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Full Length Research Paper

Knowledge, attitude and practice related to management of cutaneous leishmaniasis among physicians in tertiary healthcare facilities in Sokoto, Nigeria

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Reports from studies across Nigeria show that cutaneous leishmaniasis (CL) has become an important social and public health problem, particularly in the Central and North – Western geo – political zones of the country. In the absence of an effective vaccine for the prevention of leishmaniasis, coupled with the poor environmental sanitation and vector control measures prevalent in many communities in Nigeria, control of the disease in the country to a large extent depends on early diagnosis and treatment of cases. This study aimed to assess the knowledge, attitude and practice related to management of CL among physicians in tertiary healthcare facilities in Sokoto, Nigeria. This was a cross sectional descriptive study among 164 doctors practicing in the two tertiary healthcare facilities in Sokoto from October to November 2013. Data collection was done using a set of pretested, semi-structured questionnaires; descriptive statistics was used for analysis. Recognition of CL lesions was high (75.0%), 87.0% had accurate knowledge of its transmission, while 89.9% and 90.0% had accurate knowledge of its prevention by vector control and treatment of infected persons respectively. Majority, 63.1% of respondents that had ever seen a case before and correctly recognized the disease referred the patients to clinicians and surgeons for appropriate treatment. Less than half of the respondents knew pentavalent antimony compounds (42.0%), amphotericin B (42.5%), miltefosine (27.6%) and paromomycin cream (38.1%) as drugs for treating CL. Only a few knew cryotherapy (32.3%) and thermotherapy (24.5%) as treatment options for CL. This study demonstrated high recognition of CL lesions and accurate knowledge of its transmission and prevention, but poor knowledge and practice of its treatment among physicians in Sokoto. These findings suggest the need for training institutions involved in medical education to pay sufficient attention to the neglected tropical diseases in their curriculum at all levels.

Keywords: Cutaneous leishmaniasis, knowledge, attitude, practice, management.

INTRODUCTION

Leishmaniasis is a parasitic disease caused by the intracellular protozoan parasites (Leishmania species) and transmitted through the bite of infected female phlebotomine sand flies. Infection may be restricted to the skin in cutaneous leishmaniasis (CL) which produce skin ulcerations with raised borders eventually resulting in

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scarring, to the mucous membrane in mucosal leishmaniasis, or spread to the internal organs especially the spleen, liver and bone marrow in visceral leishmaniasis (VL) eventually resulting in death if severe and left untreated. (Choi and Lerner, 2002; Clen, 2010).

Leishmaniasis has been associated with poverty and also believed to constitute a serious impediment to socio-economic development. As with many diseases of poverty that cause high morbidity but low mortality, the true burden of leishmaniasis remains largely invisible. This is partly because those most affected live in remote areas, and partly because the social stigma associated with the deformities and disfiguring scars caused by the cutaneous form of the disease keeps patients hidden. Of the 350 million people at risk of the disease, an estimated 2 million new cases (1.5 million cases of cutaneous leishmaniasis and 500,000 cases of visceral leishmaniasis) occur annually, but only 600,000 cases were officially declared. About 12 million people were estimated to be currently infected, and the annual mortality from the disease was estimated at 60,000 (World Health Organization (WHO), 2013a).

While more than 90% of global visceral leishmaniasis cases occurred in just six countries (India, Bangladesh, Sudan, South Sudan, Brazil and Ethiopia), cutaneous leishmaniasis had a wider distribution with about 70 to 75% of global estimated cases occurring in ten countries that included Afghanistan, Algeria, Colombia, Brazil, Iran, Syria, Ethiopia, Sudan, Costa Rica and Peru. (Alvar et al., 2012).

Deadly epidemics of visceral leishmaniasis periodically flare up but go mostly unnoticed in spite of case–fatality rates as high as 10% or more. In the 1990s Sudan suffered a crisis with an excess mortality of 100,000 deaths among people at risk. More recently, as a result of epidemiological changes, a sharp increase in the overlapping of Human Immunodeficiency Virus (HIV) infection and visceral leishmaniasis has been observed, especially in intravenous drug users in South-Western Europe. The situation is expected to worsen in Africa and Asia where the prevalence and detection of HIV and leishmania co-infections remain largely underestimated (WHO, 2013b).

