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Human filariasis in Dass local government area of Bauchi state, Nigeria

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Abstract: In Dass area of Bauchi state Northern Nigeria we studied the infection rates, intensity and clinical manifestations of human filarial infections. After an initial census, 1,638 persons who presented themselves were physically examined from a total population of 53.213. Two hundred and fifteen (20.3%) of 1059 males and 99 (19.1%) of 569 females examined had filarial infections. Overall, 314 (19.2%) persons were infected. Microfilariae of *Onchocerca volvulus, Wuchereria bancrofti, Mansonella streptocerca, Loa loa* and *Mansonella oerstans* were encountered. Altogether, human filariasis varied significantly among communities, sex, ages and various occupational categories (P<0.05). While infections with *O. volvulus* increased with increasing host age; *L. loa* infections decreased with increase in host age with no clear trend in the age-related prevalence of mansonelliasis due to *M. streptocerca*. Females of reproductive age had low *W. bancrofti* microfilaraemia. The prevalence of ocular lesion, lizard skin, onchocercal blindness and skin depigmentation are linearly related to the intensity of *O. volvulus* infection as measured by a low Community Microfilarial Load (CMFL) of 6.0. Blood filarial parasites showed a low CMFL of 4.8. A close association was noticed between blood microfilaraemia and mean mf-density in various age groups (r=0.78, P<0.05). The need to implement well planned intervention schemes involving community mobilization, health education and mass treatment with ivermectin (Mectizan®) are discussed.

Resumen: En el área Dass del estado Bauchi, norte de Nigeria, estudiamos las tasas de infección, la intensidad y las manifestaciones clínicas de infecciones de filaria en humanos. Después de un censo inicial, 1,638 personas que se presentaron espontáneamente fueron examinadas físicamente de entre un total poblacional de 53,213. Doscientos quince (20.3%) de 1,059 hombres y 99 (19.1%) de 569 mujeres examinadas tuvieron infecciones filariales. En general, 314 (19.2%) personas estuvieron infectadas. Fueron encontradas microfilarias de *Onchocerca volvulus, Wuchereria bancrofti, Mansonella streptocerca*, *Loa loa* y *Mansonella oerstans*. A nivel general, la filariasis humana varió significativamente entre comnidades, sexo, edades y varias categorías ocupacionales (P<0.05). Mientras que las infecciones con *O. volvulus* aumentaron con la edad del hospedero, las infecciones de *L. loa* decrecieron con dicha edad, sin que hubiera una tendencia clara relacionada con la edad en la prevalencia de la mansoneliasis debida a *M. streptocerca*. Las mujeres de edad reproductiva tuvieron una baja incidencia de microfilaremia causada por *W. bancrofti*. La prevalencia de lesión ocular, piel de lagartija, ceguera oncocercal y despigmentación de la piel están relacionadas linealmente con la intensidad de la infección de *O. Volvulus*, según la medición de un valor bajo de 6.0 de Carga Microfilarial de la Comunidad (CMFL). Los parásitos filariales de la sangre mostraron un valor bajo de CMFL (4.8). Se observó una asociación estrecha entre microfilaremia de la sangre y la densidad media de mf en varios grupos de edad (r=0.78, P<0.05). Se discute la necesidad de instrumentar esquemas de intervención bien planeada que involucren una movilización de la comunidad, la educación sobre la salud y la aplicación de tratamientos masivos con ivermectina (Mectizan®).

