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PREVALENCE OF CUTANEOUS LEISHMANIASIS IN PARTS OF KADUNA STATE, NIGERIA.

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ABSTRACT

A cross-sectional survey of 29 randomly selected schools, comprising 11 (37.9%) post-primary schools and 18 (62.1%) primary schools from eight Local Government Areas (LGAs) (approximately 35% of the 23 LGAs) of Kaduna State was undertaken to determine the prevalence status of cutaneous leishmaniasis between May and October, 1997. The disease occurrence was detected by on-sight diagnosis of active lesions and scars, and observed leishmanial cases were recorded for patients who gave description of symptoms that fitted into clinical symptoms of cutaneous leishmaniasis. The recorded cases were confirmed by parasitological examination of Giemsa-stained lesion smears for amastigotes in the laboratory.

The Chi-square analysis of the result revealed that there was no significant difference (P>0.05) in the point prevalence (PP) rates (number with active lesions) between the males (3.8% of 6,104) and the females (4.0% of 4,122). Similarly, the overall prevalence (OP) rate (number with both scars and active lesions) in the state was estimated at 6.8% (697), and there was no significant difference (P>0.05) observed between the males (6.4% of 6,104) and females (7.5% of 4,122). The point prevalence rate was higher in the younger age-groups (6-9, 10-12, 13-15 years old) than in the older one (16-18 years old) while the overall prevalence and lifetime prevalence (LTP) (number with scars only) decreased with age. It was also noted that the diagnostic efficiency of the on-sight clinical screening tests and that of the parasitological examination of lesion smears compares favourably well. The results of this study have indicated that the prevalence of cutaneous leishmaniasis in Kaduna State is high enough to consider the state endemic for the disease, and that with experience the on-sight case detection of leishmanial

lesions can be dependably applied as a rapid diagnostic method for cutaneous leishmaniasis in field research.

INTRODUCTION

Cutaneous leishmaniasis manifests as skin lesions in humans and may occasionally extend to the mucous membrane. It is the most prevalent form of leishmaniasis and Nigeria is one of the countries of the world with foci of cutaneous leishmaniasis (WHO, 1 989). The lesion begins as a tiny, reddish and often itchy papule that gradually enlarges, burst to an ulcer, the edges of the ulcer become raised and firm with the surrounding skin a dusky red colour (Neva and Brown, 1994). Generally, cutaneous lesions resolves spontaneously after two months to two years leaving a disfiguring, mottled, depressed scar, with altered pigment, and which persists throughout life (Nnochiri, 1974; Muigai and Bryceson, 1982; WHO, 1985). Two clinical forms of cutaneous leishmaniasis (CL) exist, the dry-type lesions which develop a crusted scab and caused by *Leishmania tropics* (s.l.), and the moist type lesion which remains open, with sero-purulent exudates, caused by *L. major* (s.l.).

The transmission of the disease agent can be anthroponotic and / or zoonotic by the sandfly vector, *Phlebotomus* spp. (WHO, 1989). The sandfly, *Phlebotomus (Phlebotomus) duboscqui* has been identified as the probable vector of the disease in the northern savannah zone of Nigeria (Asimeng, 1985; Dondji et al, 1995) above 8 ^{0}N. Cutaneous leishmaniasis has serious socio-economic implications. Even uncomplicated forms are associated with high morbidity and loss of work time, which can have important economic consequences (WHO 1985). Weigel et al., (1994) reported that males experienced a risk of contracting CL that was about triple that of female, and men were more likely to perceive that the disease seriously diminished the victim's capacity to work, while women, on the other hand, were more prone to perceive that CL was a serious disease that significantly decreased self-esteem. Consequently, cutaneous leishmaniasis is increasingly becoming a public health problem (Said, 1995).

Several researchers have undertaken researches to determine the prevalence status of the disease in some parts of Nigeria (Ikeh, et al, 19940; Agwale, et al., 1995a , 1995b,and 1995c; Agwale and Duhlinska, 1995). However, apart from isolated reports of Obasi (1991) and Nock (unpublished report, 1993) attesting to incidence of the disease in Kaduna and Gantang village, Kachia Local Government Area (LGA) of Kaduna State, respectively, there had not been any coordinated research to determine the prevalence of the disease in Kaduna State.

