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Comparative Analysis of Some Haematological Parameters of Adults Subjects Based On ABO Blood Groups in South Eastern, Nigeria

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Abstract **Original Research Article**

It is very clear that ABO blood group system is the most clinically significant blood group system. The study was done in University Medical Centre in Southeastern part of Nigeria. A total of 200 subjects were recruited for the study comprising 5o subjects each blood group who were apparently healthy individuals drawn from the institution. About 2mls of venous blood was collected from the subjects into anticoagulant containers for haematological parameters determination. The haematological parameters were determined using Mindray BC-5300. The results were expressed as mean± standard deviation. The data were analysed with the statistical package for social science (SPSS) version 20 using t-test, ANOVA and the level of significance was set at $P<0.05$. The study showed significant difference (P=0.001) in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 4.0±0.5 X 10^9/L) and no significant difference in Neutrophils (40.0±8.2%; 41.0±6.5%, P=0.562), Lymphocytes (56.0 ±6.2%; 53.0±4.7%, P=0.836), Monocytes (1.0 ±0.1%;1.0±0.1%, P= 0.952), Red blood cells(4.6±0.3 X 10^{12}/L; 4.8±0.5 X 10^{12}/L, P=1.000), haemoglobin (13.7±2.4 g/dl; 14.3±3.1 g/dl, P= 0.869), packed cell volume(41.0±6.4%; 43.04.6%, P= 0.752), MCV(89.1±10.6fl; 89.6±7.5fl, P=1.000) , MCH(29.8±2.3pg; 29.8±1.9pg, P=1.000) and MCHC(334.0±15.2g/l; 333.0±10.8g/l, P=0.998) respectively. The study showed significant difference (P=0.001) in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 2.4±0.3 X 10^9/L, P=0.000), Monocytes (1.0 ±0.1%;2.0±0.2%, P= 0.001), and no significant difference in Neutrophils (40.0±8.2%; 40.0±7.3%, P=1.000), Lymphocytes (56.0 ±6.2%; 58.0±5.2%, P=0.724), Red blood cells(4.6±0.3 X 10^{12}/L; 4.6±0.2 X 10^{12}/L, P=1.000), haemoglobin (13.7±2.4 g/dl; 13.6±2.2 g/dl, P= 0.978), packed cell volume(41.0±6.4%; 41.0±3.5%, P= 1.000), MCV(89.1±10.6fl; 89.1±8.2fl, P=1.000), MCH(29.8±2.3pg; 29.6±2.0pg, P=1.000) and MCHC(334.0±15.2g/l; 332.0±13.6g/l, P=0.996) respectively.The study showed significant difference (P=0.001) in Neutrophils (40.0±8.2%; 52.0±5.6%, P=0.000), Lymphocytes (56.0 ±6.2%; 47.0±6.0%, P=0.000), and no significant difference in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 5.4±0.3 X 10^9/L, P=0.346), Monocytes (1.0 ±0.1%; 1.0±0.1%, P= 1.00), Red blood cells(4.6±0.3 X 10^{12}/L; 4.4±0.6 X 10^{12}/L, P=0.167), haemoglobin (13.7±2.4 g/dl; 13.3±0.9 g/dl, P= 0.532), packed cell volume(41.0±6.4%; 40.0±5.3%, P= 0.267), MCV(89.1±10.6fl; 90.9±6.8fl, P=0.436) , MCH(29.8±2.3pg; 30.2±2.6pg, P=0.257) and MCHC(334.0±15.2g/l; 333.0±20.1g/l, P=0.789) respectively. The study showed significant difference ($P<0.05$) in WBC of Blood group B subjects compared to blood group A subjects (2.4±0.3 X 10^9/L; 4.0±0.5 X 10^9/L, P=0.000) and Monocytes (2.0±0.2%; 1.0±0.1%, P= 0.001), and no significant difference ($P>0.05$) in Neutrophils (40.0±7.3%; 41.0±6.5%, P=0.467), Lymphocytes (58.0±5.2%; 53.0±4.7%, P=0.246), Red blood cells(4.6±0.2X 10^{12}/L; 4.8±0.5X 10^{12}/L, P=0.870), haemoglobin (13.6±2.2 g/dl; 14.3±3.1 g/dl, P= 0.468), packed cell volume(41.0±3.5%; 43.0±4.6%, P= 0.362), MCV(89.1±8.2fl; 89.6±7.5fl, P=1.000) , MCH(29.6±2.0pg; 29.8±1.9pg, P=1.000) and MCHC(332.0±13.6g/l; 333.0±10.8g/l, P=0.725) respectively. The study has shown wide variations of the haematological parameters which could be utilized in the management of patients under different disease conditions and also in healthy state.

