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Socio-Demographic Characteristics and Blood Parasites Among Blood Donors in Two Communities in Delta State, Nigeria

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Abstract

A six months' study was conducted to determine the occurrence of blood parasites in blood donors in Eku and Abraka, Delta State. Random sampling was adopted for blood samples collection alongside socio-demographic characteristics. Laboratory analysis using thick and thin films were carried out on samples. The result showed that 59(29.5%) were positive for blood parasites; 46(23.0%) for *Plasmodium*, 5(5.0%) for *Trypanosoma*, and 8(4.0%) for microfilaria. Parasite prevalence was highest in the age-group 45-49 years. Female showed relatively higher prevalence (30.6%) compared to male (29.3%). There was no significant difference in blood parasites prevalence based on gender of the subjects. Blood group B had the dominant prevalence (51.7%). With respect to occupation, self-employed donors had higher prevalence (38.9%). In addition, the rural-urban prevalence was skewed towards rural blood donors (39.7%) with no statistical difference, in respect to residence. PCV of donors showed no clear patterns and there was no association between PCV and prevalence of blood parasites ($p>0.05$). The results therefore indicate that there is relatively high prevalence of blood parasites among the blood donors which call for the attention of the authority concerned.

Keywords: Socio-demographic, blood donors, *Plasmodium*, *Trypanosoma*, microfilaria, Delta State

Introduction

Over the years, transfusion of blood and blood product has been a life saving measure which has resulted in the sustenance of patients worldwide. Blood transfusion is an important tool in the management and treatment of some health issues such as organ transplant, accident victims, anaemia patients and forms an integral part of clinical medicine (Zama *et al.,* 2013). The administration of blood to a patient is potentially a lifesaving procedure and the demand for blood has greatly increased over the years. Most commonly encountered complications during blood transfusion is the issues of transmitted infections usually as a result of infectious diseases endemicity across Sub-Saharan Africa (Ogbu and Uneke, 2008).

Transmission of pathogens-virus, bacteria and parasites still occurs from person to person through donated and transfused blood (Giangrande, 2001). Emerging pathogens, the testing and donor screening that are used in blood collection facilities are only able to identify known pathogens. Additionally, new variant and strains of existing infectious agents continue to emerge, moving beyond the sensitivity of existing tests.

Prevalence of blood parasites among blood donors has been reported in different parts of Nigeria by several authors. Salawu *et al.* (2010) reported the prevalence of antibody to syphilis. Saeed *et al.* (2007) reported that malaria due to *plasmodium falciparum* can be acquired even with transfusion of a small number of infected red blood cells. Dozie *et al.* (2004) reported a 26.8% seroprevalence rate of microfilariae in rural communities in Imo state, Nigeria. Egwunyenga (2004) reported an infection rate of microfilariae to be 8.2% among blood donors at

Eku, Delta State, Nigeria. Adediran *et al.* (2005) also documented 16.7% infection rate for microfilariae alone and 8.3% for both anaemia and microfilaria among blood donors in Ile-Ife, Osun state, Nigeria. Salawu and Murainah (2006) documented an infection rate among blood donors for microfilaria in Ile-Ife, Osun state, Nigeria is 2 (0.16%).

Despite the development of novel and improved diagnostic tests, these tests are not readily available for the mass screening of blood donors. Studies are still needed to access the exact risks that these parasites pose to our blood supply in order to protect susceptible recipients from these parasites. Although, blood transfusion is a probable source of blood parasitic infections, it is not well reported in Nigeria and Africa at large (Nmor and Egwunyenga, 2004). The knowledge of prevalence of transfusion transmitted parasitic infections will enlighten the people about the risk of transfusion transmitted parasitic infections associated with blood transfused to recipient. It will also help focus on stringent donor selection criteria, use of more sensitive screening methods to reduce the risk of transfusion-transmitted parasitic infections. Therefore, this study is to determine the prevalence of blood parasites among blood donors in two communities in Ethiope East Local Government Area of Delta State. Specifically, to provide baseline data for use in advocacy to convince policy makers, blood banks, and hospital managements to place more emphasis on improved and adequate blood screening strategies and elucidate any association between transfusion transmitted parasites and some characteristics of the donors such as age, gender, occupation and blood group.

