



# Infections of Hepatitis B and C and Malaria *Plasmodium Falciparum* among Blood Donors in Ife East Local Government Area, Ile Ife, Osun State, Nigeria

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Research Article

Volume 8 Issue 3

Received Date: July 27, 2024

Published Date: August 26, 2024

DOI: 10.23880/eij-16000281

## Abstract

Endemic regions for malaria are endemic for other infectious diseases that might affect the malaria infection. Infection with hepatitis B virus (HBV) and hepatitis C virus (HCV) are major global health problems. Moreover, infection with these viruses might be associated with an increased mortality rate as the infections may predispose to the development of serious liver diseases. The present study was carried out to determine the asymptomatic *Plasmodium falciparum* co-infections with Hepatitis virus among blood donors in Ife East Local Government Area in Ile Ife, Osun State, Nigeria. Five (5) ml of venous blood was obtained from each of the participating 400 blood donors into plain bottles and labeled accordingly. Thick and thin films of the blood samples were made on slides, dried for five minutes at ambient temperature (37°C) then stained with Giemsa's stain. The stained slides were thereafter examined microscopically for the presence, species identification and densities of malaria parasites. The determinations of the haematological parameters were also conducted on the blood samples of the donors. The overall mean parasitaemia of malaria infection among the donors was  $922.51 \pm 103.063$  ( $\mu\text{l}/\text{blood}$ ) while 11.0% Hepatitis virus infection, 4.0% HBV and 7.0% HCV are recorded in this study. The prevalence of Hepatitis virus infection 14.0% was highest among donors aged 21-30 years, HBV 6.4% was highest among donors aged 27-35 years. The highest 13.6% HCV was recorded among donors aged 18-26 years. The highest malaria infection with mean parasitaemia  $1,318.1818 \pm 624.03$  ( $\mu\text{l}$  of blood) was recorded among donors aged 18-26 years. 11.3% Hepatitis viral infection, 4.2% HCV, 7.1% HBV and mean malaria parasitaemia  $931.596 \pm 107.20$  ( $\mu\text{l}$  of blood) were highest among male. The single has the highest prevalence of 12.0% Hepatitis virus infection and 8.9% HCV infection among the single donors while, 4.5% HBV infection and malaria infection with mean parasitaemia  $936.9954 \pm 138.91$  ( $\mu\text{l}$  of blood) was recorded among married donors. The highest 20.0% prevalence of Hepatitis virus infection, 7.3% HBV and 12.7% HCV were recorded among donors who are student while the malaria infection with mean parasitaemia  $1,158.3710 \pm 297.18$  ( $\mu\text{l}$  of blood) was highest among donors who are trader. Among occupation the prevalence 12.5% Hepatitis virus infection was highest among donors with primary education, the highest 7.8% HCV was recorded among donors with secondary education, while the highest 6.3% HBV was recorded among donors with primary education. Donors with tertiary education has the highest malaria infection with mean parasitaemia  $1,145.8793 \pm 217.70$  ( $\mu\text{l}$  of blood). Donors with O+ve blood group has the highest prevalence of Hepatitis infection 43.2%, while the highest 8.0% HBV was recorded among donors with B+ve blood group. The highest 20.0% HCV was recorded among donors with B-ve blood group. AB+ve blood donors had the highest malaria infection with mean parasitaemia  $1,749.8000 \pm 1605.32$

( $\mu\text{l}$  of blood). Haematological parameters in this study are within the normal range. In conclusion, the blood donors in Ife East L.G.A, Ile Ife, harbour asymptomatic HBV, HCV and Malaria, although the prevalence of malaria, hepatitis B and C viral infections was low in this study, crucial screening of blood donors, creating awareness on the general public regarding transmission and prevention of the infections, provision and availability of vaccines against HBV should be expanded to cover every citizen. More aggressive strategies such as extensive environmental insecticide spraying, de-clogging of water ways and drainages as well as widespread and effective distribution of Insecticide Treated Nets and other anti-malarias should be adopted in the fight against malaria.

