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Evaluation of Changes of Haematological Parameters of Asymptomatic Malaria Individuals in Oda Road Area of Akure

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ABSTRACT

This study was conducted on asymptomatic malaria patients and apparently healthy individuals to evaluate the haematological parameters of asymptomatic malarial patients in the Oda Road area of Akure, Ondo State. One hundred (100) patients with malaria parasitaemia suspected to be asymptomatic and one hundred (100) non-malaria parasitaemia patients were recruited as controls and enrolled in this study.The result of the study showed significant difference in PCV (p=0.000), WBC (p=0.002), RBC (p=0.000), haemoglobin (p=0.000), MCV (p=0.000), MCH (p=0.000), MCHC (p=0.000), PLT (p=0.000), of asymptomatic malaria subjects when compared to the control respectively. Malaria parasitaemia has shown to have effects on some haematological parameters from this study. Subjects with asymptomatic malaria had lower mean haematological parameters such as; PCV, MCH, MCHC, Platelet, and RBC values compared to non infected subjects. However, the subjects had higher WBC value probably due to infection. Thus, malaria has significant effects on the red blood cells resulting to moderate anaemia among the study subjects.

Keywords*: haematological parameters, asymptomatic malaria, Oda Road Area*

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INTRODUCTION

Malaria is a life-threatening infectious disease of widespread burden. Globally, in 2017, 219 million people were stricken with malaria, which was an increase of 2 million cases as compared to the previous year; of these, approximately 435,000 died due to related complications [1]. Malaria remains a leading communicable disease in the developing countries of the world. It occurs mostly in the tropical and subtropical regions and accounts for considerable morbidity and death. It causes the death of more than one million in Africa every year, and is responsible for fifteen percent (15%) of clinical illnesses in the tropical regions of the continent [2]. Malaria is widespread in tropical and subtropical regions because of the significant amounts of rainfall and consistent high temperatures and high humidity, along with stagnant waters which provide mosquitoes the environment needed for continuous breeding [3].

Malaria infection is caused by invasion of red blood cells with protozoan parasites of the genus Plasmodium. The female anopheles mosquito is the carrier of the parasite and transmits it to man by next blood meal .The bite of mosquito that carries the plasmodium leads to the transmission of the parasite in red blood cells, causing symptoms that typically include fever and headache, in severe cases progressing to coma and death. The four Plasmodium species that infect humans are *Plasmodium falciparum*,

Plasmodium vivax, Plasmodium ovale and *Plasmodium malariae*. Occasional infections with monkey malaria parasite, such as *P. knowlesi*, also occur [3, 4].

It has been documented that asymptomatic malaria parasitaemia (ASMP) serves as reservoir for malaria due to gametocyte transmission [5] and represents, perhaps, one step in the heterogeneous set of the disease pathways [5]. Asymptomatic malaria is prevalent in highly endemic areas of Africa, with only a small percentage of individuals exhibiting clinical symptoms [6]. The clinical consequence of asymptomatic malaria is not fully understood. Some researchers are of the view that asymptomatic parasitaemia is involved in the development of partial immunity and may protect against clinical disease from new infections [6]. Also, there are reports that asymptomatic parasitaemia provides a reservoir for transmission and may be a precursor in the progression to symptomatic disease [6]. The asymptomatic parasitaemics are healthy carriers of malaria parasites and serve as reservoir of infection. The symptomatic people can be treated during their clinical manifestation but the asymptomatics remain unnoticed to pose a public health danger to the population as long as there is high mosquito vector density to transmit the parasites [7]. Although there is no standard definition for "asymptomatic" malaria infections, it is generally accepted to be malarial parasitaemia of any density, in the absence of fever or other acute symptoms, in individuals who have not received recent antimalarial treatment [8]. This definition includes early detection of rising parasitaemia that has yet to reach the pyrogenic threshold (i.e., the density of parasitized erythrocytes that is sufficient to trigger innate immune responses and fever) [9], infections that are intermittently symptomatic but not severe enough to cause the person to seek health care, and long-standing infections imperfectly controlled by the immune response.