Materials and Methods

Study Area

The study was carried out in Abraka and Eku both in Ethiope East Local Government Area, Delta State. Abraka lies between latitude 5° 45' and 5° 50' N and longitude 6° and 6° 15' E. The climate is equatorial; hot (23 to 37°C) with relative humidity of 50 to 70%. The rainforest vegetation has recently been decimated and replaced with farmlands. Eku lies between latitude $5N^0$ -$6S^0$ and longitudinal $5.5E^0$ - $5W^0$ with mean temperature range of 25^0– 30^0C and mean annual rainfall of 2,000mm. Eku is a semi-urban area with mangrove thick forest to mixed rain forest and grass lands vegetation.

Study Design and Sampling

A prospective study was carried out for a period of six months from March to August 2015. Sampling was done on weekly intervals during the period of the study in order to collect samples from blood donated before they are dispatched. A questionnaire comprising of several items including donor's age, gender, occupation, blood group, physical impairment etc. was established and used to obtain information of the donors. A total of 200 blood donors were sampled to determine the prevalence of transfusion transmitted parasite (TTP). The peripheral blood method was used in this study.

Laboratory Examination of Blood Sample

Two types of blood films, thin and thick films were prepared from blood collected from blood donors and stained according to standard techniques as adopted by (Garcia, 2001) for determination of Plasmodium parasites. For the determination of microfilaria, two methods were used; wet preparation and thin blood smear according to the method of Cheesbrough (1992). The presence of *Trypanosomiasis* was determined using haematocrit concentration techniques and examination of stain thick blood film.

Ethical Approval and Informed Consent

The study was conducted in compliance with the Declaration on the Right of the Patient (WMA, 2000). Informed consent was obtained from all subjects enrolled for the study. Before the study was carried out, prior notification was given to subjects at various study areas and permission were fully granted in full knowledge of the nature and scope of the research.

Statistical Analysis

Statistical analysis was performed using the Statistical Packages for the Social Sciences (SPSS) software. Differences between variables were determined by the paired t-test with the level of significance set at $p<0.05$.

Results and Discussion

Percentage prevalence of blood parasites among blood donors

The results obtained from the prevalence of parasites among the 200 subjects showed 29.5% prevalence with respect to the parasite species. The result showed that *Plasmodium* (23.0%) was the most prevalent followed by *Trypanosoma* (5.0%) and microfilaria (4.0%). The result among blood donors shows that Abraka community had the highest prevalence (36.9%) followed by Eku community (21.6%). However, there was no significant difference in the prevalence of parasites for both study area (p = 0.5866) and parasite species (p = 0.2988 and 0.2613) respectively (Table 1). The implication of this is that, fifty-nine out of the two hundred blood donors bear the risk of passing on blood parasites to their recipients. Unfortunately, most common group of patients who need blood transfusion falls under the immuno-compromised group which could exacerbate their conditions (Qari *et al.,* 1993).

The general prevalence of 29.5% recorded in this study was however, higher than that observed by Muntaka and Opoku-Okrah (2013) in Ghanaian hospital with 13.0% prevalence of *Plasmodium falciparum* among blood donor. Oladeinde *et al.* (2014) recorded 25.9% prevalence of asymptomatic malaria infection among blood donors in Benin City Nigeria. Sundar *et al.* (2007) reported 20.3% prevalence of *Toxoplasma* among healthy blood donors in India. Bolaji *et al.* (2014) reported 2.0% prevalence of filariasis among asymptomatic blood donors in Lagos state. Mohamed *et al.* (2004) recorded 6.5% prevalence of malaria among blood donors in Sudan. Agbolade *et al.* (2013) reported 14.0% prevalence of *Trypanosoma* among blood donors in Ijebu-North, South west Nigeria. Dozie *et al.* (2004) recorded 26.8% seroprevalence of microfilariae among blood donors in Imo state. Other similar studies in Nigeria with high prevalence among blood donors abound (Nmor and Egwunyenga, 2004) among blood donors in Delta state. Also, a 67.5% prevalence of *Plasmodium falciparum* was recorded by Wariso *et al. (*2015) among blood donor in Port Harcourt.