**Keywords:** Asymptomatic; *Plasmodium falciparum*; Co-infections; Hepatitis B and C Virus; Blood Donors; Ife East LGA; Nigeria

## Abbreviations

HBV: Hepatitis B Virus; WBC: White Blood Cells; HBSAg: Hepatitis B Surface Antigen; PCV: Packed Cell Volume; TTIs: Transfusion-Transmitted Infections.

## Introduction

The dual infections of malaria and hepatitis B remain vital health issues in developing countries. Approximately 350-500 million cases yearly, with 2-3 million annual deaths occur as a result of malaria infection [1]. Hepatitis B infection is caused by hepatitis B virus (HBV). An estimated 350 million persons worldwide are chronic carriers [2], 4 million clinical cases of HBI infection are recorded each year, with about 1 million deaths as a result of complications, including liver cancers [3]. The presence of HBV and malaria co-infection is usually predominant in areas where both infections are endemic as mono-infection [4]. HBV and malaria are known to share some of their developmental stages in the liver, which has sometimes been attributed to the poor clearance of the liver stage of the malaria parasite [5]. Co-infection of Malaria and HBV may occur in areas where both infections are endemic and because of their geographical coincidence [6]. These two infections share some of their developmental stages within the liver, which may cause an impaired clearance of the liver stages of Malaria parasite due to hepatocytes damage in HBV infection [5].

## Materials and Methods

### Ethical Issues

Prior to the commencement of the study, the research protocol was submitted and approved by the Ethics and Research committee of the Osun State Ministry of Health, Abere, Oshogbo. Osun State. Nigeria (OSHREC/PRS/569T/437). Verbal informed consents were obtained from all donors and confidentiality was assured by using codes.

## Study Area

The study was conducted in Ife East Local Government Areas within Osun State. The State covers an area of approximately 14,875 sq km and lies between latitude  $7^{\circ} 30' 0''$  N and longitude  $4^{\circ} 30' 0''$  E and it is situated in the tropical rain forest zone. Ile-Ife is a semi urban area where agriculture is occupied by most within the tropical savanna climate zone of West Africa. It has a mean relative humidity of 75% to 100% and the average rainfall of 1,000–1,250 mm is usually from March to October.

## Specimen Collection

Whole venous blood from 1200 blood donors were collected into commercially procured EDTA bottles and labeled accordingly. These were transported to Department of Biology, School of Sciences and Federal University of Technology Akure for Parasitological and Serological investigations.

## Laboratory Processing of Samples

The 400 blood samples from the donors will be taken to the laboratory for both microscopic and serological analysis (Malaria, Hepatitis B and C screening).

## Microscopic Examination

Thick and thin films of the blood samples were made on slides, dried for five minutes at ambient temperature ( $37^{\circ}\text{C}$ ) then stained with Giemsa's stain. The stained slides were thereafter examined microscopically for the presence, species identification and densities of malaria parasite.

## Estimation of Parasite Numbers Per $\mu\text{l}$ Of Blood

A part of the thick film where the white cells are evenly distributed and the parasites are well stained was selected. Using the oil immersion objective, 200 white blood cells (WBC) at the same time the numbers of parasites (asexual)

in each field covered was systematically counted. This was repeated in three good other areas of the film and averages of the three counts were taken. The number of parasites per  $\mu\text{l}$  of blood was calculated as follows [6]:

WBC count x Parasites counted against 200 WBC/200

### Screening for Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV)

Tests to screen the 1200 samples of the donors' blood for HBV and HCV was done based on the detection of hepatitis B surface antigen (HBsAg) and anti-HCV antibodies using rapid immunochromatographic (IC) tests which are in cassette form. The membrane is pre-coated with anti-HBsAg and anti-HCV antibodies on the test line region of the test. During testing, the plasma specimen reacts with the particle coated with anti-HBsAg and anti-HCV antibody. The mixture migrates upward on the membrane chromatographically by capillary action to react with anti-HBsAg and anti-HCV antibodies on the membrane and generates a colored line. The presence of this colored line in the test region indicates a positive result, while its absence indicates a negative result. To serve as a procedural control, a colored line will always appear in the control line region indicating that proper volume of specimen has been added and membrane wicking has occurred [7].

