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Research article **Medical research**

Investigate the Alterations in the Haematological and Urinal Parameters Due to the Exposure of" Bancroftian Filariasis" In Rural Areas of Vellore District, Tamil Nadu, India

S.Sivakalai[1]*, J Saminathan[2]

[1]*Department of Microbiology, Delhi Pharmaceutical Sciences and Research University, New Delhi-110017, India.*
[2]*Department of Public Health, Delhi Pharmaceutical Sciences and Research University, New Delhi-110017, India.*

[*]**Correspondence Author: Dr. S.Sivakalai**
Email: sivakalaiswaminathan@gmail.com

ABSTRACT

Background: Filariasis is a communicable tropical disease instigated predominantly by two species of thread-like parasitic roundworms (*Wuchereria bancrofti* and *Brugia malayi*). The larval form of the parasite transmits the infection by the bite of a mosquito to humans. Exposure to the parasite is a serious public health problem because of acute and chronic morbidity. Bancroftian filariasis caused by *Wuchereria bancrofti* is widely outspread in the Vellore district, Tamil Nadu, India. Vellore district is one of the thirteen highly endemic districts of filariasis. In 2018, 51 million people were infected. However, due to the involvement of the World Health Organization (WHO) Global Program, there has been a drastic decline (74%) in the cases.

Gap in the current literature: The changes in the haematological and urinary paraments/markers due to the exposure of *Bancroftian filariasis* are unknown.

Aim: Establish the effect of *Bancroftian filariasis* on various haematological and urinary parameters/markers in humans.

Methodology: The blood and urine samples were collected from patients exposed to filaria in and around the Vellore district (Arcot, Walajapet, Thimiri, Vellore, Sumaithangi, and Gudiyatham) with due consent. Haematological and urine tests were performed using an auto haem analyzer and uritest – 50.

Result: The most susceptible age group for the exposure is above 40 years. Among the various blood group, the blood group 'O' was predominant among filarial patients in the current study. Filarial-infected patients showed significant changes in the haematological and urinary parameters. Patients exposed to filaria had haematocrit (HCT) haemoglobin concentration (HGB), mean corpuscular volume (MCV), and mean corpuscular haemoglobin (MCH) significantly increased as compared to the controls. Regarding the urine test, there was a significant increase in the calcium and creatinine content. Interestingly, females had significantly higher pathological insults as compared to males.

Conclusion: Identification of haematological and urinary markers, can help in the appropriate therapy of filariasis and this can substantially reduce morbidity, decrease the cost of treatment, and increase healthcare management.

Keywords: *Wchereria bancrofti*, haematological analysis, urine analysis, Filariasis,

INTRODUCTION

Filariasis (or philariasis) is a group of vector – borne parasitic diseases of humans and other animals caused by an infection with roundworms of the Filarioidea type[1-2]. *Wuchereria bancrofti* is a filarial nematode that can cause lymphatic filariasis, inflammation and lymphedema lead to lymphatic damage, chronic swelling, and elephantiasis of the legs, arms, scrotum, vulva, and breasts[3-8]. These are spread by blood-feeding black flies and mosquitoes. *Culex quinquefasciatus* is responsible for the transmitting of filarial nematode. The

mosquito picks up the microfilaria from an infected vertebrate. The nematode develops inside the mosquito, and is passed on to another vertebrate[9]. In India, the most common form of this disease first caused by *Wuchereria bancrofti* accounting for 9% of the cases. This form of filariasis is widely distributed both in urban and rural areas. It is a serious public health problem as well as a major case of acute and chronic morbidity [10, 11].

Of the more than 500 filarial parasites known to infect mammal's birds, reptiles and amphibians, only eight are common parasites of man: *Wuchereria bancrofti, Brugia malayi, Onchocerca volvulus, Loa loa, Mansonella perstans, Mansonella streptocerca, Mansonella ozzardi* and *Brugia timori*. Of all these, the adults of *B.malayi, B.timori* and *W.bancrofti* inhabit the lymphatic system, hence the disease they cause is termed lymphatic filariasis.

The lifecycle of *Wuchereria bancrofti* starts, when a male and a female mate inside lymphatic vessels of an infected human. The female releases thousands of microfilariae (prelarval eggs) into the bloodstream. When the host is awake, the microfilariae tend to stay in deep blood vessels. During the sleep they travel near the surface in peripheral blood vessels. This behaviour enables them to get ingested by the night biting mosquito. When ingested by the mosquito, the microfilariae migrate through the wall of the proventriculus and cardiac portion of the midgut eventually reaching the thoracic muscles. Within 1–2 weeks they mature into first-stage larvae and eventually into infective third-stage larvae which migrate through the hemocoel to the mosquito's proboscis. When the mosquito bites another person, the larvae are injected into the human skin. They migrate to the lymph vessels and mature into adults within six months. Adult females can live up to seven years.

Repeated mosquito bites during several months are usually needed to develop lymphatic filariasis. In some cases lymph edema (swollen tissue caused by obstruction of the lymph fluid) may develop within six months and elephantiasis within a year.