Reports from studies across Nigeria show that cutaneous leishmaniasis has become an important social and public health problem, particularly in the Central and North – Western geo-political zones of the country. In a community based survey in Plateau State, Central Nigeria, Igbe et al. (2009) reported a CL prevalence of 2.6%. In another study among students from 29 randomly selected primary and post primary schools in Kaduna, Kaduna State, North - Western Nigeria, Okwori et al. (2001) reported a prevalence of cutaneous leishmaniasis high enough (6.8%) to consider the State endemic for the disease. An outbreak of CL occurred in a secondary school in Sokoto, Sokoto State, North – Western Nigeria (the study area), in 2003, about 10% of the students were diagnosed with the disease (Jiya et al., 2007).

Lack of awareness among clinicians and limited access to appropriate diagnostic methods were believed to be the major reasons why many cases of leishmania / HIV co-infection go undetected in Brazil (Rabello et al., 2003). An estimated 91% of cases of cutaneous leishmaniasis in South Sudan from 1999 to 2002 went unrecognized (Collin et al., 2006). Similarly, in India, as many as 20% of visceral leishmaniasis patients, disproportionately poor and females died before their disease was recognized (WHO, 2010). In essence, leishmaniasis appears to be the most neglected of the neglected tropical diseases (NTDs) with its poor victims virtually abandoned to suffer in silence.

Previous studies conducted in Sokoto, Nigeria (the study area) reported better response to safe, affordable and readily available drugs compared to the toxic, scarce and expensive pentavalent antimony compounds (sodium stibogluconate and meglumine antimonials) by patients treated for CL. A study by Opara and Ameh (2005) reported complete healing of ulcers (leaving a pale but smooth skin with no disfiguring cicatrix) within two to five weeks (maximum nine weeks) among 22 patients treated with a single dose of mectizan (200 – 400 µg/kg body weight), repeated at four weeks if no significant response was observed at the first evaluation, compared to ten and half weeks for patients that had surgical intervention (curettage) and dressing without mectizan administration. Among the 4 controls that took dapsone or rifampicin on the other hand, no healing was recorded even after 16 weeks.

In another study by Igbineweka et al. (2012) among 95 patients with leishmaniasis, of which 60 received topical silver nitrate as single dose, while 35 received intramuscular antimonial therapy (stibogluconate) at a dose of 20mg/kg body weight (up to a maximum dose of 850mg) daily for 21 days. On day 30 of treatment, complete healing of ulcers was recorded among 86.1% of patients treated with topical silver nitrate compared to 6.8% of patients treated with intramuscular antimonial therapy.

Studies conducted in cities in Nigeria such as Ibadan (Titus et al., 2010), Kano (Nabegu, 2010), Jos (Jatau, 2013) and Sokoto (Abiola et al., 2013) reported poor environmental hygiene with unsanitary waste disposal, thus providing breeding grounds for disease vectors. In addition, practice of other vector control measures such as use of insecticides treated nets (ITNs) was found to be low (13%) in Nigeria (National Population Commission (NPC) and ICF Macro, 2009).

In the absence of an effective vaccine for the prevention of leishmaniasis, coupled with the poor environmental sanitation and vector control measures prevalent in many communities in Nigeria, control of the disease in the country to a large extent depends on early diagnosis and treatment of cases. Accurate knowledge of diagnosis and treatment of cutaneous leishmaniasis by

physicians is therefore a sine qua non for effective control of the disease in Nigeria, thus assessment of the pattern of knowledge and practice related to management of the disease by physicians, as a foundation for the development of appropriate interventions aimed at bridging identified gaps and facilitating control of CL is of immense public health significance.