### Estimation of Packed Cell Volume (PCV)

The determination of the PCV was done by measuring the relative volume of the blood occupied by erythrocytes in Microhaematocrit tube as expressed in the following equation:

$$PCV = \frac{\text{length of red cell column}(mm)}{\text{length of the total column}(mm)} \times 100$$

### Estimation of Hematological Parameters

The counting White Blood cells (WBC) and Differential white Blood cells count (FBC) was done using the following methods.

#### Counting White Cells

##### Test Method

- 0.38 ml of diluting fluid (Turk's solution) was measured and dispensed into a small tube.
- 0.02 ml of well-mixed EDTA anti-coagulated venous blood from mice was added and mixed.
- The counting chamber was assembled and the diluted blood sample using a capillary tube held at an angle of about 45 was used to fill one of the grids of the chamber with the sample taking care not to over fill the area.

- The chamber was left undisturbed for 2 minutes to allow time for the white cells to settle.
- The underside of the chamber was wiped dried and place it on the microscope stage and using the X10 objective with the condenser iris closed sufficiently to give good contrast, the cells was focused until they appear as small black dots.
- The cells in the four large corner squares of the chamber were counted including the cells lying on the lines of two sides of each large square. The reading was done.

### Differential White Cell Count

#### Method

- To a well-made and correctly stained thin blood film, a drop of immersion oil will be dropped on the lower third of the blood film and cover with a clean cover glass.
- The film will be examined microscopically using X10 objective with the condenser iris closed sufficiently to see the cells clearly and to view the part of the film where the red cells are just beginning to overlap and the x40 objective will be used to focus the blood film.
- The blood film will be systematically examined and different white cells will be counted as seen in each field using an automatic differential cell counter.

### Determination of Blood Group of the Donors

Determination of the blood groups of the donors was done using Anti sera A, B, AB and anti D that determine the Rhesus factor as follows:

#### Method

1. A glass slide was marked as follows Anti-A, Anti-B, Anti D
2. Each division was pipetted into as follows:  
Anti-A: 1 volume anti-A serum, 1 volume donor's capillary blood  
Anti-B: 1 volume anti-B serum, 1 volume donor's capillary blood  
Anti-AB: 1 volume anti-AB serum, 1 volume donor's capillary blood  
Anti-D: 1 volume anti-D serum, 1 volume donor's capillary blood
3. The contents of each division were mixed using a clean piece of stick for each.
4. The slide was tilted from side to side, looking for agglutination and the results recorded after 2 minutes.

### Results

The overall mean parasitaemia of malaria infection among the donors was  $922.51 \pm 103.063 (\mu\text{l}/\text{blood})$  while that of Hepatitis virus infection was 44/400 (11.0%), HBV

and HCV are 16/400 (4.0%) and 28/400 (7.0%). Table 1, present the Socio- Demographic Characteristics of the Study Population of Donors in Ife East Local Government Area. A total of 400 blood donors; aged 18-62 years had participated in the study. Majority of the donors that participated 94.8%

(379/ 400) were male, 60.50% (242/400) were married, 43.00% (172/400) were in the age range 21-30 years, 35.8% (143/400) were artisans, and 67.0% (268/400) were in secondary.

Variables	Number Examined	Percentage (%) in the pool
<b>Sex of the subjects</b>		
Male	379	94.8
Female	21	5.3
<b>Marital Status</b>		
Married	242	60.5
Single	158	39.5
<b>Age group (in years)</b>		
Oct-20	22	5.5
21-30	172	43
31-40	153	38.3
41-50	44	11
51-60	9	2.3
<b>Occupation of the subjects</b>		
Artisan	143	35.8
Trading	62	15.5
Civil Servant	65	16.3
Driver	59	14.8
Student	55	13.8
Farmer	16	4
<b>Level of Education of the subjects</b>		
Primary	16	4
Secondary	268	67
Tertiary	116	29
<b>Religion</b>		
Christianity	316	79
Islam	82	20.5
Traditional	1	0.5
<b>Total</b>	<b>400</b>	<b>100</b>