In India, more than 42 million people are exposed to the risk of infection and 11million are likely to have infection. Vellore district is one among the 13 highly endemic districts of filariasis in Tamil Nadu. Currently, worldwide there are approximately 120 million cases of lymphatic filariasis [12]. 29.7 million People are exposed to the risk of infection with a distribution of 22.4 million in rural and 7.3 million in urban areas[13]. Sharma[14], Atwell[15], Niwetopathomwat *et al.*,[16] have done notable works on biochemical and haematological studies on *Canine dirofilariasis* infected dog. Sufficient literature is not available for haematological and biochemical studies of *Wuchereria bancrofti*. The purpose of this project is to study and analysis the filarial diseases in different aged groups with blood groups sex, haematological and biochemical parameters in their blood and urine and to find out whether it associated with diabetes mellitus among filarial patients in Vellore district.

MATERIALS AND METHODS

2.1. Sample Collected Area

Totally 6 locations were selected in Vellore district such as Arcot, Gudiyatham, Sumaithangi, Thimiri, Vellore, Walajapet. Blood and urine samples were collected from filarial patients. The area map in Fig.1.

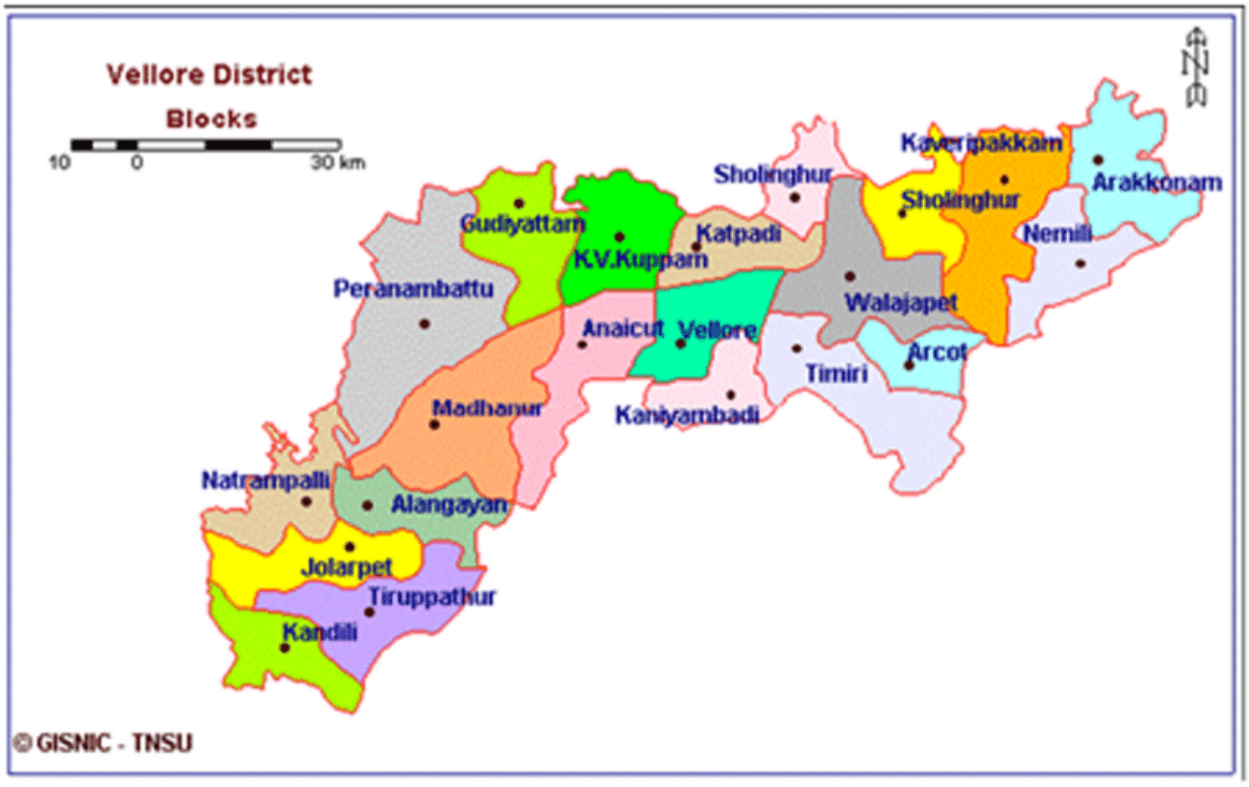

Fig 1: Area Map of Vellore District

2.2. Collection of samples

Blood samples were collected from 32 filarial patients, 3 ml of blood samples were collected in a 15 ml centrifuging tube containing anticoagulant (EDTA) and 32 urine samples were collected in a sterile wide mouth bottle containing boric acid (preservative). The blood and urine samples were brought to the laboratory and kept in refrigerator and then used for further investigation.

2.3. Haematological Analysis Using Auto-Haemanalyzer

The filaria-lymphodema-infected blood samples were analyzed using auto-hematology analyzer (BC-300 plus Mindray). Totally 19 tests were performed by auto-heam analyzer[17,18]. They are white blood cell (WBC), haemoglobin concentration (HGB), mean corpuscular volume (MCV), mean cell haemoglobin concentration (MCHC), red blood cell distribution width co-efficient of variation (RBC-CV), red blood cell (RBC), hematocrit (HCT), mean corpuscular haemoglobin (MCH), platelet (PLT), platelet distribution width (PDW), mean platelet volume (MPV), plateletcrit (PCT), lymphocyte (Lymph#), Mid-sized cell (Mid#), lymphocyte percentage (Lymph %), granulocyte (Gran#), mid-sized cell percentage (Mid%), granulocyte percentage (Gran %), RBC distribution width standard deviation (RDW-SD) were analysed and the values are given in Table 1.

