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ASSESSMENT OF THE RELATIONSHIP BETWEEN ABO BLOOD GROUPS AND SOME HAEMOSTATIC PARAMETERS AMONGST MEDICAL STUDENTS IN NIGER DELTA UNIVERSITY, BAYELSA STATE

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ABSTRACT

Introduction: Distinctive human ABO blood type antigens present on the surface of the human red blood cells are helpful in actively predicating physiologic and pathophysiologic conditions of the cells. It has been severally claimed to have marked link with some haemostatic indices. The present study was therefore carried out to assess the relationship between the ABO blood groups and some haemostatic parameters amongst medical students in Niger Delta University, Bayelsa State. **Materials and Method:** This study was a cross sectional survey-based study conducted in the Department of Human Physiology of University of Port Harcourt. The study made use of a sample size of 171 male and female undergraduate medical students of the Niger Delta University, Bayelsa State. A multi-stage (involving stratified and random sampling) sampling technique was used for the study. **Results:** The result indicated that the males had significantly ($P<0.05$) lower bleeding time than their female counterparts. The ABO blood groups distribution pattern was found to be: O > B > A > AB for the medical students. The findings on the association between bleeding and clotting times according to the subjects' ABO blood group revealed bleeding and clotting times that were significantly higher in both gender of blood group O when compared to others. There were significant ($P<0.05$) associations between the bleeding and clotting times and ABO blood groups of the subjects. **Conclusion:** The outcome of the present study is useful for promoting awareness and guide for both the populace and healthcare providers in helping with transfusion, disease prediction and marital/pregnancy counseling.

KEYWORDS: Blood group, bleeding time, clotting time, BMI and gender.

INTRODUCTION

Amongst other existing blood types/groups, the 'ABO' system of blood grouping is of higher relevance to medical practice/science (Mahvesh and Rajkhmani, 2017). This system of blood grouping is represented by substances on the surface of red blood cells (RBCs) and these substances are important because they contain specific sequences of amino acid and carbohydrates which are antigenic (Baishya et al., 2017). As well as being on the surface of RBCs, some of these antigens are also present on the cells of other tissues. A complete blood type describes the set of 29 substances on the surface of RBCs, and an individual's blood type is one of the many possible combinations of blood group antigens. Usually only the ABO blood group system and the presence or absence of the Rhesus D antigen (also known as the Rhesus factor or RH factor) are determined and used to describe the blood type (Akhtar et al., 2003).

The importance of blood type or group cannot be over emphasized in the practice of medicine. In the year 1900 Austrian scientist Karl Landsteiner identified the ABO system of blood group which heralded the take-off of blood banking and transfusion medicine (Bijlani *et al*., 2011).

The A and B glycosyltransferase encoded by A and B alleles converts H antigen into A and B determinants. The O allele does not encode a functional enzyme, so express only the basic unmodified antigen (Yamamoto F 2000). This transferase enzyme is deficient in the group O individuals who continue to express H antigen. (Watkins *et al*., 1980). Therefore, type A individuals have antigen A, type B have antigen B, and type AB have both; type O have neither of these antigens. In addition to RBC'S, these antigens are also expressed in various cells including platelets, vascular endothelium, epithelial cells and Von Willebrand factor (Vwf).(Oriol

R *et al*., 1991). Many diseases are found to be associated with blood groups for e.g., duodenal ulcer, diabetes mellitus, urinary tract infection, fetomaternal incompatibility etc. (Akhtar *et al*., 2003). Previous research as shown clear association between ABO blood group status and von Willebrand factor. Deficiency of vWF leads to hemorrhagic disorders, while elevated levels are a risk factor for thrombosis. Earlier studies state that the O group individuals have prolonged bleeding time and clotting time.

MATERIALS AND METHOD

This study was a cross sectional survey-based study that involved only human subjects: Medical students of the Niger Delta University in Bayelsa State. A multi-stage (involving stratified and random sampling) sampling technique was used for the study. The study was conducted in the Human Physiology Department of University of Port Harcourt. Data collection was done for a period of six months from January 2023 to June 2023. A sample size of 171 subjects were randomly selected for the study. This number is made up of 76 males and 95 females.

Inclusion Criteria

1. Male and female subjects with the age group of 19–39 years.
2. Subjects who have signed the consent form.
3. Individuals without any history of bleeding disorder.
4. Individuals who are not on medications that affect blood clotting (e.g. anticoagulants and non-steroidal anti-inflammatory drugs).
5. Women who are not pregnant.
6. Apparently healthy individuals.
7. Individuals who have not received blood transfusion within the previous three months.