Age-related prevalence of blood parasites among blood donors

In terms of age-related prevalence, the age group 45-49 years had the highest prevalence (75.0%) while the least was observed among age group 20-24 years (17.9). Also, the prevalence of blood parasites among blood donors increased with age though, there was no significant difference in the prevalent with age (p = 0.0547). Further analysis using the age group 20-24 as reference shows a significant difference in infection for age group 30-34 years (p =0.0383) (Table 2.). Parasites were observed in all age groups, the prevalence of blood parasite among blood donors increases with age group. The rate was highest (75.0%) in 45-49 age groups. This is in line with the reports of Sarkari *et al. (*2013) they found that, the highest infection rate occurred among age group of 46-55 years. The t-test analysis showed no significant difference among age-groups (p = 0.0547), thus suggesting that there was no age difference in exposure to vectors of these parasites. This observation is in line with previous reports (Nmor and Egwunyenga, 2004; Achidi *et al.,* 1995; Akinboye and Ogunrinade, 1987). They found no significant difference between age of blood donors and parasite. Further analysis using the age group 20-24 as reference shows a significant different in infection for age group 30-34 years (p = 0.038).

Gender-related prevalence of blood parasites among blood donors

Prevalence was relatively higher in females (30.6%) than in males (29.3%) although there was no significant difference in blood parasites in relation to gender (p =0.2370). The parasite specific prevalence shows that *Plasmodium* species was highest for both male and females and for *Trypanosoma* and microfilaria. The prevalence was higher in female donors compared to male donors (Figure 1.). The gender- related prevalence of parasites among blood donors indicates that parasites prevalence is relatively higher in female donors (30.6%) than in male donors (29.3%). Chi-square analysis showed no significant difference in gender-related prevalence (p =0.2370). This finding agrees with the observations of other studies (Badaki *et al.,* 1999; Adediran, *et al.,* 2003; Okocha, *et al.,* 2005). They did not find

significant difference between male and females.
The parasites specific prevalence shows that

Table 1: Prevalence of Blood Parasites among Blood Donors in Abraka and Eku

Parasite	Study site						
	Eku (N=97)		Abraka (N=103)		Overall (N=200)		
	No of infection	%	No of infection	%	No of infection	%	P value
Plasmodium	17	(17.5)	29	(28.2)	46	(23.0)	0.5866
Microfiliaria	3	(3.1)	5	(4.9)	8	(4.0)	
Trypanosoma	1	(1.0)	4	(3.9)	5	(5.0)	
P value	0.2988		0.2613				
Total	21	(21.6)	38	(36.9)	59	(29.5)	

Table 2: Age- Related Prevalence of Blood Parasites among Blood Donors in Abraka and Eku

Age group (years)	Number examined	Number positive	% Prevalence	*P* value
20-24	39	7	17.9	-
25-29	71	22	31.0	0.1490
30-34	52	13	25.0	0.0383
35-39	23	9	39.1	0.1040
40-44	11	5	45.5	0.3085
45-49	4	3	75.0	0.4478
Total	**200**	**59**	**29.5**	**0.0547**