Keywords: Haematological parameters, adults subjects, ABO blood groups, Southeastern.

INTRODUCTION

ABO was reported in a paper reviewed by Obeagu in 2019 as the most clinically significant of all the blood group systems as the vast majority of the population carrying preformed ABO antibodies [1]. The ABO blood group system was the first human blood

group system to be discovered. Blood groups are based on antigens that are located on red blood cells (RBC_S) membranes and are coded by alleles on different loci on a chromosome. Individuals are divided into four major blood groups namely A, B, AB and O groups depending on the antigens present on their red blood cells [2]. Dominant blood group genes express themselves through minute protein polysaccharide substance on the surface of the erythrocytes membrane according to Okoroiwu *et al.*, [3]. Apart from their importance in blood transfusion practice, they are useful in genetic studies of populations and also resolving medico legal issues like disputed parentage [4]. In addition, many studies have associated blood group systems with different disease conditions in different parts of the world. For example, several research works have shown that stomach cancer has a higher prevalence rate among blood group A than the rest of the ABO blood groups [5, 6]. Blood group O individual have also been reported by several workers to be more prone to peptic ulcer disease due to lack of N-actyl-glucosamine necessary for the development of mucosa living of their alimentary canal [7]. ABO blood group normally varies from population to population as opined by Adeyeomo and Soboyejo [8] and Obeagu *et al.*, [9].

The study was done to determine the levels of haematological parameters of adults subjects based on ABO blood groups in Southeastern, Nigeria

MATERIALS AND METHODS

Study Area

The study was done in Medical Centre of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

Subjects

A total of 200 subjects were recruited for the study comprising 5o subjects each blood group who were apparently healthy individuals drawn from the institution.

Sample Collection

About 2mls of venous blood was collected from the subjects into anticoagulanted containers for haematological parameters determination.

Laboratory Investigations

The haematological parameters were determined using Mindray BC-5300. The haematological parameters investigated include WBC, Neutrophils, Lymphocytes, Monocytes, Red Blood Cells, Haemoglobin, Packed Cell Volume, MCV, MCH and MCHC.

Ethical Consideration

The details of the research were explained to the subjects and written consents obtained from them and were assured of joining the study willingly and confidentiality also assured. The subjects who gave their consents were allowed to participate in the study.

Statistical Analysis

The results were expressed as mean± standard deviation. The data were analysed with the statistical package for social science (SPSS) version 20 using t-test, ANOVA and the level of significance was set at $P<0.05$.

RESULTS

Table-1: Mean±SD Values Of Some Haematological Parameters of Blood Group O and Blood Group A Subjects

Parameters	GROUP O	GROUP A	P-value
WBC(X 10^9/L)	5.5 ±0.8	4.0±0.5	0.001*
Neu(%)	40.0±8.2	41.0±6.5	0.562^{NS}
Lym(%)	56.0 ±6.2	53.0±4.7	0.836^{NS}
Mon(%)	1.0 ±0.1	1.0±0.1	0.952^{NS}
RBC(X 10^{12}/L)	4.6±0.3	4.8±0.5	1.000^{NS}
Hb(g/dl)	13.7±2.4	14.3±3.1	0.869^{NS}
PCV(%)	41.0±6.4	43.0±4.6	0.752^{NS}
MCV(fl)	89.1±10.6	89.6±7.5	1.000^{NS}
MCH(pg)	29.8±2.3	29.8±1.9	1.000^{NS}
MCHC(g/l)	334.0±15.2	333.0±10.8	0.998^{NS}