This study was therefore undertaken to estimate the prevalence status of cutaneous leishmaniasis within the population of primary and post-primary school pupils in Kaduna State, to determine the level of awareness of the people about the disease and to compare the relative efficiency of the on-sight clinical case detection in the field with the visual demonstration of leishmanial amastigotes by microscopy.

MATERIALS AND METHOD

The study population considered to be at risk of the disease was the primary and post-primary school pupils in the state because leishmanial active lesions occur in children and non-immuned adults (Zadeh-Shirazi and Hashemi Nasah, 1980; WHO, 1985; Ali and Ashford, 1993; Momeni and Aminjavaheri, 1994; Kamhawi et al., 1995; Davies et al, 1995). This could be due to the fact that children, unlike most adults, would not have developed resistance to infection and would thus, be susceptible. The estimated size of the study population was 4.4% of the current population of Kaduna State (3,969,252) (Source: Planning, Research and Statistics Section, Ministry of Education, Kaduna). From the study population a sample size of 10,226 pupils (5.9%) were screened for leishmanial lesions. The number screened (10,226) comprised 6,104 (59.7%) males and 4,122 (40.3%) females obtained from 29 randomly selected schools made up of 1 1 (37.9%) post primary schools, and 18 (62.1%) primary schools from eight LGAs (approximately 35% of the 23 LGAs of the State). The eight LGAs were selected to represent strategic geographical locations (areas) in the State, viz: Giwa, Sabon-Gari, and Zaria for the Northern part; Birnin-Gwari for Northwest; Lere for East, Chikun for Central, and Kachia and Jema'a for the South (Fig. 1). The total sample size per geographical area ranged from 619 (mean, 155 pupils per school) in Central area to 3,065 (mean, 766 pupils per school) in Western area (Table 1). In each LGA, three to four schools were randomly selected for screening, bearing in mind geographical spread. An average of 1,278 pupils was sampled per LGA. (Table 2).

SCREENING TECHNIQUES

Two methods of screening were adopted in the diagnosis of cutanenous leishmaniasis; the on-sight clinical case detection in the field and parasitological examination of lesion smears to detect Amastigotes intracellularly or extracellularly by microscopy in the laboratory. The on-sight diagnosis involved examination of the skin of the pupils was examined individually, on a class-by-class basis. The pupils observed to harbour characteristic leishmanial lesions/scars were interviewed to describe the clinical development of the active lesions or scars. Where the description fitted into clinical symptoms of cutaneous leishmaniasis, an active lesion or scar was recorded as a probable leishmanial case. The number of subjects with and without lesions/scars was noted per class per school. The place of residence, age and sex of the pupils were recorded. Some photographs of the lesions were taken, and pupils were interviewed to explain if they knew the cause of the disease.

The lesion smears of each active lesion observed was prepared for microscopy. An encrusted ulcer was flooded with hydrogen per oxide (H_20_2) from a wash bottle to soften the dry tissues. The encrusted covering of the wound and the pus were removed using sterilized Davis cotton buds (100% pure, NATRAT, cotton, London). The ulcer was reflooded with the hydrogen peroxide to clean up the surface of the lesion so as to expose the depressed ulcer.

The cotton bud was used to collect swabs from the depressed edges of the ulcer, and the swab smeared on a clean slide. The slide was air-dried, and then flooded with 70% methanol to fix the smear, and once more, air-dried (Adam et al., 1971; Athukorale et al., 1992). The dry slides were labeled appropriately and each wrapped in tissue paper and transported to the laboratory for staining and microscopy.

The stock stain Giemsa 'R66' (Improved, Certified stain for blood, bone marrow and blood parasites; George, T. Gurr Ltd., England) was used to prepare 10% of the stain solution in a phosphate buffer (PH 7.2) (Neva and Brown, 1994). Giemsa stain had been effectively used by other researchers (Agwale et al. , 1995a; Dondji et al., 1995).