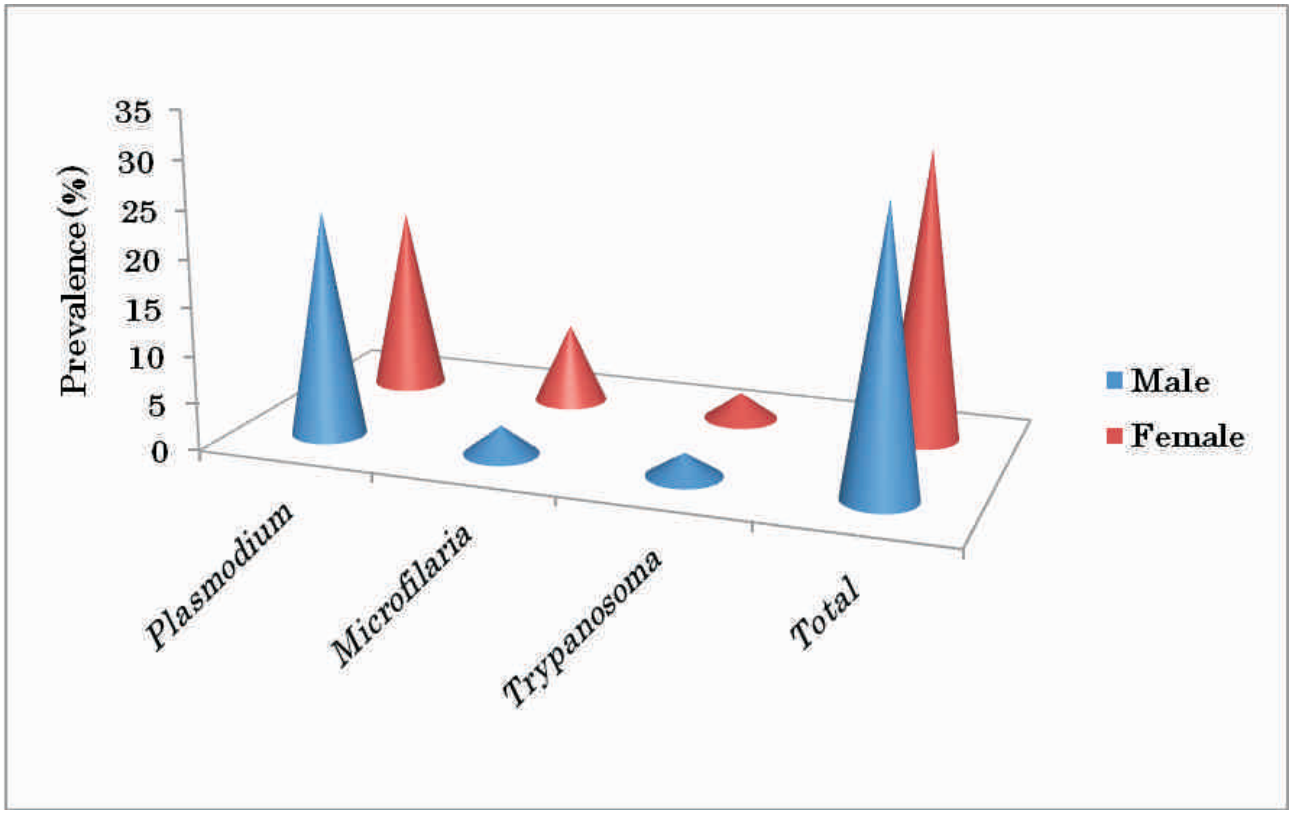

Figure 1. The gender- related prevalence of blood parasites among blood donors

Blood group-related prevalence of parasites among blood donors

Prevalence of blood parasites was highest among blood group B (51.7%) donors and least among group O (13.5%). There was no significant difference in blood parasites with respect to blood group (p = 0.1105) Also, unpaired t- test analysis using the blood group A as reference showed no significant difference in blood parasites among blood donors (Figure 2). The high infection rates observed among all blood groups suggest that they are all susceptible to blood parasites, although, blood group B had the dominant prevalence (51.7%) donors and least among group O (13.5%). There was no significant difference in blood parasites with respect to blood group (p=0.1105). This finding is in line with previous reports (Mohammad *et al.,* 2014; Singh *et al.,*1995; Gupta and Chowdhuri, 1980). They found that blood group B had the highest prevalence among blood donors. This study contradicts previous reports (Nmor and Egwunyenga ,2004; Oladeinde *et al.* (2014; Agboola *et al.,* 2010) which observed that blood group O had had the highest prevalence among blood donors.