Despite the numerous reports of misdiagnosis of CL by physicians, only a few studies have examined their knowledge on diagnosis and treatment of the disease. This study was conducted to assess the knowledge, attitude and practice related to management of cutaneous leishmaniasis among physicians in tertiary healthcare facilities in Sokoto, Nigeria.

MATERIALS AND METHODS

This was a cross sectional descriptive study conducted at the Usmanu Danfodiyo University Teaching Hospital and Specialist Hospital, Sokoto, Sokoto State, North – Western Nigeria, from October to November 2013. The hospitals provide healthcare services to the population in Sokoto and those referred from the other local government areas in the State; likewise the neighboring Kebbi and Zamfara States. The study population consisted of doctors practicing in the two tertiary healthcare facilities in Sokoto. All doctors practicing in the core clinical departments (community medicine, family medicine, internal medicine, pediatrics, obstetrics and gynaecology and surgery) were considered eligible for enrolment into the study.

The sample size was estimated at 150 using the formula for calculating sample size in a descriptive study (Ibrahim, 2009), 84.0% prevalence of knowledge of sandfly as the vector of the agent of leishmaniasis from a previous study (Ruoti et al., 2013), adjustment for desirable sample size for a population of 437 doctors in the two tertiary healthcare facilities, as obtained from institutional records (Araoye, 2004), and anticipated 95% response rate. The study subjects were selected by universal sampling, those that gave informed consent to participate in the study after explaining the objectives of the study to them were recruited consecutively as they present at the weekly departmental seminar presentations in their respective departments at the end of which 164 study subjects were eventually enrolled. A standardized semi-structured, self administered questionnaire was developed to obtain the required data. The questionnaire sought information on socio-demographic variables, recognition of CL (history of presenting complaints, pictures of typical CL lesion in various stages, and previous treatment offered to the patient were stated in the questionnaire), knowledge of diagnosis and treatment of CL and attitude towards CL. It was reviewed by senior colleagues in the Department of Community Medicine and Department of Veterinary Parasitology and Entomology of the Usmanu Danfodiyo University, Sokoto. The necessary correction was made based on their inputs to ascertain content validity. The questionnaire was pre-tested in a pilot study among 9 doctors at Maryam Abacha Women and Children Hospital, Sokoto, Nigeria; the necessary adjustment was effected based on the observations made during the pre-test. The instrument shows good internal consistency (Cronbach's alpha = 0.85) and stability (2 weeks test-retest correlation coefficient was 0.71). Three resident doctors and two medical officers assisted in questionnaire administration after pre-training on conduct of survey research, the objectives of the study, selection of study subjects and questionnaire administration. Ethical permission to carry out the study was obtained from the Ethical and Education Research Committee of the Usmanu Danfodiyo University Teaching Hospital, Sokoto, Nigeria. Permission was obtained from the heads of the respective departments and informed consent was also obtained from the study subjects before questionnaire administration.

Data was analyzed using the SPSS version 20 computer statistical software package. Frequency distribution tables were constructed; cross tabulations were done to examine relationship between categorical variables. The Chi-square test was used to compare differences between proportions. Logistic regression analysis was used to determine the variables that predict recognition of CL lesions by the study subjects. All statistical analysis was set at 5% level of significance (i.e. $p < 0.05$).

RESULTS

The respondents were between 25 and 50 years in age (Mean = 33.26; SD = 4.31). Majority, 122 (74.4%) of the 164 respondents were in the 30 to 39 years age group, followed by the 20 to 29 years age group (15.9%). Most of the respondents were males (75.0%), married (76.8%), and practiced Islam as religion (73.2%). The respondents were predominantly registrars (35.4%) and have spent less than 5 years in practice (73.2%) as shown in Table 1.

