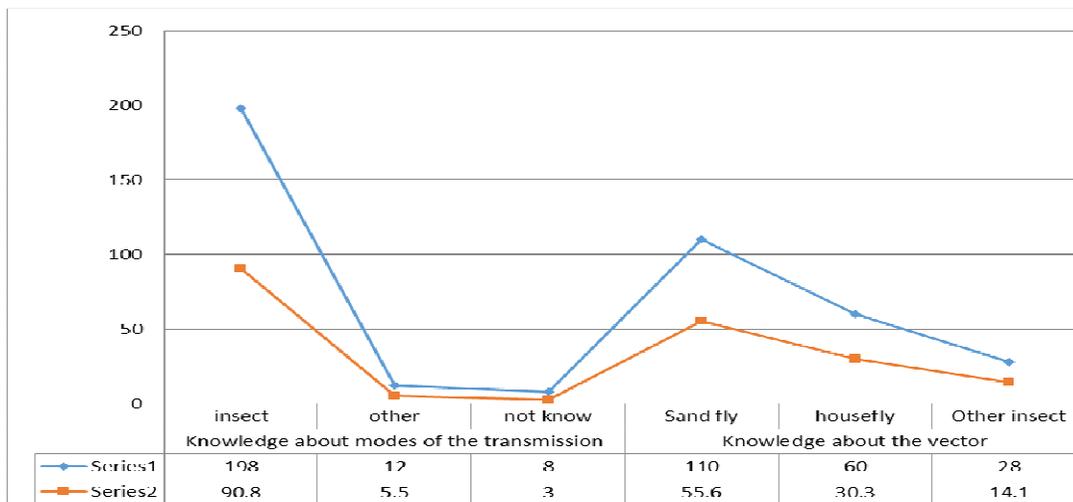


Fig 1 Knowledge Variables

Table 2 Behavioral Variables

Risk Factors	Group		Total	Chi-Square	P. Value
	+ve	-ve			
Uses ITNs					
Yes	39 (17.4%)	37 (94.9%)	2 (5.1%)	7.452	0.01
No	185 (82.6%)	139 (75.1%)	46 (24.9%)		
Sleeping Habits					
Indoors	15 (6.7%)	8 (53.3%)	7 (46.7%)	9.375	0.01
Outdoors	169 (75.4%)	133 (78.7%)	36 (21.3%)		
Vary	40 (17.9%)	35 (87.5%)	5 (12.5%)		
No. of Rooms					
One	11 (4.9%)	6 (54.5%)	5 (45.5%)	26.581	0.00
Two	113 (50.4%)	76 (67.3%)	37 (32.7%)		
Three	75 (33.5%)	70 (93.3%)	5 (6.7%)		
Four	25 (11.2%)	24 (96.0%)	1 (4.0%)		

DISCUSSION

The study revealed that majority (80.3%) of head of the households are males, a group (24.4%) of them were infected with kala azar, and only (19.7%) are females, small group (9.1%) of them were infected. There was a significant relationship between Kala azar infection among respondents and the gender factor ($P.V=0.03$), infection in male is more than twice in female. The difference could be due to males work and the outdoor life they lead, which make them more frequent exposure than females, also it might be due to under detection of disease in women in traditionally male-dominated families. This is similar to that reported by Judith, 2003⁷ "As in most

countries males are almost twice more likely to be affected by VL than females, with young children being at the highest risk in Sudan". The disease infection is high among age group (<20 yrs) and (20_40 yrs) with percentage (42.9%) and (31.7%) respectively. There was a significant relationship between the disease prevalence and the age group in this study results ($P.V = 0.00$). These findings appear that VL is mainly a disease of youngest people who have not yet enquired adequate clinical immunity. This is similar to study in Bangladesh conducted by Caryn, 2005⁸ " Risk was highest for persons 3–45 years of age", and also similar to study in Nepal carried by Picado, 2014⁹ "Individuals aged 14 to 24

years old had twice the risk of seroconverting and presenting with VL compared to children (0–6 years old)." Also the study highlighted that about (47.3%) of respondents were illiterate and (30.1%) of them were infected with VL. There was a significant relationship between the illiteracy and prevalence of the disease ($P.V=0.04$).

Education is a vital factor; it shapes future occupational opportunities and earning potential. It also provides knowledge and skills that allow better educated persons to gain more ready access to information and resources to promote health. This is similar to that reported by Oryan, 2014¹⁰ "The low level of education increased the infection with VL". The study showed that most respondents (63.8%) are farmers. The highest proportion of VL infection (28.2%) was founded among them. There was a significant relationship between the occupation and prevalence of the disease ($P.V=0.03$). The occupations may represent risk factors for VL infection, because it has been thought that the transmission of the disease in eastern Sudan takes place outside the villages. This is similar to that reported by Oryan, 2014¹⁰ "Nomadic populations, and men who work in agricultural or pastoral settings are also often at increased risk, due to increased time spent outdoors and thus higher exposure to the sand fly vector, especially for those who sleep outside." The findings in this study indicated a significant relationship between the family size and the infection with kala azar ($P.V=0.01$). Most of the cases of Kala-azar were found in the household having fewer numbers of rooms. The result showed a significant relationship ($P.V=0.00$). These findings indicated that overcrowding had facilitated the disease transmission. People who lived in such condition (having one or two rooms for 6 or more persons) had a great risk for being bitten by sand flies. This is similar to study carried by Oryan, 2014¹⁰ "crowding of a large number of people into a small space may attract peridomestic anthropophilic sand flies by providing a large biomass for blood-meals." The study demonstrated that VL risk in the area is dependent on decreased of respondents income.