Occupation-related prevalence of parasites among blood donors

Based on occupation and employment status, prevalence was highest among self-employed (38.9%), closely followed by farmers (35.7%), students (34.2%) and applicants (31.0%). There was no statistical difference in prevalence of parasites with respect to occupation (p = 0.0056) (Figure 3). In terms of location, there was higher prevalence among rural dwellers compared to urban counterpart (39.7% vs 15.5 %). The occupation-related prevalence reveals that parasites are most prevalent among self-employed (38.9%), closely followed by farmers (35.7%), students (34.2%) and applicants (31.0%), while the least prevalence was observed among others (13.6%). There was no statistical difference in prevalence of parasites with respect to occupation (p=0.0056). This observation is in consonance with the reports of (Ekwunife *et al.,* 2011). They found no significant difference among blood donors based on occupation. All occupational groups are also susceptible to blood parasites infection whether educated or not. This suggests that occupation is

probably a risk factor for blood parasites. Further analysis using the farmers as reference showed a significant difference in blood parasites among student blood donors (p=0.0072). This is in line with the reports of (Nmor and Egwunyenga, 2004), they found significant difference among blood donors of varied occupation.

Locality-related prevalence of parasites among blood donors

The prevalence by parasites was consistently higher among donors from rural settings than donors from urban settings (Table 3). There was no significant difference in the prevalence with respect to residence (p = 0.3784). The prevalence of blood parasites among blood donors was consistently higher among rural dwelling blood donors (39.7%) than urban dwelling donors (15.5%). There was no significant difference in the prevalence with respect to residence (p =0.3784). This finding is in line with the reports of Nmor and Egwunyenga (2004). They found no significant difference in the prevalence with respect to residence. This observation does not conform to the findings of by Minvielle *et al. (*2000) who reported a significant higher prevalence among rural blood donors.

PCV-related prevalence of parasites among blood donors

With respect to PCV of donors showed no clear pattern and there was no association between PCV and prevalence of blood parasites among blood donor (p = 0.1105). The prevalence was highest among subjects with PCV 40 -44 (38.2%), followed by 45 -49 (29.6%) and least among 30-34 (27.8%). Also, an analysis using the 30-34 PCV as reference showed no association of PCV with prevalence of parasite among blood donors (Table 4). With respect to PCV of donors, there was no clear pattern and there was no association between PCV and prevalence of blood parasites among blood donor (p=0.1105). The prevalence was highest among subjects with PCV 40-44 (38.2%), followed by 45-49 (29.6%) and least among 30-34 (27.8%). Also, an analysis using the 30-34 PCV as reference showed no association of PCV with prevalence of parasite among blood donors. Majority of the donors had PCV between 35% and 44%, The lower value is in line with what is generally recommended as lowest PCV values at which patients should be bled (Marcela, 1998). The prevalence of anemia in this study was 18.2% and is higher than 13.7% reported in another Nigeria study (Jeremiah and Koate, 2010).