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Resumo: Na área de Dass, no estado Bauchi no norte da Nigéria, foram estudadas as taxas de infecção, a intensidade e as manifestações clínicas das infecções de filariose humana. Depois de um censo inicial, 1638 pessoas, de uma população total de 53213 pessoas, e que se apresentara, individualmente, foram fisicamente examinadas. Destas, duzentos e quinze machos (20.3%), de uma população de 1059 indivíduos, e 99 fêmeas (19.1%) das 569 fêmeas examinadas, apresentavam-se infectadas. Das Microfilariae foram examinadas a *Onchocerca volvulus, Wuchereria bancrofti, Mansonella streptocerca, Loa loa* and *Mansonella oerstans*. No seu conjunto, a filariose humana variou significativamente entre comunidades, sexos, idades e várias categorias ocupacionais ($\rho<0.05$). Enquanto que as infecções com a *O. volvulus* aumentaram com o acréscimo das idades do hospedeiro, as infecções com a *L. loa* decresceram com o aumento da idade do hospedeiro. Já com a prevalência da mansonelíase devido à *M. streptocerca*. Não se encontrou uma tendência clara com a idade do hospedeiro. As mulheres em idade reprodutiva apresentaram baixa infecção por *W. bancrofti*. A prevalência de lesão ocular, pele de lagarto, cegueira por oncocercose e despigmentação da pele estão linearmente relacionados com a intensidade das infecções por *O. volvulos* tal como é expressa por baixo Carga de Comunidade Microfilárica (CMFL) de 6,0. Os parasitas de filariose no sangue mostraram um valor baixo de CMFL da ordem dos 4,8. Encontrou-se uma associação estreita entre microfilaremia e a densidade média mf em vários grupos etários ($r = 0,78$, $\rho<0.05$). A necessidade de implementar esquemas de intervenção bem planeados invocando a mobilização da comunidade, educação sanitária e tratamento de massa com "ivermerctin" (Mectiza®) são discutidos.

Key words: Clinical manifestations, filariasis, intensity, infection rates, ivermectin, Nigeria.

Introduction

Filariasis is a common infection frequently seen in most tropical and subtropical countries. The epidemiology of the disease in Nigeria is complicated because of the diversity of the environmental conditions of the different regions. Recently, large-scale dam and irrigation projects in addition to deteriorating drainage systems have created suitable breeding sites for filarial vectors in various parts of Nigeria. Consequently, the disease distribution is far more extensive than has been hitherto assumed. In the past six decades, various levels of endemicity have been documented in different bioclimatic zones of Nigeria on onchocerciasis. These include those reported in the Middle Hawal valley (Bradley 1976), in the Galma river valley (Crosskey 1981), in the Kwande Local Government Council of Benue State (Gemade & Dipeolu 1983), in Plateau State (Onwuliri *et al.* 1987, 1991), as well as in Taraba river valley of Gongola State (Akogun & Onwuliri 1991). Observations showed that one out of every three sufferers of onchocerciasis lives in the Federal Republic of Nigeria (Donald Hopkins – personal communication).

Furthermore, several investigators have contributed to establishing the existence of human filariasis due to *L. loa* and *W. bancrofti* infections in Nigeria (Ogunba 1977; Udonsi 1986, Ufomadu *et al.* 1991) other studies on filariasis due to *M. perstans* and *M. streptocerca* infections have been vastly recorded in different parts of Nigeria (Anosike *et al.* 1992; Edungbola *et al.* 1988-90; Wijeyratne *et al.* 1982), however, not in Dass area of Bauchi state. Study of available literature shows that the entire Bauchi state of Nigeria especially Dass Local Government Area seemed to have been over-looked in these surveys. As a result, many endemic communities are yet unidentified and unstudied (Anosike & Onuwuliri 1993; Anosike *et al.* 2001). Therefore, in continuation of our effort to provide necessary base line information in human filariasis in Bauchi state, we hereby present results of investigations on the infection rates, intensity, distribution and clinical manifestations of human filariasis in Dass local government area where a case of vertical transmission of *O. volvulus*

microfilariae has been documented (Anosike & Onwuliri 1993). The present study gives further refinements that are desirable before feasible control measures are begun.