Recognition of cutaneous leishmaniasis lesions and management of previous cases seen by respondents

Recognition of cutaneous leishmaniasis lesions by respondents is shown in Table 2. One hundred and twenty three (75.0%) of the 164 respondents recognized CL lesions. All the 6 consultants (100.0%), 28 of 33 senior registrars (84.8%), 25 of 30 medical officers (83.3%), 44 of 58 registrars (75.9%) and 21 of 37 house officers (56.8%) recognized CL lesions. The difference in recognition of CL lesions by the consultants compared to

Table 1. Socio-demographic profile of respondents

Socio-demographic profile	Frequency (%)
Age groups (in years)	
20-29	26 (15.9)
30-39	122 (74.4)
40-49	15 (9.1)
50 and above	1 (0.6)
Sex	
Male	123 (75.0)
Female	41 (25.0)
Marital status	
Single	34 (20.7)
Married	126 (76.8)
Divorced	1 (0.6)
Widowed	3 (1.8)
Religion	
Islam	120 (73.2)
Christianity	44 (26.8)
Rank	
House officer	37 (22.6)
Medical officer	30 (18.3)
Registrar	58 (35.4)
Senior registrar	33 (20.1)
Consultant	6 (3.7)
Length of practice (in years)	
Less than 5	120 (73.2)
5 - 9	32 (19.5)
10 - 14	8 (4.9)
15 – 19	3 (1.8)
20 and above	1 (0.6)

Table 2. Recognition of cutaneous leishmaniasis lesions by respondents

Rank of respondent	Correctly recognized CL lesions	
	Yes [N (%)]	No [N (%)]
House officer	21 (56.8)	16 (43.2)
Medical officer	25 (83.3)	5 (16.7)
Registrar	44 (75.9)	14 (24.1)
Senior registrar	28 (84.8)	5 (15.2)
Consultant	6 (100.0)*	0 (0)

* Statistically significant, $p < 0.05$

the other ranks was found to be statistically significant ($\chi^2 = 9.631$, $p = 0.047$). In logistic regression model, rank of respondent was the only predictor of recognition of CL lesions (OR = 2.372, p = 0.019, 95% confidence interval (CI) = 0.013 – 0.146) as shown in Table 3.

One hundred and thirty (79.3%) of the 164 respondents reported ever seeing a similar case before. While 100 (76.9%) of the 130 respondents that reported ever seeing

Table 3. Predictor of recognition of cutaneous leishmaniasis lesions

Variable	Odds ratio (OR)	Sig.	95% CI	
			Lower	Upper
Age (40 years and above versus below 40 years)	0.702	0.484	- 0.006	– 0.223
Length of practice (10 years and above versus below 10 years)	0.098	0.922	- 0.118	– 0.107
Rank (consultant versus other ranks)	2.372	0.019	0.013	– 0.146
Sex (male versus female)	0.023	0.981	-0.162	– 0.159

Table 4. Respondents' knowledge of transmission of cutaneous leishmaniasis

Can CL be transmitted through the following ways?	Response		
	Yes [No (%)]	No [No (%)]	I don't know [No (%)]
Close contact with an infected person (N = 136)	32 (23.5)	83 (61.0)	21 (15.4)
Bathing with contaminated water (N = 134)	35 (26.1)	87 (64.9)	12 (9.0)
Through the bite of infected mosquitoes (N = 136)	34 (25.0)	85 (62.5)	17 (12.5)
Through the bite of infected phlebotomine sand flies (N = 154)	134 (87.0)	7 (4.5)	13 (8.4)

a similar case before recognized CL lesions, more than half, 23 (56.1%) of the 41 respondents that misdiagnosed the disease reported ever seeing a similar case before.

Only 97 of the 100 respondents that reported ever seeing a similar case before and correctly recognized the disease indicated the criteria based on which they made the diagnosis. Thirty four (35.1%) reported clinical diagnosis only, 8 (8.2%) reported clinical diagnosis and wound swab microscopy culture and sensitivity, 45 (46.4%) reported clinical diagnosis and microscopy of tissue for parasite, and 10 (10.3%) reported clinical diagnosis and blood test for antibody to the parasite.

