PREVALENCE OF MALARIA AND TRYPANOSOMIASIS AMONG BLOOD DONORS ATTENDING AMINU KANO TEACHING HOSPITAL, KANO-NIGERIA

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ABSTRACT
Background: Transfusion-based screenings predominantly focuses on viruses, often overlooking parasites, particularly in developing countries. This oversight raises concerns about the potential presence of parasitic diseases in donors' blood.
Aim: This study primarily aimed to investigate the prevalence of malaria and trypanosomiasis among blood donors in the study area.
Methodology: The methodology involved collecting blood samples and preparing both thin and thick blood films on clean, grease-free slides for parasite identification using microscopic technique.
Results: The results indicated a significant prevalence of malaria in 13 cases (8.6%), while no instances of trypanosomiasis were detected (0%). Furthermore, the data revealed that the proportion of malaria parasitemia was higher in male donors 69.2% (9/13) compared to female donors 30.8% (4/13). With regards to age groups, the malaria severity revealed: 7.7% in ages 18-20, 23.1% in 21-30, 30.8% in 31-40, 15.4% in 41-50, and 23.1% in 51-60. Notably, the 31-40 age group exhibited the highest prevalence at 30.8%.
Conclusion: These findings underscore the necessity for comprehensive parasitic screening in blood transfusions, especially in regions where malaria is prevalent. Enhancing blood safety protocols to include parasitic detection can significantly reduce the risk of passive disease transmission through blood donation.
Key words: Malaria, Trypanasomiasis, Blood donors, Parasitamia

INTRODUCTION

In modern times, blood transfusion safety is compromised due to inadequate screening for certain pathogens, particularly blood-borne protozoan parasites such as Plasmodium and Trypanosomes. This oversight necessitates a heightened focus on these parasites in transfusion practices. For instance, *Trypanosoma cruzi*, the causative agent of Chagas disease (CD), primarily transmitted through triatomine bugs like *Rhodnius prolixus* and *Triatoma infestans*, is prevalent on the American continent, especially in Latin America (WHO, 2010). The epidemiology of Chagas disease has evolved globally due to increased international travel and migration leading to congenital and transfusion-related cases in Europe, highlighting the need for improved control and preparedness (Verra *et al*., 2018).

The incidence of *T. cruzi* infection varies geographically. In Europe, prevalence rates reach up to 35 cases per 100,000 people, with notable variations among countries.

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For example, Spain reported up to 307 cases per 100,000 individuals, including transfusion-related cases, while other European countries show lower incidences (Piron *et al.,* 2008; Strasen *et al.,* 2014).

The risk of malaria and trypanosomiasis transmission through blood transfusion is influenced by several factors including the parasite's infectivity, the volume of transfused blood, the parasite strain, the recipient's immune status, and the level of parasitemia at the time of donation, as well as the efficacy of the screening process (Schmunis, 2007). Historically, transfusion-transmitted cases have been recorded since 1952. Improved screening programs in various countries have since reduced the occurrence of such infections. The chronic, often asymptomatic nature of these infections complicates detection, leading to undiagnosed cases of transfusion-based parasitic infections globally (Menitove and Bennett, 2012).

Research indicates that approximately 20% of recipients of parasitemic blood transfusions become infected, with half of these individuals displaying low-level chronic parasitemia (Leiby, 2002; Kirchhoff *et al.,* 2006). This low parasitemia level poses a challenge in detection and prevention.

Transfusion-transmitted malaria (TTM) represents an accidental route of transmission. With over six *Plasmodium* species causing human malaria, leading to significant morbidity and mortality worldwide, it's crucial to recognize and address the transfusion-related risks, especially in non-endemic countries. The variability in species, such as the dormant liver stage of *P. vivax* and *P. ovale*, and the zoonotic nature of *P. knowlesi* and *P. simium*, complicates the screening process (Guerra *et al*., 2010; O'Brien *et al.,* 2015; Brasil *et al*., 2017).

