

Prevalence Of Malaria Among Blood Donors in The National Center for Blood Transfusion and Research in Sana'a Yemen

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Abstract

Background: Malaria has been killing millions of people worldwide. World Health Organization estimates that there are 300 million to 500 million of people infected with malaria. Therefore, the aim of this study is to explore the prevalence of malaria parasites among the blood donors attending the National Center for Blood Transfusion and Research in Sana'a, Yemen over a period of 6 months. **Methods:** Data collected from the National Center for Blood Transfusion and Research records for the year of 2012 and 2020. Secondary data were taken from 12,000 donors from 2012 and 18,000 from 2020. The records contain the patient's number, blood bag, type of examination: cassette and confirmatory tests such as ELISA and type of malaria test. **Results:** In 2020, there were 814 Malaria-infected blood donors (97.8%), whereas, in 2012, there were only 18 Malaria-infected blood donors (2.2%). The male donors more infected (99.2%) than female donors (0.8%). The number of donors with blood group O+ were the highest infected people (50.4%), while the least infected donors is AB- (0.1%). The number of infected people with Plasmodium falciparum (24%) is the highest compared with other types of malaria (4%). The most packed cell volume (PCV) ratio among donor was 49%, the lowest PCV ratio in donors is 95% and 60% respectively. **Conclusion:** The study showed that the war played a significant role in increasing the number of people suffering from malaria and that the situation is worsening due to lack of awareness, migration and weak economic conditions.

Keywords: : Malaria parasite; Blood donors; Prevalence, Blood group, Infected, Civil war

I. INTRODUCTION

Malaria killed millions of people worldwide. World Health Organization estimates that there are 300 million to 500 million of people infected with malaria so that, malaria is a serious situation that we have to over shine the light on it. Malaria is a serious and sometimes fatal disease caused by a parasite that commonly infects a certain type of mosquito, which feeds on human [1-3]. Malaria is spread in Africa, India, eastern, and south Asia and it cause mortality for millions of peoples most of them are children. This disease caused by many parasites but only five types infects human which are Plasmodium falciparum, Plasmodium ovale, Plasmodium malaria Plasmodium vivax and Plasmodium knowlesi. The most common types in Yemen are Plasmodium vivax and PATIENTS AND METHODS

Coronary artery disease (CAD) accounts for the utmost proportion of CVDs and is the main cause of mortality in the developed countries as well as in developing countries. Three-fourths of global deaths due to CAD occurred in the low and middle-income countries [3,4].

The major risk factors for coronary artery disease include hypertension, cigarette smoking, diabetes mellitus, elevated cholesterol levels, and obesity. The prevalence of those important risk factors varies greatly according to geographical region, sex, age and ethnic background.[5-7]. The variation in disease prevalence from region to another is likely a result of many non-traditional risk factors. Some investigators proposed considering khat chewing which is common habit among Yemenis as a risk factor for CAD as it was associated with a higher mortality rate and complications such as cardiogenic shock, heart failure, recurrent ischemia, and Plasmodium falciparum. The danger of malaria being

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reintroduced is always present [2-4]. Malaria is transmitted also by blood transfusion, sometimes malaria infect people and cause no symptoms. These asymptomatic, parasitaemic people maybe they are donors in blood transfusion. That's why human nowadays consider it the most dangerous transmitter disease ever, especially in transmutates malaria. Human malaria is the most common vector-borne disease in Yemen, with an annual incidence of about 900,000 cases and approximately 60% of the total population considered to be at risk of the disease [1]. Plasmodium falciparum accounts for 95% of the cases and, although Anopheles arabiensis is the predominant vector, An. culicifacies plays an important role in malarial transmission in the coastal areas of Yemen and another known vector species [3]. In Yemen Malaria appears in southerliness and coastal areas like Al-Hodeida, Aden, Tehama, and Taiz. Predominance of malaria in Yemen is usually accompanied with many reasons. There are many special groomed for spreading malaria such as seasons. In rainy season, malaria becomes out of control due to swamps and stagnant water. More also absents of neatness, absents of realization and absence of government care are causals for having malaria [4-6]. It is unclear why febrile patients in the highlands of Yemen are much more likely to be found to have malarial infection than their counterparts from the coastal plains and foothills. Although it is possible that malarial transmission is relatively intense in the highlands, it seems more likely that they are less immune to malaria, and therefore more likely to develop febrile illness following malarial infection. Whatever the cause of the symptomatic malarial infection commonly found in the highlands of Yemen, it is a matter of serious concern that should be addressed in the national strategy to control malaria. Therefore, the aim of this study was to explore the prevalence of malaria parasites among the blood donors attending the National Center for Blood Transfusion and Research in Sana'a, Yemen.

II. MATERIALS AND METHODS

Data Collection:

Data collected from the National Center for Blood Transfusion and Research during the period from February – July 2021. The records contain the patient's number, blood bag, type of examination: [cassette] and confirmatory tests such as ELISA and type of malaria ex. P. Falciparum and P. vivax. The other information was taken from the cards e.g. Date of diagnosis, Age, Sex, Blood group, and laboratory investigation: Hb, PCV The study was approval by the Ethical Committee at AlHikmah University and from the committee at the National Center for Blood Transfusion and Research.