Using staining troughs, fixed smears were carefully covered with the freshly prepared Giemsa stain with the aid of the pipette. Slides were allowed to stand for 30 minutes, and later flooded with the buffer. Tap water was used to remove excess stain, and blotting paper used to blot excess water from the slide, avoiding touching the smears (Adam et al., 1971; Athukorale et al., 1992). The slide was allowed to air-dry. The dry slides were viewed under the high powers of the microscope (x100 objective) to detect amastigotes.

The prevalence of the disease was determined by computing the percentage of the number of instances of diseased cases at the time of screening out of the total population sampled (or population at risk of the disease) at that point in time (Thrusfield 1995). The Chi-square analysis (Vincent 1995) was applied to determine whether the differences in prevalence across age groups, Local Government Areas and geographical areas were significant. It was also used to determine whether there was any significant difference in the prevalence of the disease between the males and females in the sampled population, and whether there was a significant difference between the frequency distribution of the number of diseased cases detected by on-sight diagnosis and the number detected by parasitological examination.

Table 1. Sample size per study location in Kadana State

Geographical area (L. G. A.)	Primary school		Secondary school		Total No. of school		Total sample size	
	No.	Sample size	No.	Sample size	No.	%	No.	%
North (Giwa, Sabon-Gari, Zaria)	4	1,301	6	1,018	10	34.5	2,319	22.7
South (Kachia, Jema's	6	971	1	476	7	24.1	1,447	14.2
East (Lere)	3	2,265	1	511	4	13.8	2,776	27.1
West (Birnin-Gwari)	3	2,799	1	266	4	13.8	3,065	30.0
Central (Chikun)	2	381	2	238	4	13.8	619	6.1
Total	18	7,717	11	2,509	29	-	10,226	-
Mean/Area	3.6	1543.4	2.1	501.8	5.8	-	2045.2	-

Table 2. Sample size per L. G. A.

L. G. A.	No. of schools	Sample population		
		males	females	total
Giwa,	3 (10.3 %)	454 (7.4 %)	184 (4.5 %)	638 (6.2 %)
Sabon-Gari,	3 (10.3 %)	427 (7.0 %)	271 (6.6 %)	698 (6.9 %)
Zaria	4 (13.8 %)	416 (6.8 %)	567 (13.8 %)	983 (9.6 %)
Lere	4 (13.8 %)	1,754 (28.7 %)	1,022 (24.8 %)	2,776 (27.1 %)
Jema'a	4 (13.8 %)	256 (4.2 %)	225 (5.5 %)	481 (4.7 %)
Kachia,	3 (10.3 %)	582 (9.5 %)	384 (9.3 %)	966 (9.4 %)
Chikun	4 (13.8 %)	328 (5.4 %)	291 (7.1 %)	619 (6.1 %)
Birnin-Gwari	4 (13.8 %)	1,887 (30.9 %)	1,178 (28.6 %)	3,065 (30.0 %)
Total	29 (%)	6,104 (59.7 %)	4,122 (40.3 %)	10,226 (%)
Mean/ L. G. A	3.6	763	515	1278 (12.5 %)

RESULTS

Of the 10,226 pupils (Table 3) screened for cutaneous lesions in Kaduna State, 394 (3.9%) had active lesions. In other words, the point prevalence rate in the State was 3.9%. There was no significant difference (P>0.05) in the point prevalence rates between the males (3.8% of 6,104) and the females (4.0% of 4,122). Similarly, the overall prevalence rate for the State was 6.8% (697) and there was no significant difference (P>0.05) in overall prevalence rates of males (6.4% of 6,104) and females (7.5% of 4,122). The Chi-square analysis showed that the differences in the frequency of subjects with active lesions within each of the four age-groupings per Local Government Area (LGA) and per geographical area (Tables 6 & 7) were insignificant (P>0.05).