Given the global mobility of populations, detecting donors that are at risk of Plasmodium infection is an important issue particularly with the increased travelling among individuals and migratory phenomena. This has led to varying blood safety policies, such as the deferral policies in the USA and Canada, and screening policies in Europe, to balance blood safety and availability (European Union Parliament. Commission Directive 2004; Kitchen *et al*., 2005; Leiby *et al.,* 2008).

MATERIALS AND METHODS

Study area

The study was carried out inAminu Kano Teaching Hospital (AKTH), which is situated within Kano metropolis. Kano lies between latitude 11^0 30N and longitude $8^0$30E and lies at about 1580feets above sea level. It was created on May 27, 1967 from part of Northern region. The total land area of Kano State is 20760sq kilometer with a population of 9,383682 based on the official 2006 national population and housing census (Barrister *et al.,* 2015).

Sample size determination

Sample size was determined using the formula n=Z^2x v/d2.

Where:

n= minimum sample size

d = desired level of significance (0.05)

Z = confidence interval (1.96)

Intermediate value (v) = p1 (1-p1) + p2 (1-p2)

p1 = 9.9% (Shehu*et al.*, 2017).

p2 = 1% (Ike *et al.*, 2019).

v = 0.099(1-0.099) + 0.01(1-0.01)

v = 0.0989

n = (1.96) ^2× 0.09899/0.05^2

n = 0.3799÷0.0025

n= 152

Sample collection and processing

Five (5) ml of blood sample was collected in EDTA bottle from each subject and labeled appropriately (DEFRA, 2001). The collected blood samples were analyzed within 1-2hr of collection. Thick and Thin blood films were made separately from blood collected from each blood donor on grease free glass slides, allowed to dry and stained with 10% Giemsa stain for 7 minutes. Stained blood smears were examined using 100x objectives for presence of both type parasites (trypanosomes and malarial parasites) in the film (Cheesebrough, 2005).

Thick blood film preparation

A small drop of blood was used to make a thick smear on a clean slide using edge of another clean slide used as a spreader, at the centre of the slide. It was allowed to dry and was not fixed with methanol. The slides were arranged on staining rack for staining and later examinnation for the trypanosomes and malarial parasites (Cheesebrough, 2005).

Thin blood film preparation

A small drop of blood was placed on a clean slide to make a thin smear; another slide used as spreader was placed at 45^{o}touching the blood and allowing it to spread along the contact line of the two slides. The spreader was quickly pushed toward the unfrosted lower end of the slide. The smear was allowed to air dry and fixed in absolute methanol before staining and examination on microscope (Cheesbrough, 2005).

Staining technique

The smear slides were arranged on staining rack. Giemsa stain was poured onto the slides and allowed for 7 minutes. The stains were washed after 7 minutes using clean water and the back of each slide was wiped and placed on draining rack and air dried then examined using 100x objective lens for the trypanosomes and malarial parasites (Cheesbrough, 2005).

Statistical analysis

The data obtained was analyzed using statistical package for social science (SPSS) version 20.0. Chi-square was used to check association between variables with P value less than 0.05 considered significant.

RESULTS

A total of 152 Blood donors from Aminu Kano Teaching Hospital were recruited in this study, 139 males and 13 females. Out of these 152 samples, a prevalence of malaria was found to be 13(8.6%), while trypanosomes were not detected 0(0.0%) as seen in Table 1. The proportion of male donors with malaria parasitaemia was 69.2% (9/13) and females were 30.8% (4/13), Table 2. However, Table 3 shows the prevalence of malaria based on age-limit and were found to be 7.7%, 23.1%, 30.8%, 15.4% and 23.1% among 18-20, 21-30, 31-40, 41-50 and 51-60 respectively. Among them, age range of 31-40 had the highest prevalence of 30.8% as observed in the study.