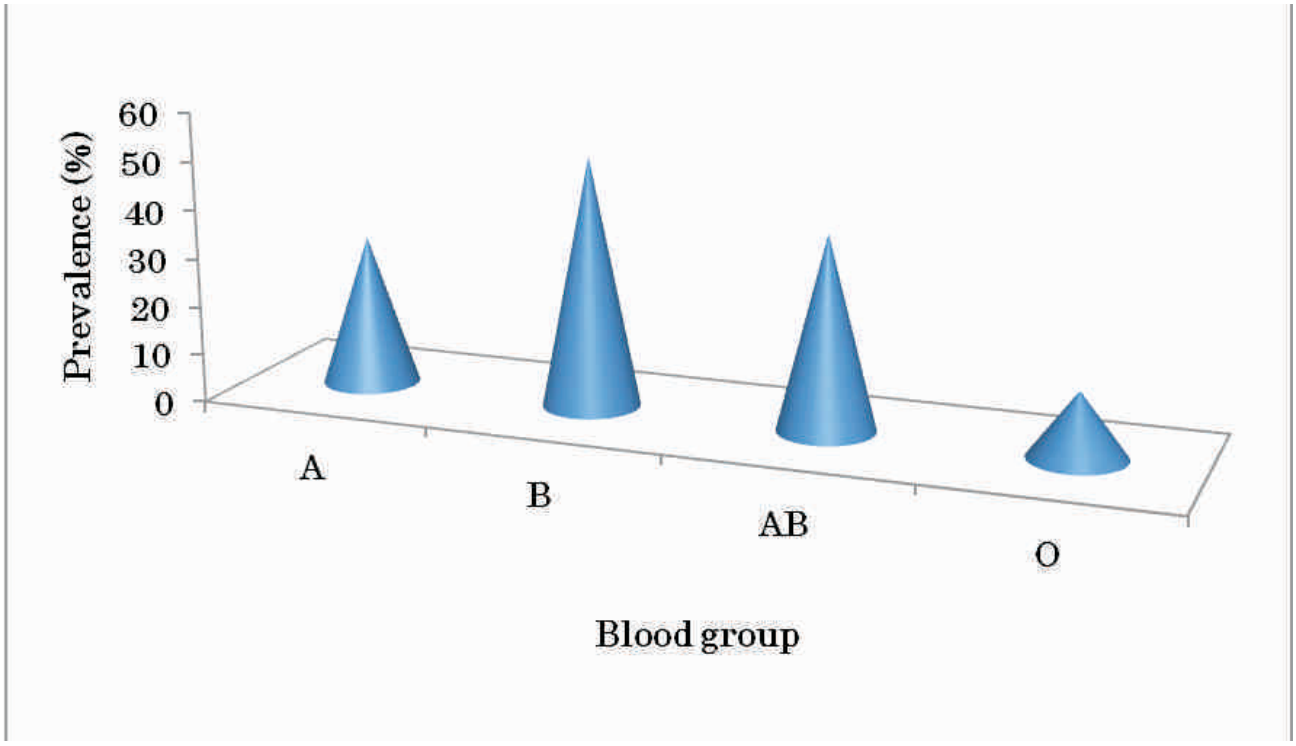

Figure 2. Prevalence of blood parasites among blood donors in relation to blood group