Table 3. Point prevalence rates of cutaneous leishmaniasis by age in Kaduna State

Age group (years)	Population sampled						Point prevalence rates					
	male		female		total		male		female		total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
6-9	3,124	51.2	2,102	51.0	5,226	51.1	136	4.3	86	4.1	222	4.2
10-12	1,880	30.8	902	21.9	2,782	27.2	57	3.0	30	3.3	87	3.1
13-15	611	10.0	684	16.6	1,295	12.7	28	4.6	36	5.3	64	4.9
16-18	489	8.0	434	10.5	923	9.2	9	1.8	12	2.8	21	2.3
Total	6,104	59.7	4,122	40.3	10,226		230	3.8	164	4.0	394	3.9
Mean per age group	1,526		1,030.5		2,556.5		57.5		41		98.5	
Mean per L.G.A	763		515		1,278		29		20.5		49	
Mean per region	1,220.8		824.4		2,045.2		46		32.8		78.8	

Table 4. Lifetime prevalence rates of cutaneous leishmaniasis by age in Kaduna State

Age group (years)	Population sampled						Lifetime prevalence rates (No. with scars)					
	male		female		total		male		female		total	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
6-9	3,124	51.2	2,102	51.0	5,226	51.1	44	1.4	22	1.0	66	1.3
10-12	1,880	30.8	902	21.9	2,782	27.2	32	1.7	35	3.9	67	2.4
13-15	611	10.0	684	16.6	1,295	12.7	37	6.1	37	5.4	74	5.7
16-18	489	8.0	434	10.5	923	9.2	45	9.2	51	11.8	96	10.4
Total	6,104	59.7	4,122	40.3	10,226		158	2.6	145	3.5	30.3	3.0
Mean per age group	1,526		1,030.5		2,556.5		39.5		36.3		75.8	
Mean per L.G.A	763		515		1,278		20		18		38	
Mean per region	1,220.8		824.4		2,045.2		31.6		29		60.6	

Furthermore, there was no significant difference (P>0.05), in the point prevalence rates between the age-groups namely: 6-9, 10-12, 13-15 and 16-18 years old respectively, though the 13-15 years age-group showed the highest prevalence (4.9%), followed by the 6-9 years (4.2%), 10-12 years (3. 1%) and the least, 16-18 years (2.3%) (Table3). This age grouping corresponds with the primary school age (6-9 and 10-12 years) and the secondary school age (13-15 years and 16-18 years), but it had been so grouped to show increasing levels of maturity, which might correspond to increased disposition to exposure to sandfly vector. The life-time prevalence and the overall prevalence, however, tended to decrease with age (Tables 4 & 5), with the 16-18 years old showing the highest life-time and overall prevalence while the 6-9 years old showed the least.

The general variations, in the point prevalence rates across the geographical areas of the State (Table 7) were not significant (P>0.05), though the highest point prevalence (8.2%) occurred in the Central region (i.e. Chikun LGA), and the least (1.5%) occurred in the Western region (i.e. Birnin-Gwari LGA). However, the point prevalence rates of the disease in Central (8.2%), Eastern (5.2%) and Southern (6.4%) areas are higher than those in Northern (2 6%) and Western (1.5%).

TABLE 5: Overall prevalence rate of cutaneous leishamaniasis by age in Kakuna State.

Age group (years)	Population sampled						Overall prevalence rale (NO. with bom active lesion & sc; rs)					
6-9	3,124	51. 2	2,102	51.0	5,226	51.1	180	5.8	108	5.8	288	55
10-12	1,880	30.8	902	21. 9	2,782	27.2	89	4.7	65	7.2	154	55
13-15	611	10.0	684	16. 6	1,295	12.7	65	10. 6	73	10. 7	138	10.7
16- 18	489	8.0	434	10. 5	923	9.2	54	11.0	63	14. 5	117	12.7
TOTAL	6,104	59. 7	4,122	40. 3	10,226		388	6.4	309	7.5	697	6.8
Mean Per Age Group	1,526		1,030.5		2,556.5		97		77.25		174.25	
Mean Per L.G.A.	763		515		1,278		49		38.6		87	
Mean Per Region	1220.8		824.4		2,045.2		77. 6		61.8		139.4	

Of the 394 (3.9%) active lesions diagnosed by on-sight identification of clinical lesion (Table 8), 193 (50.0%) were examined microscopically for intracellular amastigotes. Of this number examined, 134 (69.4%) were diagnosed positive (Plate II). The diagnostic efficiency of the parasitological examination compares favourably with that of the on-sight case detection of active lesions.