Similarly, only 92 of the 100 respondents that reported ever seeing a similar case before and correctly recognized the disease indicated how the case was managed. Majority 68 (63.1%) of the 92 respondents that had ever seen a case of CL before and correctly recognized the disease did not treat the patients, 37 (40.3%) and 21 (22.8%) referred the patients to clinicians and surgeons respectively for appropriate treatment, only 31 (33.7%) placed the patients on drugs while 3 (3.3%) performed surgical excision in addition to drug treatment.

Respondents' knowledge of transmission of cutaneous leishmaniasis

Transmission of leishmaniasis through the bite of infected phlebotomine sand flies was known to majority, 87.0% of the respondents. However, a few among them had misconceptions of CL being transmissible through close contact with an infected person (23.5%), bathing with contaminated water (26.1%), and through the bite of infected mosquitoes (25.0%) as shown in Table 4.

Accurate knowledge of transmission of leishmaniasis through the bite of infected sand flies was demonstrated by all the consultants (100.0%) and house officers (100.0%), 89.0% of medical officers, 83.9% of senior registrars and 78.6% of registrars. There was no statistically significant difference in accurate knowledge of transmission of CL across the ranks (χ^2 = 15.473, p = 0.051)

Respondents' knowledge of diagnosis and treatment of cutaneous leishmaniasis

Respondents' knowledge of diagnosis and treatment of cutaneous leishmaniasis is shown in Table 5. Majority, 92.2% of respondents knew microscopy of tissue specimen for parasite as a definitive diagnostic test for CL. Likewise blood test to detect antibody to the parasite was known to 70.0% of respondents. All the consultants (100.0%), 94.3% of registrars, 93.1% of house officers, 92.3% of medical officers and 86.7% of senior registrars knew microscopy of tissue specimen for parasite as a definitive diagnostic test for CL. There was no statistically significant difference in the knowledge of microscopy of tissue specimen for parasite as a definitive diagnostic test for CL across the ranks (χ^2 = 6.331, p = 0.610).

Less than half, 44.9% of respondents knew drug treatment alone to be sufficient for the cure of CL. Most of the respondents (77.5%) believed that drug treatment should be combined with surgery to cure CL. Only a few of the respondents (across the ranks) knew cryotherapy (32.3%) and thermotherapy (24.5%) as treatment options for CL. Cryotherapy as a treatment option for CL was known to 66.7% of consultants, 42.9% of house officers,

Table 5. Respondents' knowledge of diagnosis and treatment of cutaneous leishmaniasis

Variable	Response		
	Yes [No (%)]	**No** [No (%)]	**I don't know** [No (%)]
Which of the following do you know as a way of making a definitive diagnosis of CL?	-	-	-
Clinical diagnosis only (N = 116)	17 (14.7)	94 (81.0)	5 (4.3)
Wound swab for microscopy culture and sensitivity (N = 104)	32 (30.8)	61 (58.7)	11 (10.6)
Microscopy of tissue specimen for parasite (N = 141)	130 (92.2)	8 (5.7)	3 (2.1)
Blood test to detect antibody to parasite (N = 110)	77 (70.0)	18 (16.4)	15 (13.6)
Which of the following do you know as an appropriate treatment for CL?	-	-	-
Drug treatment only (N = 127)	57 (44.9)	68 (53.5)	2 (1.6)
Surgical excision of nodule or ulcer only (N = 100)	3 (3.0)	89 (89.0)	8 (8.0)
Combination of drug treatment and surgery (N = 120)	93 (77.5)	20 (16.7)	7 (5.8)
Cryotherapy (using liquid nitrogen) (N = 96)	31 (32.3)	21 (21.9)	44 (45.8)
Thermotherapy (N = 94)	23 (24.5)	15 (16.0)	56 (59.6)
Which of the following do you know as an effective drug for treating CL?	-	-	-
Antibiotics (such as ampiclox, ciprofloxacin, etc) (N = 112)	24 (21.4)	70 (62.5)	17 (15.2)
Dapsone (N = 104)	36 (34.6)	28 (26.9)	40 (38.5)
Pentavalent antimony compounds (N = 119)	50 (42.0)	24 (20.2)	45 (27.4)
Amphotericin B (N = 120)	51 (42.5)	34 (28.3)	35 (29.2)
Levamisole (N = 129)	75 (58.1)	26 (20.2)	28 (21.7)
Miltefosine (N = 116)	32 (27.6)	13 (11.2)	71 (61.2)
Topical application of paromomycin cream (N = 97)	37 (38.1)	16 (16.5)	44 (45.4)

