

Assessment of White Blood Cell in Abo Blood System of Blood Group Among Students: A Study in Bauchi State University Gadau Main Campus

Egya Idris Adamu*, Ahmad Aliyu Ladan*, Abbas Ibrahim*.

Department of Human Physiology, Faculty of Basic Medical Science, Bauchi State University Gadau, Bauchi State. Nigeria*

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Abstract ABO blood system relationship to infections and other pathological conditions Individuals with certain types of ABO blood groups are more susceptible to diverse kinds of infections. Blood grouping has been one of the major factors for identification of biological materials in forensic investigations and is a widely used technique in forensic laboratories. The presence of ABO blood group and Rhesus factor is applied to inherited antigens detected on red cell surface by specific antibodies. WBC count is the number of neutrophils, lymphocytes, monocytes, eosinophils, basophils, and immature or atypical cells present in 1 mL of blood, Elevation of the WBC requires accurate differential count and morphologic evaluation of the peripheral blood smear along with clinical information to determine the cause. The normal range percentage of the different types of WBCs is as follows: Neutrophils 50-70% Eosinophils 1-4% Basophils 0.4% Monocytes 2-8% Lymphocytes 20-40%A total number of 60 healthy subjects were used for the research, they comprise 16, 14, 8, 22 (A, B, AB and O) respectively with white blood cell counts and Rhesus factor were analyzed. All patients were subjected to differential white blood cell which was carried out in the laboratory. Result was statistically analyzed by Microsoft excel and SPSS. We observed that blood group O had significantly higher values of white blood cell count with p value of <0.05. White blood cell count is more significant in O+ blood group irrespective of their gender but differ in ethnicity.

Key word: blood, white blood cells count, ABO Blood group, Rhesus, morphology, patients, forensic

INTRODUCTION

ABO blood antigens are alternative phenotypes and genetically derived from glycoconjugate structures on the red cell surface. (Abdulganiyu. 2016; Mohandas N., Narla 2015). Blood group

refers to the entire blood group system comprising red blood cell antigens specifically controlled by series of genes which can be allelic or linked very closely on the same chromosome. (Hems & Kim Shapiro. 2013). Blood type refers to a specific pattern of reaction for testing antisera within the body (Shema *et al.*, 2013). Karl Landsteiner was rewarded for the discovery of ABO blood group system in 1900. (Owen Landsteiner, 2000). ABO system is the simple but strong scientific reasoning for identification of major blood groups such as O, A, and B types, compatibility testing, and subsequent transfusion practices. (Cao *et al.*, 2014; Franchm & Lipp 2019).

White blood cells are refers to leukocytes, they are the cell lineage responsible of counteracting infections in the body (Abbas et al 2020). These cells are synthesized in the bone marrow and are classified according to the presence of characteristic intracellular granules into granulocytes that are further sub classified into neutrophils, eosinophils and basophils (Yelwa 2016). The other types of cells are the agranulocytes that are of four main types: monocytes, macrophages, t-lymphocytes, and b-lymphocytes. White blood cell counts are commonly used for clinical diagnostic (Valent 2014). WBC differential count provides information about percentage adn absolute value of the different types of white blood cells in the body (Clark 1990)

ABO blood grouping

The ABO blood group system was discovered in 1901 (Shama *et al.*, 2013) and it consists of the 3 alleles A, B and O which belong ABO gene (Contreras & Danel 2011). The combination of these 3 alleles on red blood cells Red Blood Cells (Ceo *et al.*, 2021) results in 6 possible genotypes and four phenotypes, resulting in antigens on (RBCs) with antibodies in plasma(Wolphn *et al.*, 2010). Since the discovery, attempts have been made to study the potential linkage of the ABO blood group system with various infections (Emosolease *et al.*, 2008; Anifoloshe *et al.*, 2015). The polymorphism of the ABO blood group was reported to be associated with the susceptibility including tumors, coronary heart disease, hepatitis B virus, SARS-CoV2 and Helicobacter pylori (Wang *et al.*, 2015; Franchini *et al.*, 2016).

WHITE BLOOD CELL

The nuclei of WBC have different shapes, texture and sizes which might be one or more lobes based on the reaction of their specific granules with a staining process. The most useful shape, size and texture information for cell segmentation and classification are nuclei of White Blood Cells (Clark VL 1990).

Neutrophils are a part of the innate immune system which are essential line of defense mechanism (Mayadas TN et al., 2015). They are also known as “band neutrophils”. Their diameter ranges between (10–18) μ and the cytoplasm are moderate to abundant with a few non-specific granules.

Basophils secrete anticoagulant and antibodies have the ability to fight against hypersensitivity reactions (Mcbrien CN, Menzies-Gow A 2017). They are the smallest circulating granulocytes (Cromheecke 2014). Their granules in this cell are large and very numerous.

Eosinophils have the ability to release toxins from their granules for destroying pathogens which are parasites and worms. These pathogens are easily recognized in stained smears by their large granules (Abais-Battad *et al.*, 2017). The nucleuses of the eosinophil have two lobes connected by a band of nuclear material. The diameter usually ranges between (9 –15) μ . They account between (1% –4%) of the peripheral WBCs (Clark VL; Standring S. 2015).

Monocytes stimulate osteoclasts cells which have the ability to dissolve bone. Monocytes are larger type of White Blood Cell. Their average diameter ranges from (10-30) μ and are often referred to as scavenger cells or phagocytes (Dunay *et al.*, 2020).