TABLE. 6 POINT PREVALENCE RATES OF CUTANEOUS LEISHMANIASIS BY LGA AND AGE-GROUPINGS

L.G.A	6-9			10-12			13-15			16-18			total		
	Ns[1]	Nl[2]	%	Ns	Nl	%	Ns	Nl	%	Ns	Nl	%	Ns	Nl	%
Giwa	130	2	1.5	139	1	0.7	223	9	4.0	146	0	-	638	12	1.9
Sabon-Gari	497	9	1.8	147	3	2.0	23	2	8.7	31	1	3.2	698	15	2.1
Zaria	372	19	5.1	351	9	2.6	125	5	4.0	135	1	0.7	983	34	3.5
Lere	1756	85	4.8	509	21	4.1	345	29	8.4	166	9	5.4	2776	14	5.2
Jema'a	424	44	9.9	57	10	17.9	-	-	-	-	-	-	481	54	11.2
Kachia	292	19	6.5	154	14	9.1	195	9	1.0	325	3	0.9	966	38	3.9
Chikun	289	17	5.9	92	14	15.2	197	16	8.1	41	4	9.8	619	51	8.3
Birnin-Gwari	1466	27	1.8	1333	15	1.1	187	D	0.5	79	3	3.8	3065	46	1.5
Total	5226	222	4.2	2782	87	3.1	295	64	4.9	923	21	2.3	10226	394	3.9

[1]Ns = Number sampled;

[2]Nl= Number with active lesions.

Differences in Frequencies Per LGA and Frequencies Per Age-group are not significant (P>0.05).

The cutaneous lesions identified (Fig. 1a and b) ranged in diameter from the typically small (5.0mm to 1.0cm), dry type to the relatively large (1.0cm to 3.0cm, mean = 2.0cm), open and moist type. Both types occurred in each LGA sampled. Many of the moist types were purulent suggesting co-infection with bacteria (Neva and Brown, 1994). All the papules were milky coloured and multiple lesions were common. All the subjects screened claimed ignorance of the aetiologic agent of the disease. They understood it to be "Maruru" or "Kwuraje" (Hausa: boils). All those noted as positive cases of leishmaniasis in this result gave descriptions ofthe clinical symptoms that were suggestive of leishmanial infections, that is, tiny, itchy papule that gradually enlarges; a small serous discharge followed by ulceration of the skin, edges of ulcer become raised and firm, with the surrounding skin a dusky milky colour. Active lesions lasted from 1 month to over 1 year (mean, 5 months). Only very few resulting characteristic scars showed altered pigmentation, all have varied depressed depths, and usually appeared darker than the unaffected body surface (Figure 1). Of the 394 (3.9%) active lesions diagnosed by on-sight identification of clinical lesion (Table 8), 193 (50.0%) were examined microscopically for intracellular amastigotes. Of this number examined, 134 (69.4%) were diagnosed positive. The diagnostic efficiency of the parasitological examination compares favourably with that of the on-sight case detection of active lesions.

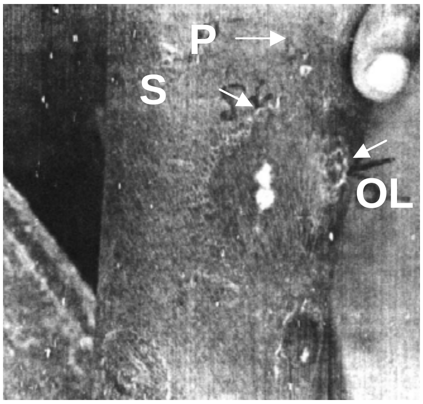
TABLE 7: Point prevalence rate of cutaneous leishmaniasis by age-groupings and geographical locations.

