Biomedical Research and Reviews

Research Article ISSN: 2515-9186

Detection and diversity of malaria parasite in blood bank of Shendi Hospi-tals-Sudan

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Abstract

Background: Malaria is considered to be one of the dangerous diseases that put the world population at risk. Transfusion transmitted malaria is an accidental *plasmodium* infection caused by blood transfusion from a malaria infected donor to recipient. In a country like ours where malaria is endemic, there is a need of screening every donor through proper laboratory tests to alleviate the chances of post transfusion malaria.

Objective: The aim is to screening the malaria parasite in blood bank in Shendi hospital using microscopic and ICT antigen.

Methodology: This is a cross-sectional study in Shendi city, Sudan, during the period from December 2023 to February 2024, a total of 100 samples were collected from blood bags of blood bank of Shendi hospital, and were screened the malaria parasite by using microscopic examination and ICT antigen.

Results: Forty nine (49%) bags were positive for malaria parasite by using microscopic examination and all bags were negative for malaria parasite by using ICT antigen. The distribution of infection on the basis of storage of bags revealed the highest prevalence rate of malaria among the 14-19 day. The rate of malaria among the storage of bag was significantly ($p<0.05$). No association was observed between the blood group types and the rate of malaria infection ($p>0.05$).

Conclusion: A high prevalence of malaria parasite was observed among blood bags, in this study. The introduction of malaria screening as part of routine screening for blood donation is highly advocated.

Introduction

Malaria is endemic throughout most of the tropics; ongoing transmission occurs in 85 countries and territories. According to the latest World malaria report, there were 249 million cases of malaria in 2022 compared to 244 million cases in 2021. The estimated number of malaria deaths stood at 608000 in 2022 compared to 610000 in 2021[1]. *Plasmodium* is single cell eukaryotic organism that belongs to the phylum *Apicomplexa,* which is named for the apical complex that is involved in host cell invasion [2].

All *Plasmodium* species share a similar life cycle. It has two parts-in the first, the parasite infects a person, and in the second, it is transmitted from the malaria patient to another host by an anopheles mosquito [3]. The significant complications of malaria are cerebral malaria, severe malarial anemia, and nephrotic syndrome. Cerebral malaria accounts for 80% of fatal malaria cases, most often occurring with P. falciparum infection [4]. Light microscopy of thick and thin stained blood smears remains the standard method for diagnosing malaria. It involves collection of a blood smear, its staining with Romanowsky stains and direct visualization of the parasite under the microscope [5].

Material and methods

This was a cross-sectional study, conducted in Shendi city; aim to screening malaria parasite in blood bank in shendi hospitals, From December 2023 to January 2024. This was performed on blood bags in blood bank. Blood samples were collected a clean, dry, and grease-free glass slide. The drop of blood was spread with the corner of another slide to make a circle of about 1 cm. The film was left on the bench to dry [6].The drop was spread out quickly along the line of contact of the spreader with the slide. The film was spread with a rapid, smooth, forward movement of the spreader holding it at an angle of about 45°. Thin film was fixed with methanol and was left on the bench to dry [6]. Blood films were stained for 10 minute and were washed gently in tap water [6]. The stained films were examined microscopically under the 100× oil immersion objective lens to demonstrate the characteristic parasitic forms [6]. Malaria P.f./P.v Rapid Test Cassette | IMPV-402 | All Test was used for diagnosis. The test kit is ready to use after bringing it to room temperature, port S in the test kit was filled with 5 µL of blood by micropipette, and in port B two drops of buffer solution were put vertically with the help of a plastic dropper. The results were interpreted after 10 minutes [6].

Data were entered, check, and analyzed using Microsoft Excel 2007and SPSS (Statistical Package of Social Science) soft program version 11.5. Proportional data were presented as frequencies and percentages. Permission was issued by the college of ethical committee, Shendi University, and the ethical committee of hospital.

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Key words: *malaria, blood bank, shendi state state, sudan*

Received: March 10, 2025; **Accepted:** April 04, 2025; **Published:** April 09, 2025

Results and discussion

The risk associated with malaria is worsened by the fact that absence of symptoms even for a long period does not necessarily mean lack of infectivity and malaria parasites survive well in stored blood. In this study, out of 100 blood bags 49% (n=49) were positive for malaria parasites (Table 1). The parasites detected among those bags were *P. falciparum* and *P. vivax*, with prevalence 46% and 3% respectively (Table 2). The high prevalence (49%) of malaria parasites detected by microscopic examination in our study was higher than that reported by Mosab, 2017, in kosti, [7], Sudan, collected 100 samples and found 12 positive samples (12%) using blood film by Ali et al. [8], in Khartoum. They collected 1546 samples and found 102 (6.5 %) positive samples by using blood film and by Muzamil et al. [9], also in Khartoum, they collected 200 samples and they found 6% by microscopic examination, 6.5% by immunochromatography tests and 18.5% by molecular techniques. And this is due to the endemic study area (Shendi). This rate (49%) appears to be lower when compared to study reported by Mbanugo et al, 2004 [10], in Nigeria they found 74.4% positive sample. Forty nine samples were positive by microscopic examination and negative by ICT, this may be due to low parasitaemia, also may be due to type of ICT antigene (Malaria P.f. /P.v Rapid Test Cassette | IMPV-402 | All Test). The microscopic identification technique of malaria is the ideal technique that can be applied at the present time till feasibility application of applying an advanced technique is available. The establishment of malaria diagnosis unit in each blood bank is not difficult and blood bankers can perform the tests after being well trained. Distribution of malaria on the basis of blood group which revealed that AB blood group (60%) had the highest prevalence of malaria, followed by A (57.%), O (47%), B (33%). However, there is no significant association between the prevalence of malaria and ABO blood groups (p=0.433), (Table 3) and this result was agree to study that reported by Ezeonu et al, 2019 [11], in Nigeria. Also agree with study that reported by Amani et al. [12], in Kassala.

The storage bags distribution ranges from fresh bag to 19 day. The day group with the highest prevalence of malaria was the 15-19 day (100%), There was significant difference in the storage in relation to malaria (p=0.004) (Table 4).

Conclusion

This study showed that a blood intended for donation carried malaria parasites in Shendi Hospitals. So active laboratory procedures need to be conducted exclude potential malaria-infected individuals from donation. The hazard of transmitting malaria through blood transfusion is much greater than the cost of testing donors' blood even if an expensive technique is used.

Table 1: Show prevalence of malaria parasite among blood bags using blood film and ICT

Method	N. examined	N. positive	Percentage %
Blood film	100	49	49%
ICT	100	0	0

Table 2: Show the detection of *p. falciparum* and other species by two methods

Species	Blood film	ICT
p. falciparum	46	0
p. vivax	3	0
Non infected	51	100
Total	100	100

Table 3: Show prevalence of malaria parasite among blood grouping

Blood group	N. examined	N. positive	Percentage %	p. value
A	35	20	57%	0.433
B	15	5	33%	
AB	5	3	60%	
O	45	21	47%	

Table 4: Show prevalence of malaria among blood bags storage

Storage (day)	N. examined	N. positive	Percentage %	P. value
0-4	67	27	40%	0.004
9-May	17	13	76%	
14-Oct	11	4	36%	
15-19	5	5	100%	

Recommendation

Screening blood donors for malaria is mandatory. Infected donors should be treated before being accepted for donation also further studies are recommended for absolute eradication of this problem.

Acknowledgments

We are grateful to all individual involved in the study and to the staff of the blood bank of Shendi hospitals for their great support and help during the study.

Conflicts of interest

The author declares there are no conflicts of interest.

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