Significant level-*P < 0.05, ns-Not significant (P > 0.05)

The study showed significant difference (P=0.001) in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 4.0±0.5 X 10^9/L) and no significant difference in Neutrophils (40.0±8.2%; 41.0±6.5%, P=0.562), Lymphocytes (56.0 ±6.2%; 53.0±4.7%, P=0.836), Monocytes (1.0 ±0.1%;1.0±0.1%, P= 0.952), Red blood cells(4.6±0.3 X 10^{12}/L; 4.8±0.5 X 10^{12}/L, P=1.000), haemoglobin (13.7±2.4 g/dl; 14.3±3.1 g/dl, P= 0.869), packed cell volume(41.0±6.4%; 43.04.6%, P= 0.752), MCV(89.1±10.6fl; 89.6±7.5fl, P=1.000) , MCH(29.8±2.3pg; 29.8±1.9pg, P=1.000) and MCHC(334.0±15.2g/l; 333.0±10.8g/l, P=0.998) respectively.

Table-2: Mean±Sd Values of Some Haematological Parameters of Blood Group O and Blood Group B Subjects

Parameters	GROUP O	GROUP B	P-value
WBC(X 10^9/L)	5.5 ±0.8	2.4±0.3	0.000*
Neu(%)	40.0±8.2	40.0±7.3	1.000^{NS}
Lym(%)	56.0 ±6.2	58.0±5.2	0.724^{NS}
Mon(%)	1.0 ±0.1	2.0±0.2	0.001*
RBC(X 10^{12}/L)	4.6±0.3	4.6±0.2	1.000^{NS}
Hb(g/dl)	13.7±2.4	13.6±2.2	0.978^{NS}
PCV(%)	41.0±6.4	41.0±3.5	1.000^{NS}
MCV(fl)	89.1±10.6	89.1±8.2	1.000^{NS}
MCH(pg)	29.8±2.3	29.6±2.0	1.000^{NS}
MCHC(g/l)	334.0±15.2	332.0±13.6	0.996^{NS}

Significant level-*P < 0.05, ns-Not significant (P > 0.05)

The study showed significant difference (P=0.001) in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 2.4±0.3 X 10^9/L, P=0.000), Monocytes (1.0 ±0.1%;2.0±0.2%, P= 0.001), and no significant difference in Neutrophils (40.0±8.2%; 40.0±7.3%, P=1.000), Lymphocytes (56.0 ±6.2%; 58.0±5.2%, P=0.724), Red blood cells(4.6±0.3 X 10^{12}/L; 4.6±0.2 X 10^{12}/L, P=1.000), haemoglobin (13.7±2.4 g/dl; 13.6±2.2 g/dl, P= 0.978), packed cell volume(41.0±6.4%; 41.0±3.5%, P= 1.000), MCV(89.1±10.6fl; 89.1±8.2fl, P=1.000) , MCH(29.8±2.3pg; 29.6±2.0pg, P=1.000) and MCHC(334.0±15.2g/l; 332.0±13.6g/l, P=0.996) respectively.