Geo.	6-9			10-12			13-15			16-18			total		
Areas	Ns[1]	Nl[2]	%	Ns	Nl	%	Ns	Nl	%	Ns	Nl	%	Ns	Nl	%
North	999	30	3	637	13	2	371	16	4.3	312	2	0.6	2319	61	2.6
Central	289	17	5.9	92	14	15.2	197	16	8.1	41	4	9.8	619	51	8.2
West	1466	27	1.8	367	15	1.1	187	D	0.5	79	3	3.8	3065	46	1.5
East	1756	85	4.8	509	21	4.1	345	29	8.4	166	9	5.4	2776	144	5.2
South	716	63	.8	211	24	11.4	195	12	1.0	325	3	0.9	1447	92	6.4
Total	5226	222	4.2	1816	87	4.8	1295	64	4.9	923	21	2.3	10226	394	3.9

[1]Ns = Number sampled;
[2]Nl= Number with active lesions.
Differences in Frequencies Per Geographical Area and Frequencies Per Age-group are not significant (P>0.05).

TABLE 8. Comparison of diagnostic method

L.G.A.	Total sample	No of Active Lesions Detected by Screening		No. of Active Lesions Sampled for Microscopy		No. Positive by Microscopy	
		No	%	No	%	No	%
Giwa	638	12	1.9	9	75.0	3	33.3
Sabon-Gari	698	15	2.1	13	86.7	13	100
Zaria	983	34	3.5	24	70.6	16	66.7
Lere	2776	144	5.2	31	21.8	19	61.3
Jema's	484	54	11.2	29	55.8	24	82.8
Kachia	966	38	3.9	35	94.6	22	62.9
Chikun	619	51	8.2	23	45.1	14	60.9
Birnin-Gwari	3,065	46	1.5	29	63.0	23	79.3
TOTAL	10,226	394	3.9	193	50.0	134	69.4



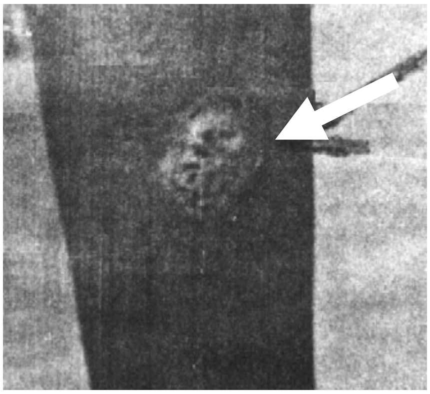


Figure 1. Leishamanial active legion in the patients in the study area.

a. A multiple legion showing papules (P), open legion (OL), and scar (S) with altered pigmentation. The left leg of a male pupil, 8 years old.

b. A dry type legion with crusted scab, stage of disease after three month. The left leg of a female pupil, 7 years old.

DISCUSSION

Based on the finding of the clinical signs of the disease and the results of the diagnostic techniques, it has been adequately proven that cutaneous leishmaniasis exist in Kaduna State in high proportion. This finding confirms the isolated reports of Obasi (1991) and Nock (unpublished Report, 1993).

However, while the initial sign of cutaneous leishmanasis (CL) found in this work begins as a tiny, milky-coloured papule, reports elsewhere (Neva and Brown, 1994) indicates that it starts as a tiny reddish papule. It is presumed that racial difference might account for the difference such that milky-coloured papule appears in blacks and reddish papule in the Caucasians (whites). Furthermore, the disfiguring dark colouration of the scars as noted in this study, and which contrasts with the finding of Sharquie (1995), may be attributable to the same reason. The differences could also be attributed to the fact that a considerable range of clinical involvement in humans may result from infection with a strain of any species depending upon such factors as nutritional state, race, integrity of lymphatic drainage, and, most importantly, host immune response (Neva and Brown, 1994).

The result has shown that the diagnostic efficiency of the screening tests in the field and that of the parasitological examination of the smears in the laboratory is such that either of the two can produce a valid leishmanial lesion diagnosis. This implies that with experience, the screening technique can bereliably employed solely as a rapid diagnostic method in the facility – deficient rural areas of the country. This finding consistent with the work ofDondji et al.(1995) and Agwale et al. (1995a).