Materials and methods

The study area

The area of coverage during this investigation is Dass local government area located in south western part of Bauchi state and is one of the smallest in size. It is about 58 km from the state capital. It has 1991 projected population of 53,213 people. There are more than 20 villages some of which are very difficult to reach during the wet season. Bauchi state, however, is located in the northeastern part of Nigeria. It is situated between latitudes 9°5'N and 12°6'N and between longitudes 8°3'E and 11°6'E. The climate is tropical. Temperature ranges between 12°C and 30°C and relative humidity between 10-43%, which is similar to that of Jos in Plateau state. The vegetation is pure savannah. Most of the sampled populations are nomads, fishermen, hunters and subsistence farmers who cultivate millet, maize, sugar cane, rice, beans and groundnuts. Although there are dispensaries located at different parts of Dass local government, most people in Dass seldom go for medical care except drugs bought from patent medicine dealers Diethycarbamazine is available and people take it often.

Physical examination and parasitological techniques

A total 0f 1938 persons were examined for both skin-dwelling and blood microfilariae between March and December 1995. This was possible because of the cooperation of community leaders especially the villages of the sampled village were helpful in the initial mobilization of the sampled villagers prior to health education and physical and parasitological examination. They also provided the team with interpreters in the local language. Data collected were stratified by sex, age and occupation of the inhabitants examined. For each person, physical examination for clinical manifestations was carried out on the lower limbs, the groin, the trunk, the shoulder and head regions; cases of blindness were detected using the World Health Organization recommendation on the inability to count fingers at 3 meters or less (WHO 1966). Bloodless skin-snips were taken from each person from the shoulder and left iliac crest, using a Holthtype corneosclera punch (2 mm, E2802, STORZ LTD Japan). Each skin-snip was placed in a microtitre plate (Flat bottom, 96 wells containing 3 drops of 0.085% physiological saline solution) and incubated for 24 hours. Microfilariae that emerged were examined, counted and recorded. Preparations were selected randomly, fixed in methyl alcohol, stained with Giemsa, and examined under the microscope to confirm the species of the microfilariae morphologically (Eberhard & Lammie 1991).

Both day and night blood samples were collected from the subjects whose skin snips had been collected. Adopting the finger prick method, a thick blood smear of about 20 mm^3 was collected using a disposable sterile blood lancet. The blood films were fixed in methanol, stained with Giemsa and examined microscopically for microfilariae. The Community Microfilarial Load (CMFL) is calculated as the geometric mean of microfilarial scores of all adults 20 years of age or older (Anosike *et al.* 2001; Brown & Shannon 1989).

Results

A total of five different filarial parasites namely *O. vovulus, W. bancrofti M. streptocerca, L. loa* and *M. perstans* were encountered during this investigation. Of the 1938 persons examined for various filarial parasites, 314 (19.2%) were infected (Table 1). Variance analysis indicated that the distribution of the difference parasites varied significantly ($P<0.05$) between the thirteen communities. The highest prevalence rate was recorded in B.Butur (50.0%). At Bundili and Dagan communities, prevalence rates of 37.2% and 37.0% respectively, were recorded. Prevalence rates in the other communities ranged from 11.1% in Gwaltukurwa to 36.4% in Birnin Ganye. The highest prevalence of onchocerciasis was noted in Bundili (33.3%) followed by Dagan (25.9%) and Pitman (25.0%) Only 12 persons had *L. loa* infections. Infection rates of 11.1%, 11.1% and 5.6% were recorded for *M. perstans*, *W. bancrofti* and *M. streptocerca,* in *B. Butur*.

Table 2 shows the prevalence of human filariasis in relation to sex. The population of males examined appear to be almost double that of females.

Table 1. Distribution and prevalence of human filariasis in Dass, Bauchi State; Nigeria.