Table-3: Mean±Sd Values of Some Haematological Parameters of Blood Group O and Blood Group Ab Subjects

Parameters	GROUP O	GROUP AB	P-value
WBC (X 10^9/L)	5.5 ±0.8	5.4±0.3	0.346^{NS}
Neu (%)	40.0±8.2	52.0±5.6	0.000^{*}
Lym (%)	56.0 ±6.2	47.0±6.0	0.000^{*}
Mon (%)	1.0 ±0.1	1.0±0.1	1.00^{NS*}
RBC (X 10^{12}/L)	4.6±0.3	4.4±0.6	$0.\ 167^{NS}$
Hb(g/dl)	13.7±2.4	13.3±0.9	0.532^{NS}
PCV (%)	41.0±6.4	40.0±5.3	0.267^{NS}
MCV(fl)	89.1±10.6	90.9±6.8	0.436^{NS}
MCH (pg)	29.8±2.3	30.2±2.6	0.257^{NS}
MCHC (g/l)	334.0±15.2	333.0±20.1	0.789^{NS}

Significant level-*P < 0.05, ns-Not significant (P > 0.05)

The study showed significant difference (P=0.001) in Neutrophils (40.0±8.2%; 52.0±5.6%, P=0.000), Lymphocytes (56.0 ±6.2%; 47.0±6.0%, P=0.000), and no significant difference in WBC of Blood group O subjects compared to blood group A subjects (5.5 ±0.8 X 10^9/L; 5.4±0.3 X 10^9/L, P=0.346), Monocytes (1.0 ±0.1%; 1.0±0.1%, P= 1.00), Red blood cells(4.6±0.3 X 10^{12}/L; 4.4±0.6 X 10^{12}/L, P=0.167), haemoglobin (13.7±2.4 g/dl; 13.3±0.9 g/dl, P= 0.532), packed cell volume(41.0±6.4%; 40.0±5.3%, P= 0.267), MCV(89.1±10.6fl; 90.9±6.8fl, P=0.436) , MCH(29.8±2.3pg; 30.2±2.6pg, P=0.257) and MCHC(334.0±15.2g/l; 333.0±20.1g/l, P=0.789) respectively.

Table-4: Mean±Sd Values of Some Haematological Parameters of Blood Group A and Blood Group B Subjects

Parameters	GROUP B	GROUP A	P-value
WBC(X 10^9/L)	2.4±0.3	4.0±0.5	0.000^{*}
Neu(%)	40.0±7.3	41.0±6.5	0.467^{NS}
Lym(%)	58.0±5.2	53.0±4.7	0.246^{NS}
Mon(%)	2.0±0.2	1.0±0.1	0.001^{*}
RBC(X 10^{12}/L)	4.6±0.2	4.8±0.5	$0.\ 870^{NS}$
Hb(g/dl)	13.6±2.2	14.3±3.1	0.468^{NS}
PCV(%)	41.0±3.5	43.0±4.6	0.362^{NS}
MCV(fl)	89.1±8.2	89.6±7.5	1.000^{NS}
MCH(pg)	29.6±2.0	29.8±1.9	1.000^{NS}
MCHC(g/l)	332.0±13.6	333.0±10.8	0.725^{NS}

Significant level-*P < 0.05, ns-Not significant (P > 0.05)

The study showed significant difference (P<0.05) in WBC of Blood group B subjects compared to blood group A subjects (2.4±0.3 X 10^9/L; 4.0±0.5 X 10^9/L, P=0.000) and Monocytes (2.0±0.2%; 1.0±0.1%, P= 0.001), and no significant difference (P>0.05) in Neutrophils (40.0±7.3%; 41.0±6.5%, P=0.467), Lymphocytes (58.0±5.2%; 53.0±4.7%, P=0.246), Red blood cells(4.6±0.2X 10^{12}/L; 4.8±0.5X 10^{12}/L, P=0.870), haemoglobin (13.6±2.2 g/dl; 14.3±3.1 g/dl, P= 0.468), packed cell volume(41.0±3.5%; 43.0±4.6%, P= 0.362), MCV(89.1±8.2fl; 89.6±7.5fl, P=1.000) , MCH(29.6±2.0pg; 29.8±1.9pg, P=1.000) and MCHC(332.0±13.6g/l; 333.0±10.8g/l, P=0.725) respectively.