Changes in haematological parameters are likely to be influenced by any disease condition which affects the haemopoetic physiology at any level [10]. This is likely to happen with an endemic disease such as malaria that affects the host homeostasis at various fronts resulting in a myriad of clinical presentation. Typically, microscopic slide examination of peripheral blood remains the most widely used test and is the gold standard for detecting malaria infection [11]. However, due to it requires technical expertise and is time-consuming in smear examinations. Moreover, the World Health Organization (WHO) recommends the use of antimalarial drugs based on a definitive demonstration of parasites in the peripheral blood film [12]. Therefore, in cases of low malaria parasitaemia, certain automated haematological parameters could prompt peripheral blood smear examination for parasitic forms [12].

Haematological changes are some of the most common complications in malaria and they play a major role in malaria pathology. These changes involve the major cell lines such as red blood cells, leucocytes and thrombocytes [13]. The haematologic picture, however, varies from person to person and largely depends on nutritional status (parameters are severely depleted in malnourished than well-nourished children), intensity of malaria transmission, age, and co-morbidities, such as helminthiasis [14]. Also, Malaria infected patients tended to have significantly lower platelets, WBCs, lymphocytes, eosinophils, RBCs and haemoglobin level, while monocyte and neutrophil counts were significantly higher in comparison to non-malaria infected patients [15]. To foster the knowledge of haematological parameters, this is thus, aimed at evaluating the haematological parameters of asymptomatic malaria patients by comparing the level of haematological parameters of asymptomatic malaria patients with non-malaria patients.

The study aimed to evaluate the haematological parameters of asymptomatic malarial patients in Oda Road Area of Akure, Ondo State. Nigeria.

MATERIAL AND METHODS

Research Design

The study is a cross-sectional study among asymptomatic malaria patients and patients who are apparently healthy individuals. The subjects were selected using a well-structured questionnaire who were age and sex matched.

Study Area

This study was conducted on asymptomatic malaria patients and apparently healthy individuals in the Oda Road area of Akure, Ondo State.

Target Population

One hundred (100) patients with malaria parasitaemia suspected to be asymptomatic and one hundred (100) non-malaria parasitaemia patients were recruited as controls and enrolled in this study.

Blood Collection

5ml of venous blood was collected from each participant into an Ethylene Diamine Tetra-acetic Acid (EDTA) bottle which was then used for the determination of full blood count and Malaria.

Method of the Test

Screening for Malaria parasite was carried out using Rapid Diagnostic Test. A pink line at the positive and control band indicated a positive reaction whereas only one pink line at the control band indicated negative reaction. No pink line at both positive and negative control bands indicates an invalid result. Thick and thin blood films from each blood specimen were made, allowed to air-dry and stained in 10% Giemsa stain solution for 30 min. The stained smears were rinsed in buffer solution and allowed to air-dry. The stained thick films were examined under bright field light microscope for estimation of malaria parasite density while the thin films were examined for species of Plasmodium.

Malaria Parasite Density = $\frac{\text{Number of parasite} \times 8000}{\text{Number of White blood cell (200)}}$

Full Blood Count (FBC): Measurement of haemoglobin, red blood, cells, white blood cells and platelets count were done by using ADVIA® 2120i Haematology system (SIEMENS). The cell count was cross-checked by experienced Medical Laboratory Scientist on duty.

Method of Data Analysis

The data were presented in tables and as mean ± standard deviation and analyzed using student-test for parametric data and chi-square for non parametric data by statistical packages for social sciences (SPSS, Version 20.0) and level of significance set at as $p \leq 0.05$.

Informed Consent

Informed consent was obtained from the subjects who participated in the study. The purpose of the study was explained to all participants. Participation in the study was entirely voluntary. Anonymity and confidentiality was ensured and maintained.