Lymphocytes are described according to size and cytoplasmic granularity and can have a small or large nucleus depending on the maturation stage (Kondo *et al.*, 2010). Small lymphocytes have the diameter of a small nucleus ranges from (6 –9) μ , while the diameter of a large nucleus is approximately (10 – 15) μ . It contains just one nucleus which is rarely or barely lobed (Van Brussel *et al* 2013; Patel *et al.*, 2017).

MATERIALS AND METHODS

60 subjects were used for the test. Blood sample was collected from all the volunteers and subject to blood group test and white blood cell count test was also measure.

INCLUSIVE CRITERIA: The entire volunteers were physical fit and are undergraduate students of Bauchi State University Gadau.

EXCLUSIVE CRITERIA: Subject must not be under 18 prior to time of sample collection and must not be expose to alcohol and smoking

STUDY AREA

The study was conducted in Bauchi State University gadau. Students from all the department were included.

STUDY DESIGN

The study adopted a cross-sectional descriptive study design

RESULT

Table 1: Shows the frequency of the ABO blood Group Distribution for 60 Students 17 (28.3%) were found to be O+, 13 (21.7%) were found to be A+, 9 (15%) were found to be B+, 5(8.3%) were found to AB-, 5 (8.3%) were found to O-, 5 (8.3%) were found to be B-, 3 (5%) were found to be AB+ and 3(5%) were A- respectively.

Blood Groups	Frequency	Percent	Valid Percent	Cumulative Percent
A+	13	21.7%	21.7%	21.7
A-	3	5%	5%	26.7
B+	9	15%	15%	41.7
B-	5	8.3%	8.3%	50.0
AB+	3	5%	5%	55.0
AB-	5	8.3%	8.3%	63.3
O+	17	28.3%	28.3%	91.7
O-	5	8.3%	8.3%	100
Total	60	100.0%	100.0%	

Table 2: This Table shows the distribution of Rhesus factor, expressed in percentage. A total number of 44 (73.3%) of the population were Rhesus 'D' positive while 16 (26.7%) were Rhesus 'D' negative.

Rhesus Positive	44	73.3%
Rhesus Negative	16	26.7%
Total	60	100%

Table 3 Shows the frequency of total white blood cell count in blood group for 60 Students. O+ is having the highest white blood cell count with 9955 while O- is having the lowest with 4760.

Blood Group	White Blood Cell Count ($10^3/\text{mm}^3$)	Mean \pmSD ($10^9/\text{L}$)
AB+	6083	6.08 \pm 1.2*
AB-	5953	5.9 \pm 1.0
O+	9955	9.9 \pm 3.6*
O-	4760	4.7 \pm 7.0
A-	5617	5.6 \pm 4.5
A+	6272	6.2 \pm 1.4
B+	5486	5.4 \pm 1.6
B-	6090	6.0 \pm 1.8*

Show the white blood cell among the three ethnicity in the campus. Others ethnic group have highest white blood cell count follow by Hausa and Fulani

Ethnicity	White blood cell count in population	Percentage in population
HAUSA	5747 ($10^3/\text{mm}^3$) (24)	40%
Fulani	4845 ($10^3/\text{mm}^3$) (21)	35%
Other	6344 ($10^3/\text{mm}^3$) (15)	25%
Total	60	100

DISCUSSION

The main objective of this research was to determine the predominant blood group and white blood cell count among students of Bauchi state University, Gadau campus. According to this research, blood group 'O+' was found to be the predominant blood Group with (28.3%), followed by blood Group 'A+', with (21.7%). This study also reveals that Rhesus 'D' negativity has the lowest distribution among the students. The studies also reveals that O+ have the highest number of white blood cell count followed by A+, during the research other ethnic group have the highest number of white blood cell count against Hausa and Fulani with the campus. However, other findings in Nigeria (Onwukeme. 1990), reports from Caucasian population show that blood group 'A' is the next most common after 'O'. This clearly points to the fact that more research is still required on ethnic percentage distribution of ABO blood group phenotype, especially in northern part of the country. This study also found that among the both male and female students, blood group O has the highest frequency, followed by blood group A, B and AB in that order. Moreover, in contrast to my study, studies conducted in India, (Rosendaal. *et al.*, 2009). and Pakistan (Nuinoon *et al.*, 2014), showed blood group 'B', was the most predominant, followed by blood group 'O', 'A' and 'AB'. We advocate the use of this and similar data from other parts of the country by the recently established national blood transfusion service for efficient distribution of blood products to the various hospitals in Bauchi state. However, some other studies reported blood group A to be the most frequent among males, while blood group B has the highest frequency among females.(Ghobadian *et al.*, 2014) Most of the male and female students were found to have rhesus positive blood group as also reported by previous studies. This shows that inheritance of ABO and rhesus blood groups are not sex-linked (Enoslease 2008)

CONCLUSION

In conclusion, the result of the present study confirms that the predominant Blood Group and White blood cell among Male and Female students of Bauchi state university, Gadau campus is Blood Group 'O+' and also with highest white blood cell count.

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AUTHOR CONTRIBUTION

Egya Idris Adamu draft the manuscript. Egya Idris Adamu collected the data. Egya Idris Adamu and Ahmad Aliyu Ladan analysis the data. Egya Idris Adamu design the study. Egya Idris Adamu and Ahmad Aliyu Ladan revised the manuscript. All the authors contributed to the article and approved the submitted version.

ETHICAL APPROVAL: the study was approved by the faculty of basic health science, Bauchi State University Gadau ethical committee.

FUNDING

It is a personal research

RESEARCH LIMITATIONS

This study had the following limitation which should be taken in future research. It was limited to only undergraduate students. Future studies should include individual outside the university community, those expose to some minor disease condition. Therefore, future studies should involve more participants.

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