Community	Total No. Examined	No. (%) (mf-rate)	*Onchocerca volvulus*	*Loa loa*	*Mansonella perstans*	*Mansonella streptocerca*	*Wuchereria bancrofti*
Kagadama	253	35(13.8)	26(10.2)	1(0.4)	4(1.6)	0	4(1.6)
Kuletu	98	8(18.4)	15(15.3)	1(1.0)	1(1.0)	1(1.0)	0
Bondi	80	17(21.3)	15(18.8)	0	1(1.3)	0	1(1.3)
Bangel	150	23(14.4)	18(11.3)	0	2(1.3)	1(0.6)	2(1.3)
Nda Barbak	90	30(33.3)	21(23.3)	0	5(5.6)	1(1.10)	3(3.3)
Dagan	27	10(37.0)	7(25.9)	1(3.7)	1(3.7)	0	1(3.7)
Dass	429	64(14.0)	50(11.7)	3(0.7)	4(0.9)	2(0.5)	
Bimin Ganye	66	24(36.4)	15(22.7)	0	7(10.6)	0	2(3.0)
Birgal Dopze	80	13(16.3)	12(15.0)	0	1(1.3)	0	0
Gwaltukurma	187	21(11.2)	17(9.1)	2(1.1)	1(0.5)	0	1(0.5)
Pitman	72	21(29.2)	18(25.0)	1(1.4)	0	0	2(2.8)
Bundihi	78	29(37.2)	26(33.3)	3.(3.9)	0	0	0
B.Butur	18	9(50.0)	4(22.2)	0	2(11.1)	1(5.6)	2(11.1)
Total	1628	314(19.2)	244(14.9)	12(0.7)	29(1.8)	6(0.4)	23(1.4)

Table 2. Sex-related prevalence of human filariasis in 13 communities of Dass local government area.

Community	Male			Female			Total		
	Number Examined	Number Infected	% Infected	Number Examined	Number Infected	% Infected	Number Examined	Number Infected	% Infected
Kagadama	120	16	13.3	133	19	14.3	253	35	13.8
Kuletu	54	14	25.6	44	4	9.1	98	18	18.4
Bondi	42	11	26.2	38	6	15.8	80	17	21.3
Bangel	103	17	16.5	57	6	10.5	160	23	14.4
Nda Barbak	39	8	20.5	51	22	43.1	90	30	33.3
Dagan	14	7	50.0	13	3	23.1	27	10	37.0
Dass	319	55	17.2	110	9	8.2	429	64	14.9
Bimin Ganye	29	12	41.4	37	12	32.4	66	24	36.4
Birgal Dopze	80	13	16.3	0	0	0	80	13	16.3
Gwaltukurma	173	21	12.1	14	0	0	187	21	11.2
Pitman	27	11	40.7	45	10	22.2	72	21	29.2
Bundihi	45	24	53.3	33	5	15.2	78	29	37.2
B.Butur	14	6	42.9	4	3	75. 0	18	9	50.0
Total	1059	215	20.3	579	99	17.1	1638	314	19.2

This may result in over estimation of burden of disease. Adopting valid sampling procedures was not carried out during the selection of study subjects. Overall 215 (20.3%) of 1059 males examined were infected while 99 (17.1%) of 579 females sampled had filarial infections. Infection was found to be sex-related ($x^2 = 82$; 12 d.f. $P<0.001$).

Table 3 depicts the age-related distribution of human filariasis in Dass province. Prevalence of infection increased with increasing host age ($P<0.05$). There was a low prevalence (4.5%) at an early age, which increased to 22.1% in the 20-29 years old and then to 64.5% in the eighth decade of life. It was applicable to *O. volvulus* infections. The

Table 3. Age related distribution of human filariasis in the study area.