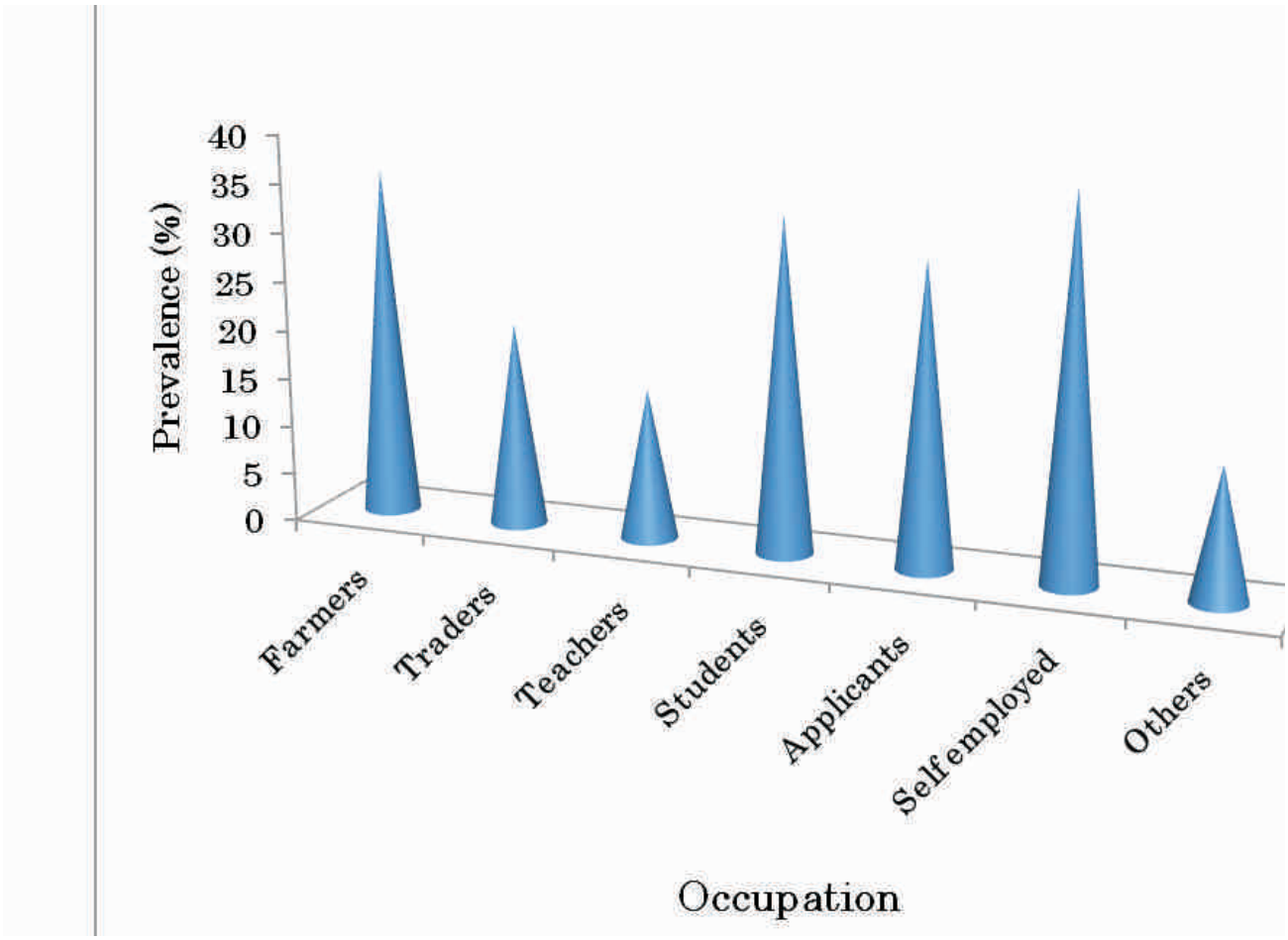

Figure 3. Prevalence of blood parasites among blood donors with respect to occupation

Table 3: Prevalence of Blood Parasites by Locality (Rural or Urban) among Blood Donors in Abraka and Eku.

Parasite	Rural (N=116)		Urban (N=84)		P value
	No of positive	% prevalence	No of positive	% prevalence	0.5866
Plasmodium	37	31.9	9	10.7	0.3784
Microfiliaria	6	5.2	2	2.4	
Trypanosoma	3	2.6	2	2.4	
Total	**46**	**39.7**	**13**	**15.5**	

Table 4: Prevalence of Blood Parasites by PCV Count among Blood Donors in Abraka and Eku

PCV (%)	Number examined	Number positive	% Prevalence	*P* value
30 – 34	18	5	27.8	-
35 – 39	66	12	18.2	0.3264
40 – 44	89	34	38.2	0.1801
45 – 49	27	8	29.6	0.2646
Total	**200**	**59**	**29.5**	**0.1105**

Conclusion

The study has revealed the presence of blood parasite among asymptomatic Nigerian blood donors in Delta State, Nigeria. General prevalence rate of 29.5% among blood donors in this study in relation to donors presumed to be healthy reflect the high endemicity of malaria, *Trypanosma* and microfilaria. The implication of this is that, fifty-nine in two hundred blood donors bear the risk of passing on blood parasites to their recipients. Unfortunately, most common group of patients who need blood transfusion falls under the immuno-compromised group which could exacerbate their conditions. The high rates of positivity for blood parasites in blood donor in this study indicate that blood supply for transfusion in the study area is unsafe and the implications of this with regard to blood transfusions carry the risk of transmitting blood parasites to the recipients. This is a clear reflection of the high rate of asymptomatic parasitaemia in Delta state, an endemic region. Consequently, this study provides baseline data on the occurrence of blood parasites among blood donors in Nigeria. The overall infection rate could be said to be high when compared to other studies. In endemic areas, all donor blood should however be screened for Malaria, Filarial, and Trypanosoma infections. Blood donors with active history of filarial, malaria and *Trypanosomiasis* infection should be deferred from donating blood.

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