Data analysis:

Data obtained from the study were subjected to Chi square to compare and test for relationship between the means using SPSS version16. Level of significant was accepted at $p < 0.05$.

The significant difference was indicated if p value was < 0.05

Results

Table 1 shows the frequency of malaria infection. The percent of infected people in 2020 were 97.8% while in 2012 were 2.2%. Of the total infected people 99.2% were male blood donors and only 0.8% were female donors. **Table 1: The frequency of malaria infection**

	Frequency	Percentage (%)
Year 2012	18	2.2
Year 2020	814	97.8
Total	832	100
Male	825	99.2
Female	7	0.8

Table 2 shows the prevalence of malaria infection in different age groups. The most infected donors by malaria disease were those in the age range 20 - 29 years old (39.1%) and the least infected donors were those of 18 - 19 years old (2.4%).

Donors over 50 years showed an infection frequency of 3.2%.

1. Table 2: The prevalence of malaria infection in different age groups

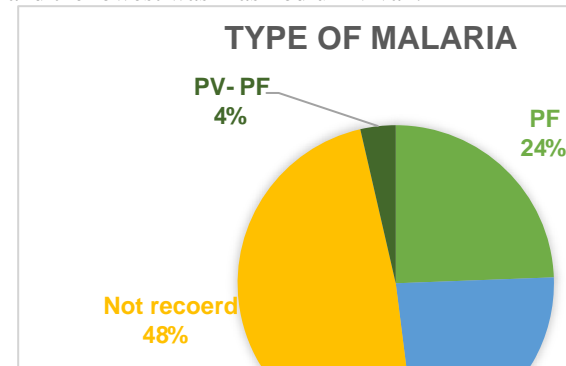
Age	Frequency	Percentage (%)
18 – 19	20	2.4
20 – 29	325	39.1
30 – 39	289	34.7
40 – 49	169	20.3
>50	27	3.2
Not recorded	2	0.2
Total	832	100.0

Table 3 shows the relationship between blood groups and the prevalence of malaria infection. About 50.5% of those having group O+ were malaria infected; whereas the least voluntary platoon is AB- (0.1%).

2. Table 3: Relationship between blood group and the prevalence of malaria parasites infection

Blood Group	Frequency	Percentage (%)
A+	232	27.9
A-	30	3.6
B+	79	9.5
B-	6	0.7
AB+	16	1.9
AB-	1	0.1
O+	419	50.4
O-	45	5.4
not recorded	4	0.5
Total	832	100.0

Figure 1 shows the prevalence and type of malaria. The most frequent type of malaria found was Plasmodium falciparum and the lowest was Plasmodium vivax.



3. Figure 1: Prevalence and type of malaria

III. DISCUSSION

The present study conducted among blood donors attending in the National Center for Blood Transfusion and Research with the objectives to determine the demographic characteristics of blood donors and the frequency of malaria parasites among the blood donors in

Sana'a city. Blood safety is a topic of continuing concern, and much effort is expended on measures to decrease the risk for transmission of infectious agents via transfusion. At the same time, emerging infections may threaten this safety. The risk for major transfusion transmissible infections continues to decline as a result of continually strengthening interventions and because of more general improvements in public health [4,8,9].

Our results showed a difference in the infection rate between the two selected points (the years 2012 and 2020) before and after the war. In 2020 the infected people were 814 with only 18 back in 2012, the reasons of this great contrast due to, the massive change in the climate, current war and conflict in Yemen. People also play a role in spreading malaria from endemic areas to Sana'a, where after war, many people displaced from their home because of the war and the conflict, this could be the possible reason for the higher rate during the current conflict in Yemen. Lack of awareness of personal hygiene and sanitation services, poverty, climate change and an environment conducive to mosquito growth [4,10,11] have led to the spread of malaria such as lack of awareness. This study showed that male donors are more than female donors. Previous study has also showed that very small proportions of donors were females. Similarly, in India, a study showed the percentage of female donors to be even as low as 0.1% [12]. The low number of female donors in developing countries has been attributed to negative culture and wrong beliefs. The ratio of male to female blood donors was similar to the study conducted by Tagny et al [13] who reported 61% of donor population to be males in Togo. Our study also noted that

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people in the age group 20 to 29 years were highest donors because they enjoyed good health not suffering from a chronic disease and did not use any medication; while those older than 50 years were the lesser donors because of their overall health conditions.

Our results showed that the most Blood group are suspected for having Malaria is O+ because it is the most common blood group in Yemen, similar to that reported globally whereby O+ accounted for 38.66% while the AB- is 0.36% [14-17]. This finding is different from other those reported in previous studies reporting no relationship between ABO blood group and malaria [10,11,18]. However, recent studies support the view that blood group O provides a selective advantage against severe malaria. A recent case-control study carried out in India showed a significant association of blood group B, but not A and AB, with severe malaria [19,20].