Age group (years)	No. (%) tve for filarial parasites						
	No. Examined	No.(%) tve (mf-rate)	*Onchocerca volvulus*	*Loa loa*	*Mansonella perstans*	*Mansonella streptocerca*	*Wuchereria bancrofti*
0-9	247	11(4.5)	7(2.8)	4(1.6)	0	0	0
10-19	754	76(10.1)	54(7.2)	3(0.4)	13(1.7)	0	6(0.8)
20-29	204	45(22.1)	32(15.7)	3(1.5)	5(2.5)	2(1.0)	3(1.5)
30-39	146	38(26.0)	30(20.6)	1(0.7)	4(2.7)	1(0.7)	2(1.4)
40-49	110	37(33.6)	29(26.6)	0	3(2.7)	0	5(4.6)
50-59	73	41(56.2)	34(46.6)	1(1.4)	2(2.7)	2(2.7)	2(2.7)
60-69	73	46(63.0)	40(54.8)	0	2(2.7)	0	4(5.5)
70+	31	20(64.5)	18(58.1)	0	0	1(3.2)	1(3.2)
Total	1638	314(19.2)	244(14.8)	12(0.7)	29(1.8)	6(0.4)	23(1.4)

youngest patient who presented positive *O. volvulus* microfilariae was a 28 weeks old male child delivered by a 39 year old Fulani woman suffering from onchocerciasis. *M. perstans* microfilaraemia appeared in the population after the first decade rising from 1.7% in the second decade to 2.8% in the fourth decade and remain at a plateau until the seventh decade after which there was no other case encountered. Females within the 20-49 years bracket representing a cohort of reproductive age had a reduced *W. bancrofti* microfilariaemia. While there was no clear trend in the prevalence of mansonelliasis due to *M. streptocerca*, the prevalence of *L. loa* infection decreased with increasing host age ($P<0.05$).

The occupational-related prevalence of filariasis in the study area (Table 4) showed that nomads (64.4%), farmers (36.0%) and housewives (20.0%) were the most affected group while students (3.1%) and traders (2.7%) were significantly the least affected ($P<0.001$).

Table 4. Occupational related prevalence of human filariasis in the study area.

Occupation	No Examined	Number Infected	%
Civil Servants	192	26	13.5
Nomads	45	29	64.4
Traders	146	4	2.7
Students	579	18	3.1
Housewives	40	8	20
Farmers	636	229	36
Total	1638	314	19.2

Table 5 expresses the intensity of *O. volvulus* microfilaria in various communities. The association between the *O. volvulus* mf-rate and the mean mf-density was slightly significant ($r = 0.6543$, $P<0.01$). The details of the distribution of *Onchocerca* lesions in relation to age and *O. volvulus* mf-density are shown in Table 6.

Microfilarial counts appeared to increase with age rising from 2.7 in the first decade of life when mf-rate of 2.8% was recorded to microfilarial density of 11.7 in the eighth decade when the highest prevalence of 58.1% was recorded. The prevalence of lizard skin, ocular lesion, onchocercal blindness and skin depigmentation are linearly related to the intensity of infection as measured by the CMFL. Both the total mfd (7.2) and the CMFL (6.0) were greater than five. There is high level of agreement between *O. volvulus* mf-rate and mf-density among age groups ($r = 0.97$; $P<0.001$). Similarly, the age-related prevalence of clinical filariasis regarding mean mf-density and the geometric mean of microfilariae are presented in Table 7. There is also a close association between blood microfilaraemia and mean mf-density in various age groups ($r = 0.78$, $P<0.05$). Results of physical examinations showed that various clinical signs are associated with different filarial parasites. Amongst Ochocerciasis affected subjects, clinical manifestations mainly pruritic rash, skin depigmentation, nodules, leopard skin (LS), lizard skin, ocular lesions, itching of the eye, scrotal elephantiasis and onchocercal blindness were recorded. Blood filarial nematodes encountered showed few clinical signs such as pruritis, hydrocoele, limb elephantiasis and hyperaemia.

Table 5. Density of *O. volvulus* microfilariae in skin snips of positive subects in the study area.