There was a significant relationship between Kala azar infection and poverty ($P.V=0.04$). Low income

increases the risk for VL and aggravates disease progression. Most of the respondents living even at or below poverty line and poverty increases the risk for leishmaniasis in many ways. This is similar to that reported by WHO, 2014² "VL mostly affecting the poorest population groups" and previous study in India and Nepal carried by Picado, 2014⁹ "Belonging to the richer quintiles of the wealth distribution was associated with a reduced risk of infection." The study revealed a high level of knowledge among head of the households, (97.3%) are aware of VL disease and (93.6%) out of them aware of kala-azar is an infectious disease and can be transmitted from one person to another. The study showed that (42.2%) of head of the households said that fever, headache and loss of weight are the most common signs and symptoms, (35.8%) said spleen or liver enlargement, and (22.0%) not know. This finding appears the low knowledge of respondents regarding the signs and symptoms of the disease. This level of knowledge about the signs and symptoms of the disease prompts patients not to seek early diagnosis and treatment. This is similar to a previous study in Gedaref State carried by Mo'awia, 2008¹¹ "Fever and loss of weight were the most common symptoms known to 28.1% of respondents. Liver and splenic enlargement is a symptom of kala-azar that was answered by 31.4%". The study revealed that the majority (90.8%) of head of the households said that the disease is transmitted by an insect without determining the type but only (55.5%) of them knew that the vector is sand fly. The knowledge of head of the households about the sand fly was poor although knowing of sand flies was very important in the control measures for kala azar infection. This is similar to a previous study in Gedaref State carried by Mo'awia, 2008¹¹ "The villager's knowledge about transmission of kala-azar was poor. Most of the villagers believed that other insects (e.g. mosquitoes) (51.0%) rather than sand flies (49.0%) are responsible for transmission of the disease." The study showed that only (34.5%) of head of the households said that the sand fly biting time is at dusk. The majority (74.5%) of head of the households showed poor knowledge about breeding sites of the sand fly. Poor knowledge of head of the households about biting time and breeding sites of sand fly underline the need of health educational program to help in kala azar

infection control. This is similar to a previous study in Gedaref State carried by Mo'awia, 2008¹¹ "Approximately, third of the respondents thought that sandflies breed in hospitals". The study indicated that the majority (91.1%) of head of the households knew the ITNs, but only (17.4%) of them use it. Also the study showed that only (4.5%) of head of the households provide ITNs for all family members. When looking for the reasons (36.5%) of head of the households said it is expensive, (28.9%) said it is not priority, (4.7%) said it is valueless and (29.9%) said no reason. These findings showed that head of the households were appearing high level of knowledge about ITNs. Even though they appear low level of behavior about the use of ITNs as an effective personal protective mean. This is similar to a previous study in Gedaref State carried by Ritmeijer, 2007¹² "During an epidemic of (VL) in eastern Sudan, (MSF) distributed 357,000 (ITN) to 155 affected villages. Two years later, 44% of nets were reasonably intact, of the missing nets, (7.3%) were reportedly sold. This occurred only in the village of Barbar Elfugara, the poorest village. During difficult financial periods, a bed net is an asset of value to be sold". Out of (17.4%) ITNs users, only (5.1%) had VL infection while out of (82.6%) ITNs nonusers (24.9%) had developed the disease. The difference in occurrence of disease between two groups was significant (P.value=0.01). Head of the households not using ITNs in the area had more probability of developing disease than those using it. As in many studies carried out in the endemic countries ITNs are very effective in the control of VL. This is similar to a previous study in Gedaref State carried by Ritmeijer, 2007¹² "Regression analysis of incidence data from 114 villages demonstrated a significant reduction of VL by village after months following ITN provision. The greatest effect was 17-20 months' post-intervention, with VL cases reduced by 59%. An estimated 1060 VL cases were prevented, a mean protective effect of 27%. This analysis indicates a potentially strong reduction in VL incidence following a community distribution of ITN." The behaviour of head of the households regarding kala azar diagnosis and treatment, the study indicated that the majority of head of the households (78.6%) preferred kala azar Treatment Centers for diagnosis and treatment, (17.8%) said public hospitals and health centers

(SMoH) and (3.6%) said private sectors. The behaviour of head of the households regarding kala azar diagnosis and treatment, most of them preferred specialize kala azar Treatment Centers than (SMoH) hospitals and health centers because it is affordable, accessible and reasonable for transport cost. Good accesses to health services and strengthen of health systems in hyper endemic areas are the major factors in controlling transmission of VL. This is similar to a previous study in Gedaref State carried by Mo'awia, 2008¹¹ "Most of the respondents preferred specialized VL treatment centers than health centers or public health sectors for treatment. VL treatment centers were chosen by the population due to their distance from their villages. A close centre distance, with low transport costs, was preferred to a further one with access difficulties, especially in the rainy season".

CONCLUSION

The study showed that the low socioeconomic status and poor knowledge of kala azar transmission are the major risk factors for kala azar infection in the area. Based on these findings, a prevention and control strategy should be implemented that aims at high coverage with and usage of insecticide treated nets and maintenance of adequate kala azar diagnostic and treatment facilities at the peripheral level. Health education is very essential in reducing risk of kala azar.

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