In this study, the most prevalent malaria parasite species found among the donors was P. Falciparum, which is the most dangerous of the four human malaria parasites and most effectively transmitted by Anopheles gambiae. P. Falciparum predominated because Anopheles is the most widespread and the most difficult to control of all vectors of malaria parasites, and because of the high degree of virulence of P. Falciparum it is necessary to screen blood routinely for malaria parasites before transfusion [21].

IV. CONCLUSION

To sum up the study showed that the war played a significant role in increasing the number of people suffering from malaria and that the situation is worsening due to lack of awareness, migration and weak economic conditions. Raising people's awareness of the dangers of malaria is highly recommended, Blood donors should be routinely screened for malaria parasites, the collected blood samples should be properly labeled either negative or positive of malaria parasites.

V. REFERENCES

- [1] World Health Organization (WHO). Drug resistance in Plasmodium: Natural products in the fight against malaria. Mini Reviews in Medicinal Chemistry. 2010; 9(2): 206 – 614.
- [2] World Health Organization (WHO). Guidelines on Drawing Blood: Best Practices in Phlebotomy. Publications of the World Health Organization Press World Health Organization, 20 Avenue Appia, 1211 Geneva 27, Switzerland. 2010 13.
- [3] Alkadi HO, Al-Maktari MT, Nooman MA. Chloroquine-resistant plasmodium falciparum local strain in Taiz governorate, Republic of Yemen. Chemotherapy 2006; 2: 166-170.
- [4] Agboola PM, Peter E, Alexander P, Koggie AZ, Maikenti JI. The prevalence of malaria among blood donors in Lagos University Teaching Hospital, Lagos, Nigeria. J Health Sci 2019; 5: 47-51.
- [5] World Health Organization. World Malaria Report; WHO: Geneva, Switzerland, 2020; Available online: <https://www.who.int/publications/i/item/9789240015791>.
- [6] Dayananda KK, Achur RN, Gowda DC. Epidemiology, drug resistance and pathophysiology of Plasmodium vivax malaria. J Vector Borne Dis 2018; 55: 1-8.

- [7] Bamaga OA, Mahdy MA, Mahmud R, Al-Lim Y. 2014 Malaria in Hadhramout, a southeast province of Yemen: prevalence, risk factors, knowledge, attitude and practices (KAPs). 2014.
- [8] Hawash Y, Ismail K, Alsharif K, Alsanie W. Malaria prevalence in a low transmission area, Jazan District of Southwestern Saudi Arabia, June 2019.
- [9] Cassette World Malaria Report 2011. World Health Organization. http://www.who.int/malaria/world.malaria_report_2011/en
- [10] Fischer PR, Boone P. Severe malaria associated with blood Group. *Am J Tropical Medicine and Hygiene* 1998; 58: 122-123.
- [11] Montoya F, Restrepo M, Montoya AE, Rojas W. Blood groups and malaria. *Revista da Institute Medicina Tropica de Sao Paulo* 1994; 36: 33-38.
- [12] Chaudhary RK, Gupta D, Gupta RK. Analysis of donor-deferral pattern in a voluntary blood donation population. *Transf Med* 2008; 5(3): 209-212.
- [13] Tagny C, Owusu-Ofori S, Mbanya D, Deney V. The blood donor in Sub-Saharan Africa: A review. *Transfusion Med* 2010; 20: 1-10.
- [14] Loscertales MP, Owens S, O'Donnell J, et al. ABO blood group phenotypes and plasmodium falciparum malaria: Unlocking a pivotal mechanism. *Adv Parasitol* 2007; 65: 1-50.
- [15] Cserti CM, Dzik WH. The ABO blood group system and Plasmodium falciparum malaria. *Blood* 2007; 110: 2250-2258.
- [16] Kuliya-Gwarzo A, Kwaru AH. Pattern of blood donation in Aminu Kano teaching Hospital. *J Med Rehab* 2007; 1(1): 35-38.
- [17] Owusu-Ofori A, Gadzo D, Bates I. Transfusiontransmitted malaria: Donor prevalence of parasitaemia and a survey of healthcare workers knowledge and practices in a district hospital in Ghana. *Malaria J* 2016, 15: 234.
- [18] Jamilu AO, Aminu M, Abubakar I, Hannah RS, Olofin EA, Nabegu AB, et al. The prevalence of malaria among blood donors in University of Ilorin Teaching Hospital, Kwara, Nigeria. *J Health Sci* 2011; 2: 76-83.
- [19] Jamilu AO, Aminu M, Abubakar I, Dauda E. The prevalence of malarial parasitemia among blood donors in Ahmadu Bello University Teaching Hospital, Shika, Zaria, Nigeria. *Niger J Med* 2017; 21: 445-449.
- [20] Isah D, Ajumobi O, Sabitu K, Nguku P, Kwaga J, Ntadom G. Malaria infection among pregnant patients in Nigeria. *Am J Tropical Medicine and Hygiene* 2017; 92: 828-833.
- [21] Abba K, Deeks JJ, Olliaro P, Naing CM, Jackson SM, Takwoingi Y, et al. Rapid diagnostic tests for diagnosing uncomplicated *P. falciparum* malaria in endemic countries. *Cochrane Database of Systematic Reviews*. 2016; 7.