DISCUSSION

The study showed significant increase in total white cells of blood group O individuals compared to persons with group A. This may be that there is higher metabolic rate and higher stress level in group O persons compared to blood group A persons. This may give more immune defense upon group O persons than blood group A persons. Group O persons showed higher level of WBC in relation to blood group A. These changes seen in the WBC, Neutrophils, lymphocytes, monocytes and no significant change in the red cell lines could be related in the genetic factors as the subjects receive almost the same type of foods as people living in the same place and are apparently healthy. This may confer a stronger immunity on those with blood group O than those with blood group A as the cytokines are mainly secreted from the leucocytes. This increase in WBC in group O persons may be related to their response to infections and environmental factors and bone marrow function [1]. Blood group O subjects may survive adverse conditions more than blood group A. The clinicians and all health workers should pay attention to leucocytes of persons from this part of the world. The study proved that ABO blood group has no predisposing effect to anaemia but may have a role in immune status of the subjects. This will affect the rate by which individuals with varied ABO

blood group are challenged by infections and immune response with prognosis levels. It is crucial to embark on intense study of genetic factors that could lead to these variations in the haematological parameters studied here.

The results showed increase in WBC in blood group O persons compared to subjects with blood group B. It shows that blood group O may possess stronger immunity than blood group B. Blood group may mount rapid and lasting immunological response than blood group B. The results showed decrease in monocytes of the blood group O compared to persons with group B. Blood group B may have stronger immunity against intracellular infections such as tuberculosis and other chronic diseases. This will affect the levels of cytokine secreted by monocytes which will affect both cellular immunity and antibody-mediated immunity.

The results showed increase in lymphyocytes and decrease in neutrophils of blood group O persons compared to blood group AB persons. Persons with blood group O may have more robust immunity more than AB blood group AB persons. If there is any viral infection such as HIV the CD4 cells, the blood group O will be more stable to overcome the infections more than the AB blood group persons. This may explain the reason behind the varied susceptibility pattern to infections based on ABO blood group of individuals. There is a report that suggested that erythrocytes may be crucial in the pathogenesis of HIV as they enhance viral infectivity by binding free viruses as well as viral immune complexes and through such binding transfect HIV susceptible cells [10, 11]. HIV infection has been reported to occur in selected blood groups in some regions of the world Sayal *et al.*, [12].

The study also showed elevated levels of WBC (P=0.000) of blood group A persons relative to persons with blood group B. This shows that blood group A persons have stronger immunity persons with blood group B which will affect the immunological response of the individuals. There was decrease in monocytes of the blood group A compared to persons with blood group B which may confer stronger immunity to persons with group B in relation to intracellular infections. The cilinicians should take cognizance of these varaiations in handling persons with varied ABO blood gropus.

The results showed decrease in WBC (P=0.000), Neutrophil (P=0.000), increase in lymphocytes (P=0.001) and Monocytes (P=0.002) in group B persons relative to persons with blood group AB. This shows that subjects with blood group AB may have stronger immunity to bacterial infection and acute diseases than persons with group B and group B persons may have have stronger antibody mediated immunity than AB as there was increased synthesis and release of cytokines which will regulate immunological and haematological systems of the subjects. The increased monocytes in persons with blood group B may confer stronger immunity in intracellular infections than in persons with AB blood group.

The results showed decrease in WBC (P=0.002) and in neutrophils (P=0.000) between blood gropu A subjects and AB blood group subjects and increase in lymphocytes (P=0.000) between subjects with blood group A and AB. The decrease in WBC and neutrophils may be as a result of bone marrow function and capacity which depict immunological strength of the blood groups [1].

CONCLUSION

It is very clear that ABO blood group system is the most clinically significant blood group system. The study has shown wide variations of the haematological parameters which could be utilized in the management of patients under different disease conditions and also in healthy state. This study should a guide to many health practitioners.

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