2.4. Bio-Chemical Analysis Using Auto Analyzer

The filarial lymphodema infected urine samples were analyzed using Uritest-50. Totally 13 tests were performed by using uritest-50 [17,18]. The tests such as white blood cell (leukocytes) (WBC), ketone body (KET), nitrite (NIT), urobilinogen (URO), Bilirubin (BIL), Protein (PRO), glucose (GLU), specific gravity (SG), pH value (pH), blood (BLD), creatinine (CR), calcium (Ca), Micro albumin (MA) were analysedand the values are given in Table 2.

2.5. Comparative Study

Comparative study among various age groups, sex group, and blood group were also done.

RESULTS AND DISCUSSION

Haematological Study

3.1. Haematological Study

The flow chart of work in Figure 2. The haematological tests done by auto-haem analyzer, filarial infected persons showed increased value (Table 3 & Figure 3) of Mid% in 18 patients (56%) and 14 patients (44%) recorded normal value. In RDW-CV test 18 patients (56%) recorded normal value and 14 patients (44%) recorded increased value. Sarojini and Senthilkumar[19] reported there was a considerable increase in total WBC count, neutrophils, eosinophils, platelet count, ESR and mean corpuscular value in the affected patients.

The test haemotological analysis results showed a wide variation in the decreased value in filarial patients. In HGB 15 patients (46%), in HCT, 24 patients (75%) showed decreased values, MCV test result showed 16 patients with decreased values (50%) and in MCH, 13 patients (40%) recorded lower values than normal persons (Table 4 & Figure 4).