**Table 1:** Socio-Demographic Characteristics of the Study Population of Donors (N=400) Ife East Local Government Area.

In Table 2, the highest prevalence of Hepatitis virus infection of 14.0% was recorded among donors aged 21-30 years followed by 13.6% among donors aged 18-26 years and the least of 6.8% among donor aged 45-53 years. HBV has the highest prevalence of 6.4% among donors aged 27-35 years followed by 4.5% among donors aged 45-53 years and the least 2.0% among donors 36-44years. The highest HCV of 13.6% was recorded among donors aged 18-26 years

followed by 7.6% among donors aged 27-35 years and the least 2.3% was recorded among donors aged 45-43 years. The malaria infection was highest with mean parasitaemia 1,318.1818± 624.03(µl of blood) among donors aged 18-26 years followed by 1,032.3636±339.42 (µl of blood)among donors aged 45-53 years and the least 506.2222±212.29 (µl of blood) among donors aged 54-62years.

Variables	No Examined	No Infected Hepatitis (%)	No Infected (HBV)(%)	No Infected (HCV) (%)	Mean Malaria Parasitaemia ( $\mu$ l of blood)
Age (years)					
18-26	22	3 (13.6)	0 ( 0.0)	3 (13.6)	1,318.1818 $\pm$ 624.03
27- 35	172	24 (14.0)	11 (6.4)	13 (7.6)	907.5988 $\pm$ 149.67
36-44	153	14 (9.2)	3 ( 2.0)	11 (7.2)	875.2876 $\pm$ 168.25
45-53	44	3 (6.8)	2 (4.5)	1 (2.3)	1,032.3636 $\pm$ 339.42
54-62	9	0 (0.0)	0 (0.0)	0 (0.0)	506.2222 $\pm$ 212.29
Sex					
Male	379	43 (11.3)	16 (4.2)	27 (7.1)	931.596 $\pm$ 107.20
Female	21	1 (4.8)	0 (0.0)	1 (4.8)	757.4762 $\pm$ 248.99
Marital status					
Married	242	25 (10.3)	11 (4.5)	14 (5.8)	936.9954 $\pm$ 138.91
Single	158	19 (12.0)	5 (3.2)	14 (8.9)	900.3354 $\pm$ 155.35
Occupation					
Artisan	143	14 (9.8)	6 ( 4.2)	8 (5.6)	577.9441 $\pm$ 108.13
Trader	62	7 (11.3)	2 (3.2)	5 (8.1)	1,158.3710 $\pm$ 297.18
Civil servant	65	4 (6.2)	1 (1.5)	3 (4.6)	1,150.9385 $\pm$ 316.97
Driver	59	6(10.2)	2 (3.4)	4 (6.8)	1,035.2034 $\pm$ 290.05
Student	55	11 (20.0)	4 (7.3)	7 (12.7)	1,144.4182 $\pm$ 304.34
Farmer	16	2 (12.5)	1 (6.3)	1(6.3)	981.8750 $\pm$ 776.11
Education					
Primary	16	2 (12.5)	1 (6.3)	1 (3.6)	377.9375 $\pm$ 263.57
Secondary	268	30 (11.2)	9 (3.4)	21 (7.8)	858.3470 $\pm$ 121.92
Tertiary	116	12 (10.3)	6 (5.2)	6 (5.2)	1,145.8793 $\pm$ 217.70
Total	<b>400</b>	<b>44 ( 11.0)</b>	<b>16 (4.0)</b>	<b>28 (7.0)</b>	<b>922.5150 <math>\pm</math> 103.94</b>

**Table 2:** Prevalence of Hepatitis B virus, Hepatitis C virus and Malaria parasite and co-infections according to socio-demographic factors among blood donors in Ife East L.G. A in Osun State. (N=400).