Exclusion Criteria

The following individuals were excluded from the study:
1. Drug addict and alcoholic people
2. The Elderly
3. Individuals with any history of bleeding disorder
4. Individuals on medications that affect blood clotting e.g., anticoagulants and non-steroidal anti-inflammatory drugs
5. Pregnant women
6. Individuals who are sick
7. Individuals who have received blood transfusion within the previous three months

Method of Data Collection

Biodata- The sex and age of all subjects were recorded.

Anthropometry – The weight of subjects was determined using a weighing scale while their height was measured using a standiometer. The body mass index of subjects was then calculated using their weight and height.

Blood group were determined using the standard antisera method. Blood sample was taken from the subject by finger prick with sterile lancet after cleaning the puncture site with spirit. The sample blood was then mixed with anti-A and anti-B. Blood groups were determined on basis of presence or absence of agglutination. agglutination was confirmed by observing slide under low power objective of a compound microscope (Pal et al., 2010).

Bleeding time – This was determined using Duke's filter paper technique. A deep puncture was made and the length of time required for the bleeding to stop recorded by blotting the drop coming out of the puncture site every 30seconds using the blotting paper. Bleeding time was calculated by multiplying the number of drops on the filter paper and 30seconds. The normal bleeding time by Dukes method is 1-5minutes (Pal et al., 2010).

Clotting time – This was determined by the capillary tube method. A standard puncture is made on the skin and the blood was taken into the capillary glass tube. The length of time taken for the blood to clot was calculated by breaking the capillary tube after 2minutes, 1-2cm from the end every 30seconds till of fibrin thread. The normal clotting estimated was between 5-11minutes (Pal et al., 2010).

Method of Data Analysis

The numerical data obtained from the present study were statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0. The level of statistical significance was determined using one-way analysis of variance (ANOVA) and thereafter post-Hoc multiple comparison test and Chi-square analyses for association. The P-values less than 0.05 was considered statistically significant. And the values were expressed as mean ± standard error of mean (SEM) and frequencies/percentages accordingly.

Ethical approval

Ethical approval was secured from the Ethics Committee of the Centre for Research Management and Development at the University of Port Harcourt.

RESULTS AND DISCUSSION

RESULTS

Table 1: Distribution Pattern of Blood Type of Study Subjects based on gender.

Blood Type	Gender				Chi-Square Test Outcome
	Male (n=76)	Female (n=95	Total (n=171)	Percentage (%) Distribution	
A	4(5.33)	29(30.85)	33	19.30	X^2= 71.85[a] df=9 P=0.00
B	19(25.33)	15(15.96)	34	19.88	
AB	5(6.67)	0(0.00)	5	2.92	
O	48(64)	51(54.26)	99	57.89	

Table 2: Association between Body Mass Index (BMI) and Blood Type of Male Subjects.

Blood Type	Body Mass Index (BMI)			Chi-Square Test Outcome
	Normal (18.5-24.5kg/m^2)	Overweight (18.5-4.5kg/m^2)	Obese (18.5-4.5kg/m^2)	
A	2(2.63)	1(1.32)	1(1.32)	X^2= 48.76[a] df=4 P=0.00
B	16(21.05)	1(1.32)	2(2.63)	
AB	3(3.95)	2(2.63)	0(0.00)	
O	38(50)	6(7.89)	5(6.95)	
Total	59(77.63)	10(13.16)	7(9.21)	

Table 3: Association between Body Mass Index (BMI) and Blood Type of Female Subjects.

Blood Type	Body Mass Index (BMI)			Chi-Square Test Outcome
	Normal (18.5-24.5kg/m^2)	Overweight (18.5-4.5kg/m^2)	Obese (18.5-4.5kg/m^2)	
A	25(26.31)	2(2.11)	2(2.11)	X^2= 52.94.76[a] df=2 P=0.00
B	10(10.53)	4(4.21)	1(1.05)	
AB	0(0.00)	0(0.00)	0(0.00)	
O	30(31.58)	6(6.32)	14(14.74)	
Total	65 (68.42)	12(12.63)	18(18.94)	

Table 4: Association between Bleeding time and Subjects' Blood Type.