Community	Number Examined	No. (%) tve cases	No. (Mean mf density found in skin snips [2 mm/bite])						
			0-5	6-10	11-20	21-30	31-40	41+	MFD
Kagadama	253	26 (10.3)	19 (2.4)	2 (8.5)	4 (13.0)	1 (23.0)	0	0	5.3
Kuletu	98	15 (15.3)	11 (2.5)	3 (7.0)	0	1 (22.0)	0	0	4.7
Bondi	80	15 (18.8)	7 (3.6)	5 (6.6)	3 (12.3)	0	0	0	6.3
Bangel	160	18 (11.3)	11 (2.7)	4 (7.5)	3 (14.3)	0	0	0	5.7
Nda Barbak	90	21 (23.3)	11 (3.0)	6 (7.8)	3 (15.3)	1 (30.0)	0	0	7.4
Dagan	27	7 (25.9)	5 (2.8)	1 (6.0)	0	1 (30.0)	0	0	7.1
Dass	429	50 (11.7)	21 (2.6)	14 (7.4)	11 (13.5)	3 (26.7)	1 (39.0)	0	8.5
Bimin Ganye	66	15 (22.7)	15 (2.8)	0	0	0	0	0	2.8
Birgal Dopze	80	12 (15.0)	9 (2.2)	0	3 (17.3)	0	0	0	6.0
Gwaltukurma	187	17 (9.1)	10 (2.9)	2 (8.5)	4 (14.5)	1 (24.0)	0	0	7.5
Pitman	72	18 (25.0)	6 (2.7)	7 (7.1)	4 (12.8)	1 (26.0)	0	0	7.9
Bundihi	78	26 (33.3)	9 (3.7)	7 (7.0)	5 (13.2)	1 (22.0)	3 (36.7)	1 (41.0)	12.4
B.Butur	18	4 (22.2)	2 (2.5)	1 (6.0)	1 (12.0)	0	0	0	5.8
Total	1638	244 (14.9)	136 (2.8)	52 (7.2)	41 (13.8)	10 (25.5)	4 (37.9)	6 (42.2)	6.7

Discussion

Human filariasis is endemic in Dass area of Bauchi state; and hence, a serious public health problem. This is because the figures here are based on 3.1% of the total population. The finding then, when translated to the general population, may mean a much higher rate and greater number of persons. The pattern of infections with filarial parasites in our area of coverage is analogous to the situation in the savannah areas of northern Nigeria. However, the recently reported case of vertical transmission of *O. volvulus* microfilariae in Dass Bauchi state of Nigeria was significant (Anosike & Onwuliri 1993). Earlier investigators did not encounter this phenomenon. Observations showed that *O. volvulus* predominated, followed by *M. perstans, W. bancrofti, L. loa* and *M. streptocerca.* Similar observations have been made on onchocerciasis, loiasis, mansonelliasis and wuchereriasis in the Jarawa river valley of Plateau state, which adjoins Dass local government area (Ufomadu *et al.* 1991).

Contrary to the prevalence rates reported for these infections in other endemic zones of Nigeria (Anosike *et al.* 1992; Gemade & Dipeolu 1983; Hari *et al.* 1984; Udonsi 1986), the overall infection rates for *L. loa, W. bancrofti* and *M. perstans* are generally low. Nevertheless, the results do suggest the existence of their respective vectors in the area. Perhaps, the high prevalence of self medication with dietylcarbamazine citrate (D.E.C) among residents of Dass and climatic factors would be responsible for the differences in prevalence rates.

B. Butur was of a mesoendemic level rather than the hyperendemic status observed in the other twelve communities. This is not entirely surprising. Apart from its location along the major river, observations made in west Africa showed that isolated low prevalence rates may occur amidst of high endemic communities (Akogun 1992).