Table 1: Distribution of the parasites isolated

	NO. of positive	% Prevalence	No. Negative	% Prevalence
Plasmodium spp	13	8.6	139	91.4
Trypanosomaspp	0	0	152	100

Table 2: The distribution of malaria and trypanosomiasis among the subjects based on Sex

Parasites	No. of male Examined	No. of male Positive (%)	No. of female Examined	No. of female Positive (%)
Plasmodium spp	139	9(69.2%)	13	4(30.8%)
Tryponosomaspp	139	0(0%)	13	0(0%)
Total	**139**	**9**	**13**	**4**

Table 3: The distribution of malaria cases among the subjects based on Age-group

Age – group	Number examined	Number of positive	Prevalence (%)
18-20	20	1	7.7
21-30	67	3	23.1
31-40	38	4	30.8
41-50	21	2	15.4
51-60	06	3	23.1
Total	**152**	**13**	**100**

DISCUSSION

In this study conducted at Aminu Kano Teaching Hospital, 152 blood donors were examined, comprising 139 males and 13 females. Our findings revealed an 8.6% prevalence of malaria (13 cases) among these donors, while no cases of trypanosomiasis were detected (0%). Similarly, according to a report on parasites in blood donors in 2011, prevalence of malaria parasites, microfilaria and trypanosome was found to be 38%, 5%, and 0% respectively (Inyang-Etoh*et al*., 2021).This is consistent with our results, showing high malaria prevalence with no (0%) trypanosome detected. In contrast, a different reported results on parasites in donors' blood indicated that 23.6% of the subjects enrolled were infected with *Plasmodium falciparum*, 2.1% with *Plasmodium malariae* while I.4% were infected with *Trypanosoma brucei gambiense*(Mabel *et al*., 2019*).* According to other research findings, a prevalence of 11.6% was recorded for malaria while none was detected for trypanosomes in a similar study in 2019 (Aminata *et al*., 2019), which is in line with our reported finding. However, ahigher prevalence of 62.0%than ours was revealed by James and colleagues in 2015 in a related research (James *et al.,* 2015).Similarly, it was also reported in 2014 in another research, where a prevalence of 27.3% among blood donors was reported (Hannah *et al*., 2014). In the same vein, Agboola and co-workers reported a prevalence of 28% for *P. falciparum* alone in their study (Agboola *et al*., 2010). All these higher prevalence rates than found in our work, might be due to difference in endemicity of malaria in the localities where the different researches were conducted. In contrast, report from another transfusion-based study revealed three (3) *T. cruzi*-positive subjects while malaria cases were found to be up to 178, which is by far higher than the trypanosome cases (Christoph *et al.,* 2016), this also negate the finding of our study.

The results based on age-range, revealed 7.7%, 23.1%, 30.8%, 15.4% and 23.1% among the age limits of 18-20, 21-30, 31-40, 41-50 and 51-60 respectively. Among them, age group of 31-40 had the highest infection rate with 30.8% as observed in the study. According to a related study, participants within the age limit of 20-30 not 31-40, had the highest infection rate while the least was recorded among the age group 18-19 years of age (Agboola*et al*., 2010), which is not in agreement with our findings. However, other researchers recorded age range of 31-<41 with 65.1% as the highest rate while ≤ 20 year age group had 25.0% as the least infection rate (James *et al.,* 2015). This is in conformity with finding of our work with regards to the age limits. However, a variant result was reported,which revealed age range of 25-29 years as the most at risk of the infection with 82.3% reported (Ekwunife *et al*., 2011). With regards to gender, according to our finding, the proportion of male donors with malaria parasitaemia was 69.2% while that for females was 30.8%. Similar research also reported a prevalence of 62.0% as male infection as against 38% for females, in a study on apparently healthy donors (James *et al.,* 2015) which aligned with our finding in this study. However, a non-consistent finding to our results showed that, males were found to have 27.7% as prevalence rate while females had only 16.7% recorded (Hannah *et al*., 2014). Also Agboola and colleagues reported a higher rate in male donors 26.5% as compared to 15% for females (Agboola *et al*., 2010), which in both cases are found higher than the 8.6% reported in this study.

CONCLUSION

In conclusion, this study sheds light on the crucial aspect of parasitic infections in blood donors, highlighting the need for refined screening strategies to ensure the safety and reliability of blood transfusions. The observed variability in infection rates across different demographics and regions calls for tailored approaches to blood screening and donor management.

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