The highest prevalence of Hepatitis viral infection of 11.3% and HCV of 4.2%, HBV of 7.1% and mean parasitaemia of 931.596  $\pm$  107.20 ( $\mu$ l of blood) were highest among male. The highest prevalence of Hepatitis virus infection of 12.0%, HCV of 8.9% was recorded among the single while, HBV of 4.5% and malaria infection with mean parasitaemia of 936.9954 $\pm$  138.91( $\mu$ l of blood) was recorded among married donors. The highest prevalence of Hepatitis virus infection of 20.0% was reported among student followed by 11.3% among trader and the least 6.2% among civil servant. The highest HBV of 7.3% was recorded among student followed by 6.3% among farmer and the least 1.5% among Civil servant. The highest HCV of 12.7% was recorded among donors who are student followed by 8.1% among trader and the least 4.6% among civil servant. The malaria infection was highest with mean parasitaemia of 1,158.3710 $\pm$  297.18 ( $\mu$ l of blood) among donors who are trader followed by 1,150.93 $\pm$  255.07 ( $\mu$ l of blood) among civil servant and the least 577.94 $\pm$  98.11

( $\mu$ l of blood) among artisan.

The highest prevalence of Hepatitis virus infection of 12.5% was recorded among donors with primary education followed by 11.2% among donors with secondary education and the least 10.3% among donors with tertiary education. The highest HCV of 7.8% was recorded among donors with secondary education followed by 5.2% among donors with tertiary and the least 3.6% among donors with primary education. The highest HBV of 6.3% was recorded among donors with primary education followed by 5.2% among donors with tertiary education and the least 3.4% among donors with secondary education. The malaria infection was highest with mean parasitaemia of 1,145.8793  $\pm$  217.70 ( $\mu$ l of blood) among donors with tertiary education followed by 858.3470 $\pm$  121.92 ( $\mu$ l of blood) among donors with secondary education and the least 377.9375 $\pm$  263.57 ( $\mu$ l of blood) among donors with primary education.

In Table 3, the highest prevalence of Hepatitis infection of 43.2% was recorded in O+ve, followed by 22.7% in B+ve and the least 2.3% in B-ve. In HBV, 8.0% in B+ve was the highest followed by 4.1% in A+ve and the least 3.5% in O+ve. The highest HCV of 20.0% was recorded in B-ve, followed by 17.1% in O-ve and the least 5.5% in A+ve. The

malaria infection was highest with mean parasitaemia of 1,749.8000±1605.32 (µl of blood) among AB+ve donors followed by 1,144.8400±295.51 (µl of blood) in B-ve and the least 104.0000±54.00 (µl of blood) in A-ve donors.

Blood group	No Exam	No Infected with Hepatitis (%)	HBV (No Infected) (%)	HCV (No Infected) (%)	Malaria Parasitaemia (µl of blood) mean±SEM
Ab+	5	0 (0.0)	0 (0.0)	0 (0.0)	1,749.8000±1605.32
A-	2	0 (0.0)	0 (0.0)	0 (0.0)	104.0000±54.00
A+	73	7 (15.9)	3 (4.1)	4 (5.5)	588.1095±202.58
B-	5	1 (2.3)	0 (0.0)	1 (20.0)	540.2000±330.91
B+	75	10 (22.7)	6 (8.0)	4 (5.3)	1,144.8400±295.51
O-	41	7 (15.9)	0 (0.0)	7 (17.1)	678.5122±208.61
O+	199	19 (43.2)	7 (3.5)	12 (6.0)	1,008.7136±149.23
<b>Total</b>	<b>400</b>	<b>44 (11.0)</b>	<b>16 (4.0)</b>	<b>28 (7.0)</b>	<b>922.5150±103.94</b>

**Table 3:** Prevalence of Hepatitis B virus, Hepatitis C virus and mean Malaria parasite among blood donors according to blood groups in Ife East Local Government Area, Osun State.