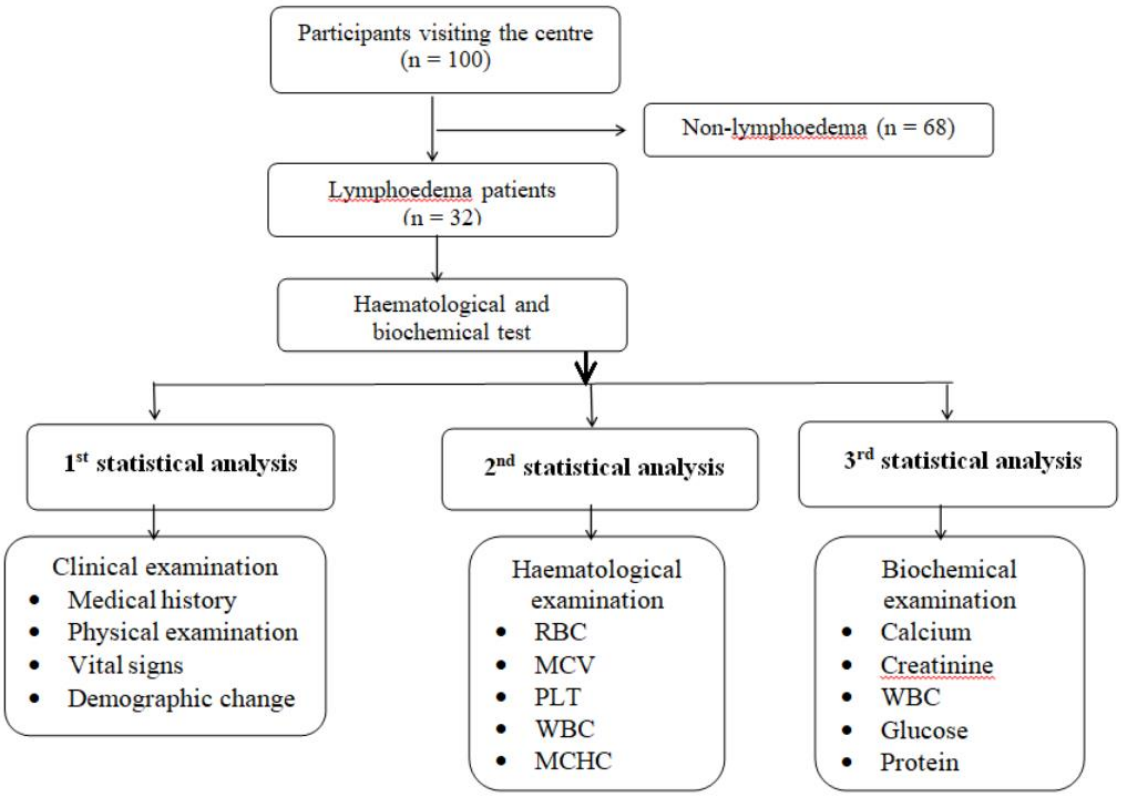

Fig 2: Flow chart of Work

Table 3: Normal And Increased Values In Haematological Analysis Among 32 Cases

Tests	Normal individual value	Affected patients showed normal value and percentage	Affected percents showed increased value and percentage
WBC	4.0-10.0×10^3/µL	30(94%)	2(6.25%)
Mid sized cell	0.1-0.9×10^3/µL	29(91%)	3(9.37%)
Granulocyte	2.0-7.0×10^3/µL	30(94%)	2(6.25%)
Lymphocyte%	20.0-40.0%	31(97%)	1(3.12%)
Mid sized cell%	3.0-9.0%	14(44%)	18(56.25%)
Granulocyte%	50.0-70.0%	28(88%)	4(12.5%)
Haemoglobin conc	11.0-15.0 g/dL	30(94%)	2(6.25%)
Platelet	100-300×10^3/µL	31(97%)	1(3.12%)
RBC	3.50-5.00 g/dL	31(97%)	1(3.12%)
Mean corpuscular haemoglobin	27.0-31.0 PG	31(97%)	1(3.12%)
Mean corpuscular haemoglobin conc	32.0-36.0 g/dL	31(97%)	1(3.12%)
RBC distribution width standard deviation	35.0-56.0 fL	31(97%)	1(3.12%)
RBC distribution width coefficient of variation	11.5-14.5%	18(56%)	14(44%)

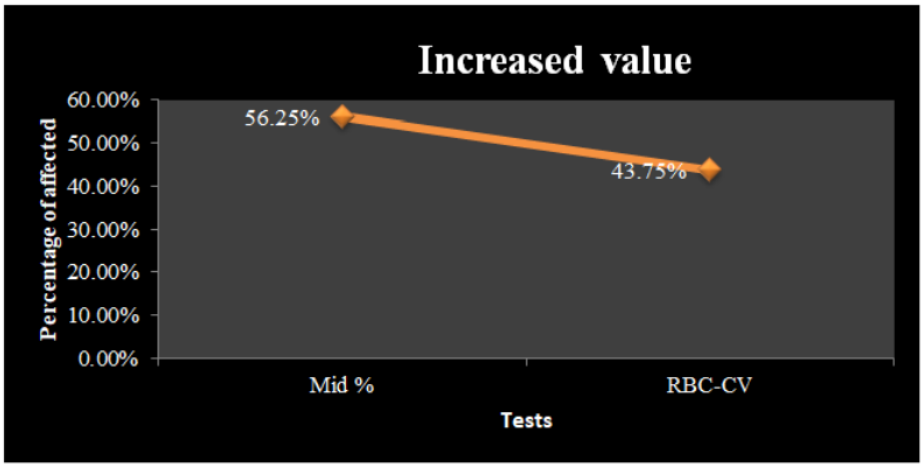

Fig 3: Normal and Increased Values In Haematological Analysis Among 32 Cases

Table 4: Normal and Decreased Values In Haematological Analysis Among 32 Cases

Tests	**Normal individual value**	**Affected patients showed normal value and percentage**	**Affected Patients showed decreased value and percentage**
WBC	4.0-10.0×10^3/µL	26(81.25%)	6(19%)
Plateletcrit	100-300×10^3/µL	30(94%)	2(6.25%)
Lymphocyte	0.8-4.0×10^3/µL	30(94%)	2(6.25%)
Granulocyte	2.0-7.0×10^3/µL	30(94%)	2(6.25%)
Mid sized cell	0.1-0.9×10^3/µL	31(97%)	1(3.12%)
Mean platelet volume	7.0-11.0 fL	31(97%)	1(3.12%)
Lymphocyte%	20.0-40.0%	28(88%)	4(12.5%)
Haemoglobin conc	11.0-15.0 g/dL	17(53.1%)	15(47%)
RBC	3.50-5.00 g/dL	28(88%)	4(12.5%)
Haematocrit	37.0-48.0%	8(25%)	24(75%)
Mean corpuscular volume	82.0-95.0 fL	16(50%)	16(50%)
Mean corpuscular haemoglobin	27.0-31.0 PG	19(59.3%)	13(41%)
Mean corpuscular haemoglobin conc	32.0-36.0 g/dL	25(78%)	7(22%)

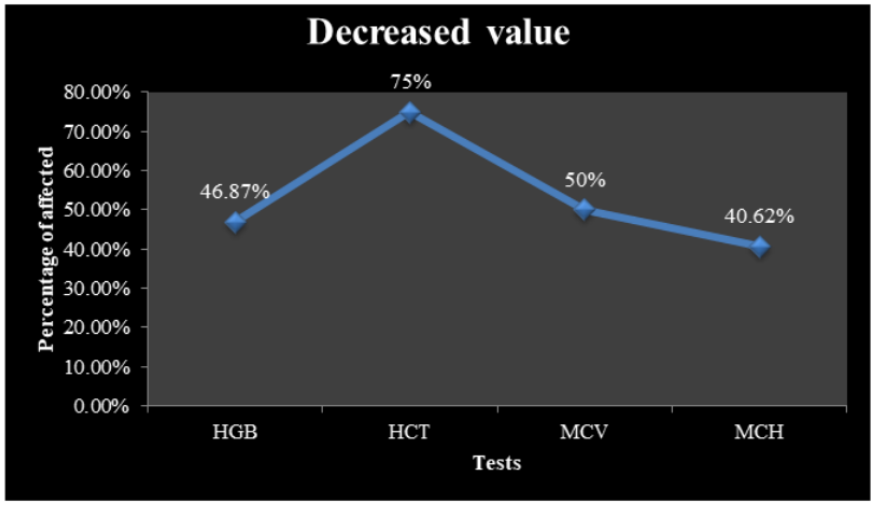

Fig 4: Normal and Decreased Values In Haematological Analysis Among 32 Cases

3.2. Bio-Chemical Study

Out of 32 samples tested for urine analysis, 15 patients (47%) showed abnormal for WBC, 19 patients (59%) showed abnormal values for calcium and creatinine (Table 5 & Figure 5).