Blood Type	Bleeding Time					Chi-Square Test Outcome
	Male (n=76)		Female (n=95		Total (n=171)	
	<2min	≥2min	<2min	≥2min		
A	4(5.26)	0(0.00)	34(35.79)	5(5.26)	14(8.19)	X^2= 88.03[a] df=9 P=0.00
B	16(21.05)	4(5.26)	15(15.79)	0(0.00)	35(20.47)	
AB	2(2.63)	3(3.95)	0(0.00)	0(0.00)	25(14.62)	
O	40(52.63)	6(7.89)	38(40.00)	4(4.21)	97(56.72)	

Table 5: Association between Clotting Time and Subjects' Blood Type.

Blood Type	Clotting Time					Chi-Square Test Outcome
	Male (n=76)		Female (n=95		Total (n=171)	
	<5min	≥5min	<5min	≥5min		
A	1(1.31)	3(3.95)	20(21.05)	9(9.47)	33(19.30)	X^2= 91.21[a] df=9 P=0.00
B	22(28.95)	5(6.58)	8(8.42)	6(6.31)	41(23.98)	
AB	3(3.95)	2(2.63)	0(0.00)	0(0.00)	5(2.92)	
O	32(42.11)	7(9.21)	22(23.16)	31(33.68)	92(53.80)	

DISCUSSION

Distribution Pattern of Blood Type of Study Subjects based on gender

The data in Table 1 above shows the distribution pattern of blood type of the study subjects, based on their gender. The present study found that the blood group 'O' had the highest prevalence (57.89%) in both genders. However, in the male, blood group B had the second highest prevalence rate, followed by group AB while blood group A had the least prevalence. In the females, blood group A was found to have the second highest occurrence, followed by blood group B while blood group AB had the least occurrence. When considering the entire sample size, blood group O had the highest occurrence (57.89%), followed by blood group B

(19.88%) and then blood group A (19.30%) while blood group AB had the least occurrence (2.92).

The above findings from the study were very similar to those of Enosolease and Bazuaye, (2008) who did a study on similar set of subjects from Benin, Niger Delta of Nigeria. This result also corroborates that of Anifowoshe et al., (2017), who did a review of literatures from around Nigeria. Again, Debele et al., (2023) evaluated similar set of subjects in Addis Ababa, Ethiopia and got a similar finding. The findings above were however different from another study carried out in the United States of America which reported A=26.98%; B=30.31%; AB=10.05% and O=27.15%. The study carried out by Manjeet *et al*., (2015), to assess the relationship between bleeding time and clotting time among various blood groups and to identify any gender difference among the same, which made use of 150 MBBS students in the age group of 17– 20 years, showed that the blood group B (40.7%) was the most common blood group in both genders followed by O (27.3%), A (20.7%), and AB (11.3%).

From the above findings it can be inferred that the frequency of the ABO blood groups among the medical students of Niger Delta University in Bayelsa State follows the order: O > B > A > AB.

Association between Body Mass Index (BMI) and Blood Type of Male Subjects

Table 2 above shows the result of the association between body mass index (BMI) and blood type of male subjects. Most of the subjects (77.63%) were normal while only a few of them (9.21%) were found to be obese. When comparing the blood groups with the BMI of the respondents, blood group O had the highest number (6.95%) of obese patients, followed by blood group B (2.63%), then blood group A (1.32%) while blood group AB had the least (0%) number.

Research on the association between Body Mass Index (BMI) and blood type has yielded mixed results, and the current body of evidence does not provide a consistent or definitive relationship between BMI and blood type. Several studies have explored this topic, but their findings have not indicated a strong and consistent correlation between BMI and blood type in male subjects.

One study on the Correlation between ABO blood groups and body mass index among medical students carried out by Shehin and Bsila (2019) and published in the International Journal of Research in Medical Sciences, found that the prevalence of obesity (BMI >30) among participants based on blood groups AB, B, A and O was 23.5%, 17.5%, 14.3% and 9.5%, respectively. Similarly, a 2015 study in the Journal of Clinical and Diagnostic Research, which focused on Indian adults, also did not find a significant association between BMI and blood type.

Association between Body Mass Index (BMI) and Blood Type of Female Subjects

Table 3 above shows the outcome of the study on the association between body mass index (BMI) and blood type of female subjects. Most of the subjects (68.4%) were found to have normal body weight while only a few of them (18.94%) were found to be obese, based on the standard WHO BMI classification. When comparing the blood groups with the BMI of the respondents, blood group O had the highest number (14.74%) of obese patients, followed by blood group A (2.11%), then blood group B (1.05%) while blood group AB had the least (0%) number.

When the incidences of overweight and obesity was compared between the male and female subjects, it was found that the female subjects had higher tendencies to present with overweight and obesity than their male counterparts. And in both male and female genders, the BMI statuses of the subjects had marked associations with the distribution of blood group in the subjects.