Variables	No Exam	Neutrophil mean±SD	Lymphocyte mean±SD	Eosinophil mean±SD	WBC mean±SD	PCV mean±SD
<b>Age (years)</b>						
18-26	22	54.09± 9.24	44.05±8.58	1.86±2.37	5,218.18± 1005.05	42.50±3.21
27- 35	172	54.44± 7.46	43.73± 7.11	1.97±2.25	5,372.09± 1047.71	42.56±4.36
36-44	153	53.13± 8.28	45.21± 8.05	1.83± 2.12	5,227.45± 1048.07	42.22±3.80
45-53	44	54.09±7.74	44.41±7.05	1.66± 2.32	5,063.64± 871.27	42.61±4.21
54-62	9	54.67± 7.46	43.56± 6.96	1.78 ±1.78	6,222.22 ± 706.71	44.33±2.82
<b>Sex</b>						
Male	379	53.89± 7.69	44.43±7.39	1.83± 2.18	5,300.26± 1034.49	42.74±3.94
Female	21	53.76± 11.21	43.62± 10.26	2.62±2.51	5,171.43± 990.02	37.71±2.81
<b>Marital status</b>						
Married	242	54.01± 7.99	44.30±7.71	1.82± 2.13	5,288.84± 1044.44	42.28±3.98
Single	158	53.70± 7.77	44.51± 7.32	1.95±2.31	5,300.63± 1014.38	42.77±4.14
<b>Occupation</b>						
Artisan	143	54.50± 8.04	43.71±7.39	1.76± 2.20	5,516.08 ± 1105.66	42.10±4.41
Trader	62	54.26± 7.38	44.08± 7.24	1.90 ± 2.09	5,245.16± 905.11	41.95±4.05
Civil servant	65	53.35± 8.88	44.51± 8.17	2.12 ± 2.15	5,175.38± 1054.31	42.82±3.96
Driver	59	52.19± 6.71	45.83± 6.83	2.05± 2.30	5,200.00± 1004.64	42.73± 3.76
Student	55	53.84± 7.88	44.80 ±7.87	1.80± 2.45	4,934.55± 860.27	43.47±3.54
Farmer	16	55.56± 8.51	44.37± 9.17	1.31± 1.62	5,550.00± 981.83	42.06± 3.37
Artisan	143	54.50± 8.04	43.71±7.39	1.76± 2.20	5,516.08 ± 1105.66	42.10±4.41
<b>Education</b>						

Primary	16	55.31± 9.11	43.19±8.40	1.50± 1.93	4,912.50 ± 1436.60	44.44± 2.98
Secondary	268	54.34± 7.44	43.96± 7.14	1.80±2.18	5,347.01± 1049.82	42.21±4.11
Tertiary	116	52.64± 8.64	45.54± 8.27	2.09 ± 2.28	5,222.41± 911.57	42.80±3.96
<b>Total</b>	<b>400</b>	<b>53.89± 7.90</b>	<b>44.39± 7.55</b>	<b>1.87± 2.20</b>	<b>5,293.50± 1031.41</b>	<b>42.47±4.05</b>

Normal ranges: WBC =Adult: 4000-10,000/mm<sup>3</sup>, Neutrophil = 40-70% Lymphocyte = 20-45%, Eosinophil= 1-6%, Packed cell volume (PCV) Women = (36-46%), Men = (40-54%).

**Table 4:** The distribution of Neutrophil, Lymphocyte, Eosinophil, White blood cells and packed cell volume according to socio-demographic factors among blood donors in Ife East L.G.A in Osun State.

In Table 4, highest mean PCV in the study was 44.33±2.82 in aged 54-62 years followed by 42.61±4.21 in aged 45-53 years and the least 42.22±3.80 in aged 36-44 years. The highest mean WBC was 6,222.22 ± 706.71 in aged 54-62 years followed by 5,372.09± 1047.71 in aged 27-35 years and the least 5,063.64± 871.27 in aged 45-53 years. The highest mean eosinophil was 1.97±2.25 in aged 27-35 years followed by 1.86±2.37 in aged 18-26 years and the least 1.66± 2.32 in aged 45-53 years. The highest mean lymphocyte count 45.21± 8.05 in aged 36-44 years followed by 44.41±7.05 in aged 45-53 years and the least 43.73± 7.11 in aged 27-35 years. The highest mean neutrophil count 54.67± 7.46 was recorded in aged 54-62 years followed by 54.44± 7.46 in aged 27-35 years and the least 54.09±7.74 in aged 45- years. The highest mean PCV 43.47±3.54 was recorded among student, mean WBC 5,550.00± 981.83 among farmer, mean eosinophil 2.12 ± 2.15 among civil servant, mean lymphocyte count 45.83± 6.83 among civil driver and mean neutrophil count 55.56± 8.51 was recorded among farmer. The highest mean PCV 44.44± 2.98 was recorded among donors with primary education, mean WBC 5,347.01± 1049.82, among donors with secondary education. Mean eosinophil 2.09 ± 2.28 among tertiary, mean lymphocyte count 45.54± 8.27 among donors with tertiary and mean neutrophil count 55.31± 9.11 was recorded among donors with primary education.