Table 5: Bio-Chemical Analysis Of Urine Among 32 Cases

Tests	Normal individual value	Affected patients showed normal value and percentage	Affected percents showed increased value and percentage
WBC	-ve	17(53%)	15(47%)
Glucose	-ve	28(88%)	4(13%)
Calcium	<=1.0	13(41%)	19(59.3%)
Creatinine	<=0.9	13(41%)	19(59.3%)
Bilirubine	-ve	29(91%)	3(9.37%)
Nitrite	-ve	29(91%)	3(9.37%)
Blood	-ve	29(91%)	3(9.37%)
Protein	-ve	28(88%)	1(3.12%)
Urobilinogen	Normal	28(88%)	1(3.12%)
Microalbumin	-ve	28(88%)	1(3.12%)

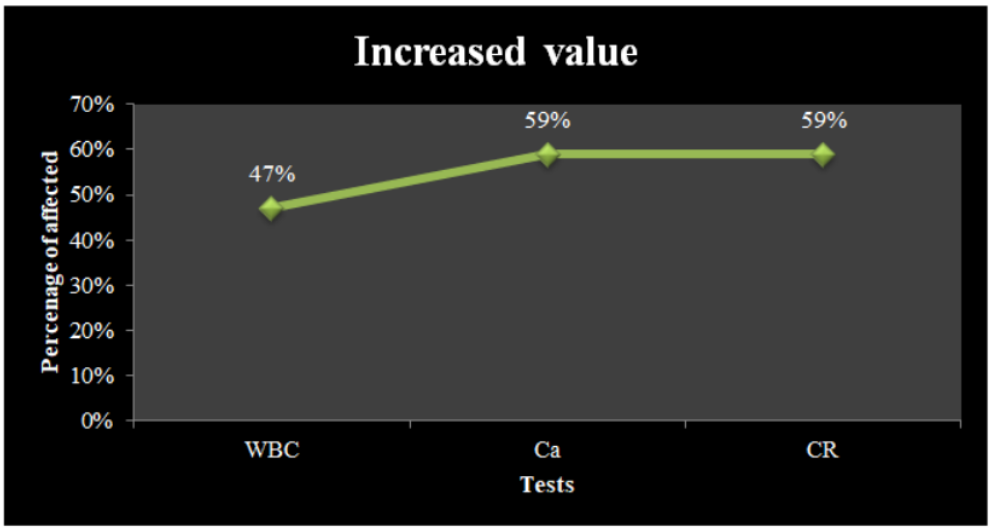

Fig 5: Bio-Chemical Analysis of Urine Among 32 Cases

3.3. Age and Sex Group Analysis

Out of 32 cases, 10 males (31%) and 22 females (69%) were present. The adult age group of both the sexes was included for this project. Among the patients the number of patients in 0-20, 21-40, 41-60, 61-80 age groups were enumerated and given in the Table 6.

Table 6: Ages and Sex Group Analysis

Age	Male	Female
0-20	1 (3%)	-
21-40	-	7 (22%)
41-60	3 (9%)	9 (28%)
61-80	6 (19%)	6 (19%)
Total	10 (31%)	22 (69%)

In males 61-80 age group recorded more patients whereas in females 41-60 age group recorded more patients. No patients were found in 0-20 age group of females and 21-40 age groups of males.

3.4. Blood Group Analysis

While analyzing the blood group wise, the test result showed the susceptibility as with order of 'O' – group > 'B' group > 'A' group > 'AB' group and given in Table 7 and Fig. 6.

Table 7: Blood Group Analysis

	Blood group			
	'O'	'B'	'A'	'AB'
No. of cases affected and percentage	12 (37.5%)	10 (31.25%)	7 (21.87%)	3 (9.37%)