The prevalence of the active lesions (point-prevalence) was found to be 3.9% in the study population, while the overall prevalence (prevalence of both scars and/or active lesions) stands at 6.8%. This implies that out of the population size of about 173,644 school children in Kaduna State, about 6,772 (3.9%) suffer from the burning/itchy scourge of leishmaniasis at a particular point in time, whileabout 11,808 (6.8%) pupils contend with the burning, itchy disease or the disgraceful, disfiguring scars on the extremities of their body surfaces. The size of the victims is reasonably large to warrant the need to rate the disease endemic and as a serious problem in Kaduna State.

Both the point prevalence (PP) and the overall prevalence (OP) have been found to be insignificantly (P>0.05) higher in females (PP = 4.0%; OP 7.5%) than in males (PP = 3.8%; OP = 6.3%) in this survey. This is consistent with the finding of Kamhawi, et al. (1995) that showed that the incidence of CL was higher in females than in males in Northern Jordan. However, Ali and Ashford (1993), and Weigel, et al. (1994) reported a reversed trend in the visceral leishmaniasis 'and cutaneous leishmaniasis research in Ethiopia and Ecuador, respectively. The differences noted in the various locations -Kaduna State,Northern Jordan, Ethiopia and Ecuador - may be attributed to socio-cultural practices of gender which might predispose one sex more to infection than the other. Hill (1972) reported that in Northern Nigeria, which includes Kaduna State, the males were involved in farm work more than the females, who were usually secluded on account of Moslem religious practices. This finding by Hill is consistent with the results of this study (Table 5). In the Moslem-dominated Northern and Western areas of Kaduna State, the point prevalence rates were higher in the males than in the females, but in the Central, Eastern and Southern areas, where majority of the females are relatively free from seclusion, the point prevalence rates of the disease were either higher in the females [Central (males = 5.8%, females = 11.0%) and Southern areas (males = 6.0%, females 6.9%)] or about the same as in the males [Eastern area (males = 5.2%; females = 5.1%)].

The point prevalence rate of the disease tends to be higher in the younger age-groups (6-15 years) than in the older ones (16 years and above). Though the differences have been shown to be insignificant (P>0.05) (Tables 3) just as was the case with the finding of Momeni and Aminjavaheri (1994), in which they could not observe any direct relationship with age, sex and clinical features of the cutaneous leishmaniasis lesions in Isfahan, Iran. The higher point prevalence in the younger age-groups in this study is supported by the report of other workers (Ali and Ashford, 1993; Davies et al., 1995) who attributed the reason to agespecific disease profile and indicated an outdoor exposure to infection. Thus, in this study, the highest point prevalence rate (4.9%) occurs in the 13-15 years old who are within the age group that starts active farm work like the adults (Table 3).

Hence, they are much more exposed to infection. The 6-9 years old experience a high point prevalence rate of 4.2% while the older age-group, 10-12 years olds, recorded only 3. 1%. This discrepancy could be accounted for basically as due to the fact that the younger age group (6-9 years) play around much more, and mostly with completely or partly naked bodies which provides wider surface area for sandfly bites; the 10-12 years old usually move around most often with protective clothes on. Secondly, the immune response in the 10-12 year olds may be more protective than in the case with the 6-9 years old. The oldest age group, 16-18 years old, recorded the least point prevalence rate (2.3%) and the highest lifetime prevalence (10.4%) and overall prevalence (12.7%) rates. This implies that it is this age group that starts to build up adequate protective immunity against the disease as evidenced from the high prevalence of scar (life time prevalence). Momeni and Aminjavaheri (1994) and Agwale et al. (1995b) advanced a similar reason to a similar situation in Iran and Nigeria (Keana), respectively. This could explain why the lifetime prevalence and the overall prevalence rates increase with age. The trend of occurrence of active lesions within the age-groupings in this study has been strengthened by the findings of Agwale et al. (1995b) and Momeni and Aminjavaheri (1994) which showed a similar trend in the 1-15 years old, and the 10-15 years old, respectively, in Keana, Nigeria and Isfahan, Iran. The High proportion of active lesions in the younger ages implies higher risk, probably due to inadequate immunity.