RESULTS

TABLE 1: Mean ± standard deviation of haematological parameters of asymptomatic malaria patient against non-malaria patient.

Parameters	Asymptomatic Malaria patient	Non malarial patient	t-value	p-value
PCV(%)	35.32 ± 5.97	43.22 ± 5.43	-11.013	0.000*
WBC(10^9/L)	10.04 ± 5.91	7.30 ± 2.18	3.272	0.002*
LYM(%)	27.39 ± 16.05	30.00 ± 5.98	-1.149	0.256
GRAN(%)	66.20 ± 18.47	60.00 ± 8.91	0.077	0.939
RBC(10^{12}/L)	4.25 ± 0.87	5.15 ± 0.70	-7.237	0.000*
HGB (g/dl)	11.78 ± 1.98	14.82 ± 1.71	-10.561	0.000*
MCV(fL)	81.51 ± 8.17	90.00 ± 5.99	-7.340	0.000*
MCH(Pg)	27.19 ± 2.81	29.50 ± 1.51	-5.802	0.000*
MCHC(g/dL)	33.38 ± 1.15	34.00 ± 1.27	-3.791	0.000*
RDW-CV(%)	16.16 ± 4.99	13.00 ± 0.89	4.473	0.000*
RDW-SD(fL)	45.92 ± 8.82	47.50 ± 4.46	0.243	0.461
PLT(10^9/L)	171.16 ± 55.38	270.00 ± 77.33	-12.363	0.000*
0MPV(fL)	8.23 ± 8.79	9.00 ± 1.18	-0.614	0.542
PDW(fL)	8.09 ± 1.50	8.95 ± 0.62	-27.587	0.000*
P-LCR(%)	11.09 ± 21.49	25.00 ± 5.99	-4.573	0.000*

The table above shows significant difference of PCV (35.32 ± 5.97%, 43.22 ± 5.43 %, p=0.000), WBC(10.04 ± 5.91x10^9/L, 7.30 ± 2.18x10^9/L, p=0.002), RBC(4.25 ± 0.87x10^{12}/L, 5.15 ± 0.70x10^{12}/L, p=0.000), HGB (11.78 ± 1.98g/dl, 14.82 ± 1.71 g/dl, p=0.000), MCV(81.51 ± 8.17fL, 90.00 ± 5.9fL, p=0.000), MCH(27.19 ± 2.81Pg, 29.50 ± 1.51Pg, p=0.000), MCHC(33.38 ± 1.15g/dL, 34.00 ± 1.27g/dL, p=0.000), RDW-CV(16.16 ± 4.99%, 47.50 ± 4.46%, p=0.000), PLT(171.16 ± 55.38x10^9/L, 270.00 ± 77.33x10^9/L, p=0.000), PDW(8.09 ± 1.50fL, 8.95 ± 0.62fL, p=0.000), P-LCR(11.09 ± 21.49%, 25.00 ± 5.99%, p=0.000) and no significant difference in LYM (27.39 ± 16.05%, 30.00 ± 5.98%, p= 0.256), GRAN (66.20 ± 18.47%, 60.00 ± 8.91%, p=0.939), RDW-SD (45.92 ± 8.82fL, 47.50 ± 4.46fL, p=0.461), MPV(8.23 ± 8.79fL, 9.00 ± 1.18fL, p=0.542) when compared between asymptomatic malaria patient and non-malaria patient respectively.

DISCUSSION

The study showed that malaria parasitaemia has significant changes on some haematological parameters. The mean values of Packed Cell Volume (PCV) of asymptomatic malaria patients showed significant difference from that of the control. This finding is in conformation with the study by [16] that suggests lower PCV in the malaria patients than in the controls. A lower PCV in the malaria infected patients may

reflect anaemia which is often mainly due to mechanical destruction of parasitized red cells as well as spleenic clearance of parasitized and defected erythrocytes. Also, Haemoglobin (HGB), Mean Cell Volume (MCV), Mean Cell Haemoglobin (MCH) and Mean Cell Haemoglobin Concentration (MCHC) of samples are significantly different from the control which agrees with a study by [6]. Anaemia has been associated with chronic malaria resulting from dyserythropoiesis and ineffective erythropoiesis. These mechanisms could be responsible for the decrease in the haemoglobin level observed among the seemingly healthy parasitaemic subjects. A report suggested that persistent asymptomatic malarial infections significantly increase the risk of becoming anaemic [17].