This study shows a significantly higher prevalence of microfilarial infection in males than females. This is in line with most reports in west Africa (Akogun & Onwuliri 1991; Anosike *et al.* 1992; Taylor 1985), this pattern of prevalence could be attributed wholly to the apparent outdoor nature of men's work such as fishing, farming and cattle rearing etc. Conversely, the prevalence of human filariasis in females exceeds that of their male counterparts in both Nda Naradak and B. Butuk communities. This is expected in areas where the exposure rates of females to infective bites is high due to outdoor domestic activities such as fetching of fire wood, collecting water from river as well as laundering in the river sides.

Observations in the age-related prevalence of human filariasis revealed a consistent increase of the disease with advancing host age. Infections

with *O. volvulus* had a similar trend. This initial rise in prevalence of onchocerciasis with age is in agreement with reported patterns in most endemic foci (Brown & Shannon 1989; Desole & Walton 1976; Nwoke 1986; Udonsi 1986), but contrast the sharp rise reported by Wyatt (1971) in Ibarapa, western Nigeria. Barring the suspected case of transplacental transmission encountered in Bagel community, the minimum average age at which infection with the *O. volvulus* was noticed was 17months – 25 months especially in Fulani settlements. This seems to suggest that individuals receive their first infective *S. damnosum* bite early in life. This is not very surprising considering the fact that babies may be bitten while on the mother's back when hawking fresh milk-"nono", or when laid out to sleep in the shade (in the farm) unprotected from insect bites while the mother works in the field. In this regard, health education of rural women on the need for proper clothing and protection of their babies against insect bite is suggested. The prevalence of *M. perstans* infection appeared in the 20-39 year age groups then maintained a plateau up to the 60-69 year age group where no case was recorded.

The presence of *M. perstans* in this part of the country where onchocerciasis is endemic is expected as its geographical distribution in Africa is similar to that of onchocerciasis. Its incidence among bush workers of the Nigeria institute of Oil Palm Research has been reported (Sofoluwe *et al.* 1978). Of recent, its endemicity among the Ibos of Abia and Imo States has been documented (Anosike *et al.* 1992). The steady rise of *M. perstans* microfilaraemia in this study indicated a local transmission rather than imported cases (Lapkova *et al.* 1990) noted in parts of Africa. Worthy of note is the relatively low *W. bancrofti* microfilaraemia observed among females in the 20-49 year age group. This finding is consistent with the observations from several parts of the Indian subcontinent, south east Asia, Americans and Africa where prevalence of wuchereriasis is consistently lower or fairly seen in women of reproductive age (Brabin 1990; Kazura 1987; Onwuliri & Anosike 1989). They opined that lower rates of infection and even clinical pathology observed in wuchereriasis are due to exposure of females to infective vectors. Brabin (1990) emphasized that the association with the reproductive years in females suggests a pregnancy/-associated mechanism which could have important implications for maternal – foetal interactions. This being so, maternal filarial infection may influence the development of immunity in children. However, detailed investigations are needed to understand the effect of maternal filarial infection in the development if immunity in children.

The between-occupation difference was observed to be statistically significant. Nomads, farmers and housewives had high infection rates while civil servants, pupils and traders were the least affected. Apart from the high prevalence recorded among housewives, other observations appear to be a common feature of human filariasis in most endemic foci due to their chances of contacting the infected vectors while in the field. The explanation is supported by the view that the general prevalence and intensity of filarial infections are dependent upon the vector's biting habit and the frequency of transmission to which a population is exposed (WHO 1976).

There was a close association between the number of microfilaria positive persons and the mean density of microfilariae in a community. As well, microfilrial counts gradually increased with age in both *O. volvulus* and other blood microfilariae recovered. This tends to support the assertion that a community's infection rate is usually indicative of its mean microfilarial density. This finding is in conformity with other reports in Africa by Akogun & Onwuliri (1991), Ufomadu *et al.* (1991). This observation is an indication of stable disease transmission during recent years in the study area. It was noticed that mf-rate of *O. volvulus* correlated positively with the frequencies of pruritis and skin depigmentation. Other workers (Akogun 1992; Edungbola *et al.* 1983, 1988-90), have shown similar consistence associations between mf-rate and the prevalence of skin depigmentation in other endemic foci of onchocerciasis. Thus, it is suggested that the prevalence and intensity of onchocerciasis in communities where *Simulium* vectors are known to breed may be based on the clinical observation of typical onchocercal lesions such as purities and skin depigmentation provided the community is relatively stable and devoid of previous intervention schemes. This would be useful considering the fact that the continual survey for new foci of onchocerciasis transmission using conventional parasitological techniques is expensive and time-consuming (Anosike