38.1% of medical officers, 26.7% of senior registrars and 22.2% of registrars. The difference observed in the knowledge of cryotherapy as treatment option for CL across the ranks was not statistically significant (χ^2 = 7.233, p = 0.512). Similarly, thermotherapy as a treatment option for CL was known to half, 50.0% of consultants, 47.4% of medical officers, 27.3% of house officers, 20.0% of senior registrars and 11.1% of registrars. The difference in the knowledge of thermotherapy as a treatment option for CL across the ranks was also not statistically significant (χ^2 = 14.379, p = 0.072).

Less than half of respondents knew the conventional drugs for treating CL, 42.0% and 42.5% of respondents knew pentavalent antimony compounds and amphotericin B respectively as effective drugs for treating CL. A fairly good proportion, 58.1% of respondents knew levamisole, while a few knew dapsone (34.6%), miltefosine (27.6%) and topical application of paromomycin cream (38.1%) as medications for CL. In logistic regression models, there was no predictor of accurate knowledge of treatment of CL.

Respondents' knowledge of prevention and control of cutaneous leishmaniasis

Table 6 shows respondents' knowledge of prevention and control of cutaneous leishmaniasis. Majority, 89.9% and 90.0% of respondents knew vector control and treatment of infected persons respectively as ways of preventing and controlling CL. About a third, 34.9% and 31.7% of respondents erroneously perceived avoiding close contact with an infected person and avoiding bathing with contaminated water respectively as ways of preventing and controlling CL.

A few, 17.5% of respondents believed CL to be preventable by immunization.

Respondents' attitude to cutaneous leishmaniasis

Majority, 91.6% of the respondents had seen less than 10 cases of CL since they have been practicing in Sokoto. Barely half, 87 (53.0%) of the 164 respondents considered CL as an important public health problem in Sokoto.

Table 6. Respondents' knowledge of prevention and control of cutaneous leishmaniasis

Can CL be prevented or controlled through the following ways?	Response		
	Yes [No (%)]	No [No (%)]	I don't know [No (%)]
Avoid close contact with an infected person (N = 126)	44 (34.9)	72 (57.1)	9 (7.1)
Avoid bathing with contaminated water (N = 123)	39 (31.7)	70 (56.9)	14 (11.2)
Vector control (N = 148)	133 (89.9)	10 (6.8)	5 (3.4)
Treatment of an infected person (N = 130)	117 (90.0)	5 (3.8)	8 (6.2)
Immunization (N = 114)	20 (17.5)	47 (41.2)	47 (41.3)

DISCUSSION

Recognition of cutaneous leishmaniasis was high (75.0%) among the respondents in this study, they also demonstrated high knowledge of CL transmission by phlebotomine sand flies (87.0%) and its prevention by both vector control (89.9%) and treatment of infected persons (90.0%). Similar to the findings in this study, Ruoti et al. (2013) also reported high knowledge of transmission of CL by phlenotomine sand flies (84.0%) among healthcare professionals in a community based survey in Paraguay. The misdiagnosis of the disease by 25.0% of the respondents could be related to the low number of patients presenting to the physicians with typical lesions of the disease in Sokoto. Majority, 91.6% of the respondents had seen less than 10 cases of CL since they have been practicing in Sokoto. Bailey and Langman (2013) had reported misdiagnosis of the disease in a 19 year old British solder that developed CL on his neck after taking part in a jungle warfare training, as CL was a rare disease in the United Kingdom.