The results have revealed a no significant difference (P>0.05) in pointprevalence rates occurring across the geographical areas studied in the State (Table 7), though the highest point-prevalence (8.2%) occurred in the Central areas and the least (1.5%) in the Western area. However, the point-prevalence rates of the disease in Central (8.2%), Eastern (5.2%) and Southern (6.4%) areas were higher in value than those in the Northern (2.6%) and Western parts (1.5%).

It is concluded, therefore, that cutaneous leishmanasis is much more prevalent in the Central, Eastern and Southern regions of Kaduna State than in the Northern and Western regions. Similarly, the LGAs in the Southern part of the State recorded relatively higher point prevalence rates than the LGAs in the Northern part. Thus, while higher prevalence rates were recorded in Jema'a (11.2%), Chikun (8.2%), Lere (5.2%) and Kachia (3.9%) LGAs, lower point prevalence rates were recorded in Zaria (3.5%), Sabon-Gari (2.1%), Giwa (1.9%) and Birnin-Gwari (1.5%) LGAs of the State (Table 6). However, the variations in the point prevalence rates across the LGAs are also not significant (P>0.05). It has been noted by Asimeng (1985) that Phlebotomus (Phlebotomus) duboscqui, the transmitting vector of CL in Nigeria, exists in the Biu, Plateau, expectedly too cold for the vector's survival. The Eastern and Southern areas, being at the fringes of the border between Kaduna and Plateau States, might have a boost of the presence of the invertebrate vectors, hence the higher point-prevalence in theregions or the four Southern LGAs (including Chikun). Another possible reason might be the relatively denser vegetation and higher humidity in the Southern parts of the State, which might support a correspondingly higher population of reservoir hosts, in addition to more number of breeding places for the sandflies. This needs to be verified. Ordinarily, the disease transmitting vector, *P. (P) duboscqui*, naturally survives in severe climatic conditions (Asimeng, 1 985), characteristic of the four LGAs in the northern part - Giwa, Birnin-Gwari, Sabon-Gari and Zaria LGAs. The relatively lower prevalence rates of the disease in these areas might be attributed to the effect of high temperature on the parasite's survival. Since the aetiologic agents of CL cannot thrive within the core body temperature (Neva and Brown, 1994), the extreme hot environments of these LGAs might account for the relatively lower prevalence rates.

The negative effects of this disease on the susceptible population can be enormous. Communities under pressure from a barrage of endemic diseases face tremendous obstacles in achieving an improved quality of life (Wijeyarante, et al. , 1994). In addition to the substandard livelihood, our school children are found due to harsh economic conditions, water, air- and food-borne parasitic diseases resulting from unhygienic environment, they are further burdened with the debilitating leishmanial disease. Yet they are expected to perform wonderfully well in their school examinations, which they combine with itchy and burning pains of leishmanial lesions. Infection is associated with an immunosuppressed condition and the infected are thus predisposed to secondary infections, which might turn out to be more injurious to their health. Apart from the psychological effects, such as reduction of self-esteem in the affected pupils, the painful, itchy condition of the disease could lead to poor performance at school. In fact, a school principal who demanded anonymity, lamented that the population of the school was drastically reducing due to the leishmanial scourge. It is worthwhile, therefore, to make the disease notifiable in Kaduna

State, institute effective control measures, and undertake a relatively cheap, but effective chemotherapeutic measure to alleviate the disease condition in the area. For application of an effective chemotherapeutic measure, more work need to be undertaken to establish specific disease - aetiologic agent relationship. This is very relevant now that *L. tropica* can cause kala-azar (Sacks et al., 1995), and *L. major* (el Hassan et al. 1995) and *L. tropica* (Morsy, et al., 1995) can cause MCL. Besides, the ignorant population needs to be educated on the disease process to facilitate effective control.

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