The mean values of White Blood Cell (WBC) of asymptomatic malaria patients is significantly different from the control probably as a result of an increase in the release of leukocytes at the early stage of the infection, to contend and fight against the infection. Increase in WBC count in malaria patients in this study collaborate that reported by [18]. The lower WBC observed among parasitaemic subjects compared to aparasitaemic subjects in the study could be due to a lymphocyte count which has been associated with acute malaria where depletion in the lymphocyte subsets through apoptosis [19] or sequestration of the cells in the lymph nodes or other body tissues is said to be responsible for the occurrence of leukopaenia [20].

The mean value of Platelet (PLT) of asymptomatic malaria patients is significantly different from the control which is in agreement with a study by [6]. The mechanism of a low platelet count associated with asymptomatic malaria in this study could be similar to that observed with acute malarial infection, which is not fully understood. It is thought to be due to peripheral destruction and consumption. Immune complexes generated by malarial antigens lead to sequestration of the injured platelets by macrophages in the spleen. Also, platelet consumption in disseminated intravascular coagulation is thought to contribute to thrombocytopenia in malaria [6]. Platelet dysfunction resulting in hyperaggregation is another alteration occurring in association with malaria. Platelets activated by such factors as formation of immune complexes, damage of endothelial cells, and surface contact of platelets with parasitized red blood cells could easily undergo intravascular lysis [6].

CONCLUSION

Malaria parasitaemia has shown to have effects on some haematological parameters from this study. Subjects with asymptomatic malaria had lower mean haematological parameters such as; PCV, MCH, MCHC, Platelet, and RBC values compared to non infected subjects. However, the subjects had higher WBC value probably due to infection. Thus, malaria has significant effects on the red blood cells resulting to moderate anaemia among the study subjects.

It is recommended that patients presenting with febrile illnesses should be screened for malaria and Full Blood Count (FBC) in order to diagnose and monitor the incidence of anaemia and probable infection.

REFERRENCES

1. World Health Organization (2018). World Malaria Report 2018. World Health Organization, Geneva, Switzerland.
2. Igbeneghu, C., and Odaibo, A.B. (2013). Impact of Acute Malaria on Some Haematological Parameters in a Semi-Urban Community in Southwestern Nigeria. *ActaParasitologicaGlobalis.***4 (1)**: 01-05, 2013.
3. Saidu, A.Y., Sadiya, H., Mustapha, U .K., Kumurya, A. S., Fana, S.A., Dikwa,M.A. and Yusuf, M. (2015). Pathophysiology of Eosinophilia in Malarial Infection in Patients Attending Usmanu Danfodiyo University Teaching Hospital (Uduth) Sokoto, Nigeria. *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS).***14**(10): 105-110.
4. Okoroiwu, I.L., Obeagu, E.I., Elemchukwu, Q., and Ochei, K. C. (2014). Some Hematological Parameters In Malaria Parasitaemia..*Journal of Dental and Medical Sciences (IOSR JDMS).***13**(9): 24-77.
5. Amodu, O.K., Olumide, A.O., Uchendu, O.C., Amodu, F.A. and Omotade, O.O. (2014). Differences in the malariometric indices of asymptomatic carriers in three communities in Ibadan, Nigeria. *Advance in Preventive Medicine*. **10**: 509236.
6. Christopher, I., Alex, B.O. and David, O. O. (2010). Impact of Asymptomatic Malaria on Some Hematological Parameters in the Iwo Community in Southwestern Nigeria. *Medical Principle and Praxtice.***20**:459–463.
7. Eke, R. A., Chigbu, L. N. and Nwachukwu, W. (2016). High Prevalence of Asymptomatic Plasmodium Infection in a Suburb of Aba Town, Nigeria.*Annals of African Medicine*. **5**(1): 42 – 45 .
8. Lindblade, K.A., Steinhardt, L., Samuels, A., Kachur, S. P. and Slutsker, L. (2013).The silent threat: asymptomatic parasitemia and malaria transmission. *Expert Review AntiInfection*.**11**(6):623-639.
9. Bousema,T., Okell, L., Felger, I. and Drakeley, C. (2014). Asymptomatic malaria infections: detectability, transmissibility and public health relevance. *Nature reviews Microbiology*.**12**(12):833–40
10. Gurjeet, S., Urhekar,A.D.,Ujwala, M., and Sangeeta, S. (2014). Effects of malarial parasitic infections on human blood cells.*International Journal of Current Microbiology and Applied Sciences* **3**(12): 622-632.
11. Manas, K., Bhukdee, P., Nuoil, P., Chaowanee, C. and Suwit, D. (2014). Effect of malarial infection on haematological parameters in population near Thailand-Myanmar border. *Malaria Journal.* **13**: 218.