Similar to the consultants, all the house officers knew CL to be transmitted by phlebotomine sand flies, in contrast to the resident doctors and medical officers. This could be related to the fact that the house officers graduated from the medical schools less than a year ago with fresh memories of the various diseases (common, rare or neglected) they were made to study as medical students; in addition, they could have been more closely supervised by the consultants. Saberi et al. (2012) also reported high level of knowledge of transmission of CL by phlebotomine sand flies (97.9%) in a study among students in Isfahan.

Similarly, majority of the respondents (92.2%) knew microscopy of tissue specimen for parasite for a definitive diagnosis of the disease. This is in conformity with established standard procedure for the diagnosis of CL (Centers for Disease Control (CDC), 2013). Diagnosis of CL is often clinical in areas where the disease is endemic, but blood test for antibody to the parasite has been found to be useful in cases that are not clinically apparent.

Recently, molecular biology has become widely applicable and more sensitive than the other diagnostic tests for CL. A study by Bensoussan et al. (2006) reported higher sensitivity (98.7%) using kinetoplast DNA (kDNA) polymerase chain reaction (PCR) in diagnosing CL compared with 62.8% for parasite culture only, 74.4% for microscopy only, and 83.3% for a combination of parasite culture and microscopy.

Even though the respondents had poor knowledge of the conventional drugs for treating CL, a fairly good proportion (58.1%) knew levamisole as a drug for treating the disease. Levamisole appears to be the most commonly prescribed drug for the disease in Sokoto in recent years, this could be related to its efficacy, availability, affordability and absence of severe side effects associated with the conventional antimony compounds.

Also, majority 68 (63.1%) of the 92 respondents that had ever seen a case of CL before and correctly recognized the disease did not treat the patients, 37 (40.3%) and 21 (22.8%) referred the patients to clinicians and surgeons respectively for appropriate treatment. This is of immense public health significance and reassuring as it implies that the respondents adhere to standard protocol in managing their patients, and by inference, a high quality of healthcare services in the two tertiary healthcare facilities in Sokoto, Nigeria. Although it was not part of the objectives of this study, it made an evaluation of process in the health facilities used for the study. Evaluation of process (all activities, procedures and tasks performed in a facility) has been identified in the Donabedian model as one of the three components of the system for the assessment of quality of healthcare services provided in healthcare facilities. The other components included structural elements (human and physical resources) and outcome (infection rate, mortality rate and patient satisfaction rate) (WHO, 2004). This highlights the importance of a study of this kind not only as a tool for quality assessment, but also a foundation for quality assurance and catalyst for quality improvement.

Only a few of the respondents (across the ranks) knew cryotherapy (32.3%) and thermotherapy (24.5%) as treatment options for CL. Cryotherapy has been found to be very effective in treating CL compared with the current treatment regimens, even when used as the sole modality with a cure rate approaching 92.0% (Kunzier, 2013). Similarly, a study by Lopez et al. (2013) reported no statistically significant difference in the efficacy

analysis of intention to treat and protocol between study subjects treated with thermotherapy (application of Thermored of 50 degrees C for 30 seconds over CL lesions and surrounding area) and those treated with miltefosine. In the study the efficacy of miltefosine was 70% by protocol and 69% by intention to treat.

The high knowledge of prevention and control of CL by vector control (89.9%) and treatment of infected persons (90.0%) among the respondents in this study could be related to their high knowledge of transmission of the disease. The findings in this study corroborate the findings in a study by Pardo et al. (2006) that reported higher preventive practices among study subjects that knew transmission of CL by sand flies.

The relatively low proportion of respondents (53.0%) that considered leishmaniasis to be an important public health problem in Sokoto could be due to the very low number of cases seen by them (91.6% of respondents had seen less than 10 cases) since they have been practicing in Sokoto.

CONCLUSION

This study demonstrated high recognition of CL lesions and accurate knowledge of its transmission and prevention, but poor knowledge and practice of its treatment among physicians in Sokoto. These findings suggest the need for training institutions involved in medical education to pay sufficient attention to the neglected tropical diseases in their curriculum at all levels.

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