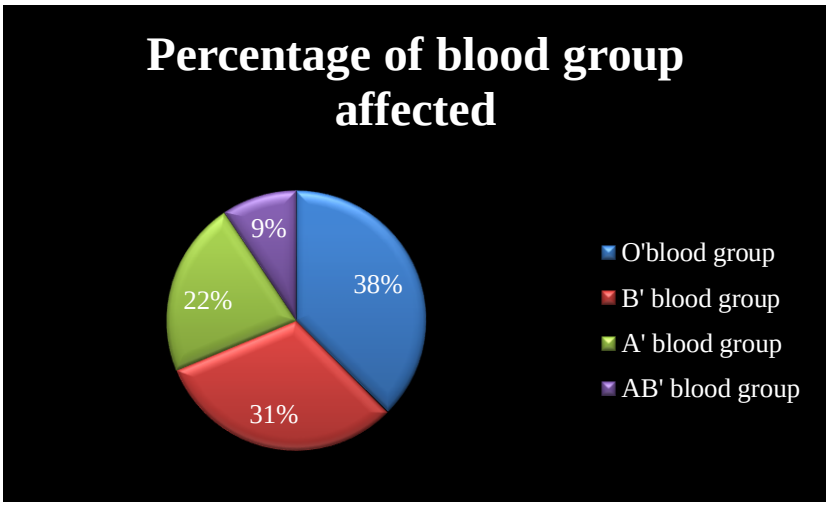

Fig 6: Percentage of Blood Group Affected

In general, the biochemical parameters vary from sick persons to normal person. The filarial lymphodema patients showed differentiation in certain extent with the hematological parameters. The host specificity may also vary from patients to patients. Several studies done in dogs [14, 20,21] and in monkey [22] reveled that certain biochemical changes can be identified.

In the present study also such changes were observed from the tests performed in Filarial patient's. Further studies may be needed in this aspect to establish several hidden facts of Haematological changes among the Filarial Lymphodema Cases.

WHO response (16 March 2022)

World Health Assembly resolution WHA50.29 encourages Member States to eliminate lymphatic filariasis as a public health problem. WHO launched its Global Programme to Eliminate Lymphatic Filariasis (GPELF) in 2000. Lymphodema management.

WHO strategy is based on 2 key components

- stopping the spread of infection through large-scale annual treatment of all eligible people in an area or region where infection is present; and
- Alleviating the suffering caused by lymphatic filariasis through provision of the recommended essential package of care.

In 2020, GPELF set the following goals for the new NTD Road Map (2021-2030):

- 58 (80%) of endemic countries have met the criteria for validation of elimination of LF as a public health

problem, with both sustained infection rates below target thresholds for at least 4 years after stopping MDA and providing the essential package of care in all areas with known patients;

- 72 (100%) of endemic countries implement post-MDA or post- validation surveillance; and
- Reduction to 0 of the total population requiring MDA.

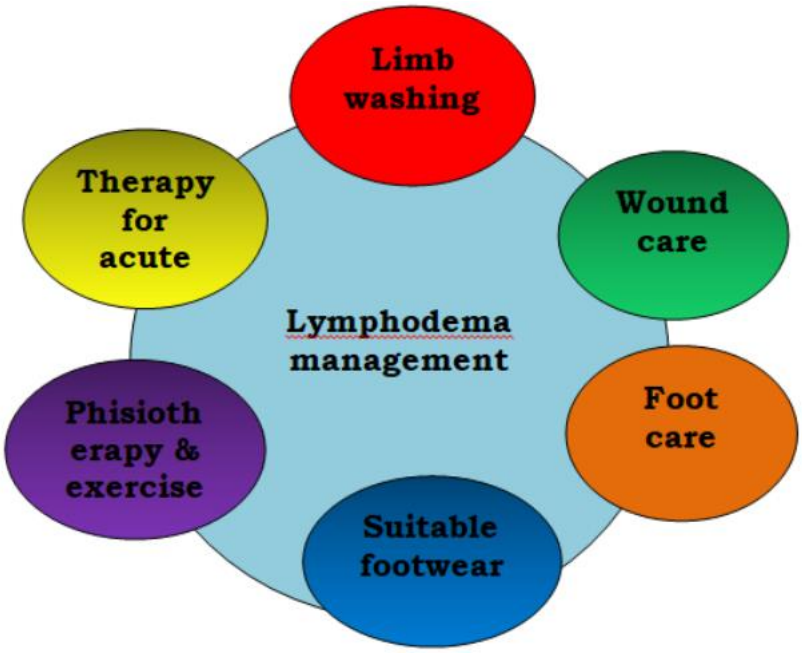

Fig 7: Steps followed in Lymphodema Management

Table 1: Haematological Analysis of Filaria lymphodema Blood Samples

S. No	Tests	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Reference Range
1	WBC	7.8	11.0	6.4	2.4	4.6	5.0	7.0	5.5	3.7	7.8	5.2	7.4	9.4	9.4	12.1	4.0-10.0 X 10^3 /µL
2	LYMPH#	2.3	2.9	1.5	0.2	-	-	2.5	1.7	-	1.6	1.2	0.8	3.3	3.1	3.1	0.8-4.0 X 10^3 /µL
3	MID#	1.2	0.7	0.7	0.3	-	-	0.7	0.4	-	0.7	0.5	0.9	0.7	0.9	1.2	0.1-0.9 X 10^3 /µL
4	GRAN#	4.3	7.4	4.2	1.9	-	-	3.8	3.4	-	5.5	3.5	5.7	5.4	5.4	7.8	2.0-7.0 X 10^3 /µL
5	LYMPH	29.2	26.6	23.4	9.8	-	-	35.8	30.4	-	21.0	22.2	10.7	34.6	32.6	25.4	20.0-40.0%
6	MID%	15.2	6.7	11.0	10.5	-	-	9.6	7.8	-	9.3	9.6	12.1	8.3	10.3	10.0	3.0 – 9.0%
7	GRAN%	55.6	66.7	65.6	79.1	-	-	54.6	61.8	-	69.7	68.2	77.2	57.1	57.1	64.6	50.0 – 70.0%
8	HGB	9.8	13.4	9.5	19.2	10.7	10.0	10.7	11.7	11.8	12.7	9.4	11.1	12.9	9.2	10.2	11.0-15.0-g/dL
9	RBC	3.63	4.64	3.78	8.47	3.94	3.81	3.82	4.12	3.97	4.18	3.20	4.23	4.65	4.37	3.71	3.50-5.00 g/dL
10	HCT	29.0	42.7	29.6	56.7	30.9	30.4	32.7	34.8	37.6	37.9	29.1	31.1	37.7	29.7	30.6	37.0-48.0%
11	MCV	79.9	92.2	78.5	67.0	78.5	79.8	85.7	84.7	94.9	90.7	91.1	73.1	81.2	68.0	82.7	82.0-95.0 fL