12. Nfor, O. N. and Tang, B. N. (2020). Assessment of Hematological Parameters in Malaria, among Adult Patients Attending the Bamenda Regional Hospital. *Journal of Anaemia.*1-8.
13. Bakhubaira, S. (2013).Hematological parameters in severe complicated Plasmodium falciparum malaria among adults in Aden. *Turkish Journal of Haematology*. **30**:394–399.
14. Damian, N., Olukayode, O., Emeka, I., Omoruyi, O., Osaro, A., Bamidele, O., Yetunde, I., and Ayebo, S. (2020). Haematological Parameters and Spleen Rate of Asymptomatic and Malaria Negative Children in Edo South District, Nigeria. *Annals of Global Health*.**86**(1): 62, 1–12.
15. Van, W.,Vliegenthart-Jongbloed, M.E., De-Mendonca, K., Melo, M., Wever, P.C., McCall, M.B., Koelewijn, R., Van, H. and Van Genderen, P.J. (2013). Predictive value of lymphocytopenia and the neutrophil-lymphocyte count ratio for severe imported malaria. *Malaria Journal*. **12**:101.
16. Udomah, F., Zama, I., Abdulrahaman, Y., Asemota, E. and Emenike, F. (2014). Haematological Parameters of Malaria Infected Patients in the University of Calabar Teaching Hospital, Calabar, Nigeria. *Journal of Hematology & Thromboembolic Diseases*. **2**(6) 2-4.
17. Mayor, A., Aponte, J.J., Fogg, C., Saute, F., Greenwood, B., Dgedge, M., Menendez, C. and Alonso, P.L. (2007).The epidemiology of malaria in adults in a rural area of Southern Mozambique. *Malaria Journal*. **6**(3): 1-20.
18. Sumbele, I.U.N., Theresa, N.A., Samje, M., Ndzeize, T., and Ndzeize, E.M. (2010) Hematological changes and recovery associated with untreated and treated plasmodium faciparum infection in children in the mount Cameroon region. *Journal of Clinical Medicine Research.* **2**(1): 143-151.
19. Dodoo, D, Omer, F. M, Todd, J. (2002). Absolute levels and ratios of pro-inflammatory and anti- inflammatory cytokine production in vitro predict clinical immunity to *Plasmodium falciparum* malaria. Journal of infectious Disease.185: 971-979.
20. Oh, M. D., Shin, H, Shin, D., Kim, U., Kin, N., Chol, M. H., Chai, J. Y., Choe, K. (2001). Clinical features of vivax malaria. The American Journal of Tropical Medicine and Hygiene. 65:143-146.

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