## Discussion and Conclusion

The overall mean parasitaemia of malaria infection among the donors in this study was 922.51± 103.063 (µl/ blood) while that of Hepatitis virus infection was 11.0%, HBV and HCV are 4.0% and 7.0%, in contrary, Jamal D, et al. [9], reported that 1.94% donors are positive for HCV while 1.7% are positive for HBV, Sial GR, et al. [10], recorded 1.24% HBV and 2.15% HCV among the subjects and Rasheed HN, et al. [11] also, reported the prevalence of HBV and HCV to be 0.78% and 0.2% respectively which were lesser than the result recorded in this study, however, higher prevalence of 16.6% of HBV was recorded by Yakubu A, et al. [12] among blood donors in Kebbi State and 19.0% of HBV was recorded by Rasheed HN, et al. [11] in Ilorin. Kwara State, Nigeria.

The prevalence of Hepatitis virus infection was highest

among donors aged 21-30 years, HBV has the highest among donors aged 27-35 years. The highest HCV was recorded in aged 18-26 years. The malaria infection was highest among donors aged 18-26 years. Yakubu A, et al. [12] reported that donors within the age group 26-30 years had the highest HBV prevalence of 20.9% compared to the other age groups. Sial GR, et al. [10], reported that the highest prevalence of 46% of HBV was recorded among aged group 20-30 years while that of HCV 55% aged 30-40 years.

The Hepatitis viral infection, HCV, HBV and mean Malaria parasitaemia was highest all among male. The prevalence of Hepatitis virus infection and HCV was highest among the single while, HBV and malaria infection was recorded among married donors this is in accordance with the report of Yakubu A, et al. [12], who recorded that single males have higher prevalence (26.1%) of HBV infection than their married counterparts (16.7%). Sial GR, et al. [10] reported that the overall prevalence of 10.8% HBV and 1.2% HCV was most strongly associated with male in Sierra Leone, but Ugwuja E, et al. [13] reported that there was no statistically significant difference in HBV infection between males 9.0% and females 6.0%. Considering the occupation, highest prevalence of Hepatitis virus infection, HBV and HCV were recorded among donors who are student. The malaria infection was highest among donors who are trader.

Education has the highest prevalence of Hepatitis virus infection among donors with primary education, while the highest HCV was recorded among donors with secondary education. The highest HBV was recorded among donors with primary education, while the malaria infection was highest among donors with tertiary education. The prevalence of Hepatitis infection was highest among donors with O+ve blood group, while highest HBV was recorded among donors with B+ve blood group. The highest HCV was recorded among donors with B-ve blood group. The highest malaria infection was recorded among AB+ve blood donors. However, Ahmad A, et al. [14], reported that the donors with the O blood group were at a higher risk of contracting transfusion-transmitted infections (TTIs) and also, significant associations were observed between HBV and group AB. Mohammadali F, et al. [15] recorded that blood group O was associated with

a lower risk of HBV infection among Iranian blood donors, but on the contrary, blood group O was associated with a higher risk of HBV among Chinese Liu J, et al. [16]. Although, haematological parameters in this study were within the normal range, but the highest mean PCV was recorded in aged 54-62 years, mean WBC was in aged 54-62 years, eosinophil was in aged 27-35 years, lymphocyte count was in aged 36-44 years and the mean neutrophil count was recorded in aged 54-62 years.

In conclusion, the blood donors in Ife East L.G.A, Ile Ife, harbor asymptomatic HBV, HCV and Malaria, although the prevalence of malaria, hepatitis B and C viral infections was low in this study, crucial screening of blood donors is of ultimate importance because they serve as an asymptomatic reservoirs and a potential source of transmission of these infections. Creating awareness on the general public regarding Malaria, HBV and HCV transmission and prevention and provision and availability of vaccines against HBV should be expanded to cover every citizen. More aggressive strategies should be adopted in the fight against malaria such as extensive environmental insecticide spraying, de-clogging of water ways and drainages.

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