12	MCH	26.9	28.8	25.1	22.6	27.1	26.2	28.0	28.3	29.7	30.3	29.3	26.2	27.7	21.0	27.4	27.0-31.0 pg
13	MCHC	33.7	31.3	32.0	33.8	34.6	32.8	32.7	33.6	31.3	33.5	32.3	35.6	34.2	30.9	33.3	32.0-36.0 g/dL
14	RDW-C	14.6	16.8	16.0	18.9	14.7	15.0	15.0	13.8	18.6	14.2	14.0	15.1	14.0	17.9	15.1	11.5-14.5%
15	RDW-SI	42.7	55.3	44.8	45.5	44.1	44.8	46.2	43.4	60.9	46.2	46.9	40.6	42.0	43.4	46.2	35.0-56.0 fL
16	PLT	170	251	201	108	216	94	227	229	254	186	202	272	274	281	199	100-300 x 10^3/uL
17	MPV	7.5	6.9	7.7	8.7	7.7	9.8	7.6	6.9	8.4	8.0	6.5	7.5	7.1	7.5	8.0	7.0-11.0 fL
18	PDW	16.2	15.5	15.7	15.1	15.5	16.0.	15.1	15.1	17.1	16.0	15.0	15.9	15.4	16.2	15.6	15.0-17.0
19	PCT	0.127	O.173	0.154	0.193	0.166	0.092	0.172	0.158	0.213	0.148	0.131	0.204	0.194	0.210	0.159	0.108-0.282%

Table 1: Haematological Analysis of Filaria lymphodema Blood Samples

S. NO	Tests	RESULTS																	Reference range
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
1	WBC	5.4	4.2	3.3	3.2	8.7	6.1	9.3	5.5	3.4	6.1	9.3	6.6	5.8	2.9	7.1	8.3	7.7	4.0-10.0 x 10^3 /uL
2	LYMPH#	1.4	~	1.1	1.1	3.0	1.1	1.9	1.6	0.9	1.9	204	2.8	1.6	0.5	2.2	2.5	3.0	0.8-4.0 x 10^3 /uL
3	MID#	0.5	~	~	0.3.	0.9	0.7	0.8	0.4	0.2	0.7	1.1	0.7	0.6	0.2	0.7	0.7	0.7	0.1-0.9 x 10^3 /uL
4	GRAN#	3.5	~	~	1.8	4.8	4.3	6.6	3.5	2.3	3.5	5.8	3.1	3.6	2.2	4.2	5.1	4.0	2.0-7.0 x 10^3 /uL
5	LYMPH%	26.8	~	~	33.4	34.8	18.5	20.7	28.5	27.4	31.2	26.3	42.2	27.0	18.7	31.0	29.6	39.1	20.0-40.0%
6	MID%	9.3	~	~	8.9	10.0	11.9	9.0	7.7	6.5	11.9	11.6	10.2	10.3	5.5	.9	9.2	8.9	3.0-9.0%
7	GRAN%	63.9	~	~	57.5	55.2	69.6	70.3	63.8	66.1	56.9	62.1	47.6	62.7	75.8	59.1	61.2	52.0	50.0-70.0%
8	HGB	10.7	16.5	5.0	~	6.8	3.0	~	~	~	5.1	~	~	~	0.7	9.0	6.7	10.0	11.0-5.0 g/dL
9	RBC	3.73	31.	2.01	1.87	3.96	2.66	4.85	4.41	2.05	4.61	3.88	4.83	3.60	2.76	4.47	4.31	3.57	3.50-5.00 10^6/uL
10	HCT	30.2	26.2	17.7	15.2	31.5	22.5	39.5	35.4	16.3	37.6	29.4	40.6	28.6	21.9	36.5	34.3	29.3	37.0-48.0%
11	MCV	81.1	84.1	88.1	81.6	79.5	84.6	81.5	80.3	79.9	81.6	76.0	84.2	79.5	79.5	81.8	79.7	62.1	82.0-95.0 fL
12	MCH	28.6	52.8	24.8	~	7.1	11.2	~	~	~	11.0	~	~	~	.5	20.1	15.5	28.0	27.0-31.0 g/dL