et al. 2001), yet elaborate and extensive survey of the entire country is necessary before the planned mectizan distribution programme can be effectively implemented in Nigeria.

The prevalence of LS, ocular lesions, pruritis, skin depigmentation and onchocercal blindness are linearly related to the intensity of infection as revealed by CMFL. A simple and rapid method of estimating the endemicity of human filariasis in an area would be to examine a sample of adult-male population for these clinical signs. The weakness of this method is its failure to secure accurate data on the status of active transmission; hence this could only be an indicator of past transmission. Nevertheless, this method might be an economical method of survey prior to establishing large scale control measures. Some authorities have reiterated on the potential diagnostic value of using LS, at least, for making a rapid preliminary screening of vast area from which selection can be made for more detailed epidemiological assessments. At present, there is transmission of human filariasis in Dass area of Bauchi state and the control of insect vectors of filarial parasites is not feasible due to the profusion of streams and breeding grounds of appropriate vectors. Based on the fact that life in Dass area will continue to be lived close to water, human filariasis and its sequellae will be a problem for years to come unless proper intervention schemes are implemented. In this regard active mobilization and health education of the inhabitants on the transmission pattern of the various filarial parasites encountered and the need for protective attire are suggested. Above all, the provision of ivermectin which has proved effective in reducing microfilarial loads (Pacque *et al.* 1991) for a large-scale treatment of Dass people considering the low CMFL at the outset will invariably interrupt the disease transmission in the near future. This could only be feasible by aggressive, semi annual mectizan therapy in these endemic communities as it is done in the Americas (Frank Richards personal communication).

Onchoceriasis, which remains a serious public health problem in Nigeria, is now receiving attention. This being so, many international agencies and Non-Government and Development Organizations (NGDOs) are currently collaborating with the Federal Ministry of Health and Human Services in the control of onchocerciasis through distribution of Mectizan in endemic communities. Dass of Bauchi state, Nigeria is qualified for Mectizan therapy through both Community Directed Treatment (CDTI) and clinic- based ivermectin distribution strategies. Since 1990, large scale ivermectin distribution programmes have been developed in most of the countries where onchocerciasis and other filarial infections is endemic. The success of these programmes prompted the World Bank and the World Health Organization to implement an ambitious African programme for onchocerciasis control (APOC), whose objectives are particularly to co-ordinate and reinforce all the ivermectin distribution activities in the African countries outside Onchocerciasis Control Programme (OCP) area (Reme 1995). An estimated 30 million Nigerians are at risk for onchocerciasis alone. Based on the baseline data provided by this investigation, onchocerciasis control is now being implemented in Dass area through the WHO - led APOC, Unicef, Global 2000 and a host of other NGDOS. Presently, ivermectin (mectizan) which is a safe and effective drug for mass treatment of onchocerciasis is now being supplied free of charge to all affected subjects in many parts of Nigeria including Dass through Community self Directed effort. This drug, when used on an individual basis, reduces the ability of the treated persons to transmit the infection. This would help in the prevention and control of not only human onchocerciasis but also other filarial infections in the area. However, the timely and prompt annual or biannual distribution of this drug of choice by community Based Distributors (CBDs) and its sustainability is a great challenge in these endemic communities. This picture calls for continued efforts of the onging control programme in Bauchi state (Anosike 1996).

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