13	MCHC	35.4	62.9	28.2	~	21.5	13.3	~	~	~	13.5	~	~	~	3.1	24.6	19.5	34.1	32.0-36.0 g/dL
14	RDW-CV	1.8	13.4	4.1	13.9	14.4	13.4	14.7	14.4	13.6	13.8	15.0	13.7	13.8	14.6	14.1	14.6	14.1	11.5-14.5%
15	RDW-SD	38.5	39.9	46.2	41.2	41.2	39.9	42.7	41.2	41.2	40.6	40.6	42.7	40.6	42.7	42.7	42.0	42.7	35.0-56.0 fL
16	PLT	199	179	156	127	219	156	223	186	166	214	279	224	330	177	217	232	282	100-300 x 10^3/uL
17	MPV	7.2	7.2	7.5	8.4	7.6	7.4	7.7	7.3	7.5	7.1	8.4	8.6	7.9	6.5	8.7	7.6	7.2	7.0-11.0 fL
18	PDW	15.4	15.4	15.6	16.2	15.1	15.6	15.1	15.5	15.4	15.6	15.7	15.6	15.6	15.0	15.6	15.5	15.3	15.0-17.0
19	PCT	0.143	0.128	0.117	0.106	0.166	0.115	0.171	0.135	0.124	0.151	0.234	0.192	0.260	0.155	0.188	0.176	0.203	0.108-00.282%

Table 2: Bio Chemical Analysis of Filaria lymphodema Infected Urine Samples

S. No	Tests	RESULTS																
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1	WBC	0	+3 3500	+-15	+3 500	0	+-15	1-15	0	0	0	+1 70	+1 70	+-15	+-15	+-15	0	0
2	KET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	NIT	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	URO	2	N	N	N	N	N	+66	N	N	N	N	N	N	N	N	N	N
5	BIL	0	+-8.6	0	+1 8.6	0	0	+2 34	0	0	0	0	0	0	0	0	0	0
6	PRO	0		0	0	0	0	+-0.15	0	0	0	0	0	0	0	0	0	0
7	GLU	0		0	0	0	0	0	+4>=55	0	+-2.8	0	0	0	0	0	0	0
8	SG	1.030	1.020	1.020	1.020	1020	1.025	1.010	1.015	1.025	1.015	1.020	1.01 15	1.020	1.020	1.020	1.015	1.020
9	PH	5.5	6.0	5.5	6.0	5.0	5.5	7.5	6.0	5.5	5.5	6.0	7.0	7.0	5.5	5.5	5.5	7.0
10	BLD	0	0	0	0	+125	0	0	0	0	0	0	0	+-10	0	0	0	0
11	CR	>=0.9	>=0.9	4.4	4.4	>=0.9	4.4	<=0.9	>=0.9	>=0.9	>=0.9	>=0.9	>=0.9	>=0.9	>=0.9	4.4	17.6	>=0.9
12	CA	<=1.0	>=1.0	2.5	2.5	2.5	2.5	>=.1.0	>=1.0	2.5	5.0	>=1.0	2.5	2.5	>=1.5	2.5	2.5	>=1.0
13	MA	0	0	0	0	0	0	>=1.0	0	0	0	0	0	0		0	0	0

Table 2: Bio Chemical Analysis of Filaria lymphodema Infected Urine Samples

S. No	Tests	RESULTS															Reference range
		18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
1	WBC	+-15	0	0	+-70	0	0	0	0	+-70	0	0	0	0	+2125	+-15	-ve
2	KET	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-ve
3	NIT	-	+	-	-	-	-	+	-	-	-	-	-	-	-	-	-ve
4	URO	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
5	BIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-ve
6	PRO	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-ve
7	GLU	0	0	0	0	+4>=55	0	+-2.8	0	0	0	0	0	0	0	0	-ve
8	SG	1.025	1.025	1.020	1.025	1.025	1.020	1.020	1.025	1.025	1.020	1.020	1.025	1.025	1.025	1.025	1.005
9	PH	6.0	5.5	5.5	7.0	5.0	5.5	7.0	5.5	5.5	6.0	6.0	6.0	5.5	5.5	7.0	5.0-5.5
10	BLD	+280	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-ve
11	CR	8.8	8.8	8.8	4.4	8.8	8.8	4.4	8.8	8.8	17.6	<=0.9	17.6	8.8	4.4	17.6	<=0.9
12	CA	5.0	<=1.0	<=1.0	<=1.0	<=1.0	<=1.0	<=1.0	2.5	2.5	5.0	<=1.0	5.0	<=1.0	<=1.0	2.5	<=1.0
13	MA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-ve

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CONCLUSION

This research concluded with hematological and biochemical changes in human naturally infected with *Wuchereria bancrofti*. Alternation such as a decreased in haemoglobin concentration (HGB), hematocrit (HCT), mean corpuscular haemoglobin (MCH), mean corpuscular volume (MCV) as well as increases in Mid-sized cell (Mid#), red blood cell distribution width co-efficient of variation (RBC -CV), white blood cell (leukocytes) (WBC), creatinine (CR), calcium (Ca) could be indicators of co-infection with *W.bancrofti*, especially in endemic region. The result can help in the study of filariasis and this can substantially reduce the mortality, decrease the cost of treatment, & increase health care.

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Competing of interest

The authors declare no conflict of interest.

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