Association between Bleeding time and Subjects' Blood Type

Tables 4 above displays the relationship between bleeding time and blood type of the study subjects, based on their gender. Among the male subjects, it was found that blood group O subjects (52.63%) had the least bleeding time, followed by blood group B (21.05%), then blood group A (5.26%) and finally blood group AB (2.63%). Amongst the female subjects, the least bleeding time was found among blood group O individuals (40.0%), followed by blood group A (35.79%), then blood group B (15.79%) and finally blood group AB (0%). In both cases, it was therefore found that blood group O had the least bleeding time while blood group AB has the highest bleeding time.

A study was carried out by Manjeet *et al*., (2015), to assess the relationship between bleeding time and clotting time among various blood groups and to identify any gender difference among the same which made use of 150 MBBS students in the age group of 17– 20 years, found that bleeding time was prolonged (44 min) in maximum number of group O (22%) followed by group B (18%), group AB (5.9%), and group A (3.2%) but the difference was statistically insignificant (p= 0.509). Similarly clotting time was 46 min group B (14.8%) followed by group O (14.6%), group AB (11.76%), and group A (9.7%) but the difference was statistically insignificant (p= 0.885). Gender-wise, bleeding time was more prolonged in females (15.7%) than males (13.1%) but the difference was statistically insignificant (p= 0.236), similarly clotting time too was prolonged more in females (16.9%) than males (9.8%) but again the difference was statistically insignificant (p= 0.662). It was therefore concluded from the study that blood group B had the least bleeding time, followed by O, A, and AB. Bleeding time was prolonged 44 min in blood group O followed by B, AB, and A whereas clotting time was

prolonged 46 min in blood group B followed by O, AB, and A. Bleeding and clotting time were also found to be higher in females than males.

Studies have suggested that certain ABO blood groups may be associated with differences in bleeding time, potentially impacting the coagulation process and the risk of hemorrhagic events. For example, a study by Wu et al. (2018) in the journal Thrombosis Research indicated that ABO blood groups might influence the risk of both thrombotic and bleeding events, with specific blood types demonstrating varying tendencies towards these outcomes.

Regarding gender-specific differences, research has indicated that hormonal disparities between males and females could potentially influence bleeding time and other coagulation parameters differently based on sex.

Association between Clotting Time and Subjects' Blood Type

Table 5 above displays the relationship between clotting time and blood type of the studied subjects. Among the male subjects, it was found that blood group O subjects (42.11%) had the least clotting time (clotting time less than 5 minutes), followed by blood group B (28.95%), then blood group AB (3.95%) and finally blood group A (1.31%). Amongst the female subjects, the least clotting time was found among blood group O individuals (23.16%), with a clotting time less than 5 minutes, followed by blood group A (9.47%), then blood group B (6.31%) and finally blood group AB (0%). In both cases it was therefore found that blood group O had the least clotting time.

Some studies have suggested that certain ABO blood groups may be associated with variations in clotting time, potentially leading to differences in the risk of thrombotic events and bleeding disorders. For instance, research by Wu et al. (2018) in the journal Thrombosis Research indicated that the ABO blood group system might influence the risk of thrombosis, with non-O blood groups demonstrating a higher predisposition to thrombotic events. Similarly, the study by Franchini et al. (2007) in the journal of Blood Transfusion suggested that individuals with non-O blood types might have a higher risk of thrombosis and impaired fibrinolysis.

Regarding gender-specific differences, a study by Sode et al. (2013) published in the Journal of Thrombosis and haemostasis highlighted potential variations in clotting factors between males and females, indicating that hormonal differences could influence coagulation profiles differently based on gender.

CONCLUSION

The observed correlations between ABO blood groups and BMI imply a potential avenue for personalized health interventions, highlighting the importance of tailored dietary and lifestyle recommendations based on an individual's genetic predisposition. Moreover, the nuanced associations between ABO blood groups and gender underscore the need for further exploration into the underlying mechanisms contributing to sex-specific health disparities.

Furthermore, the intriguing links between ABO blood groups and bleeding time, as well as clotting time, signify the intricate role of blood type in hemostasis and coagulation processes. These findings have implications for clinical practice, emphasizing the importance of considering ABO blood groups in the management of bleeding disorders and thrombotic complications.

The prevalence of the ABO blood groups among the medical students of Niger Delta University in Bayelsa State as evaluated by the current study follows thus: O > B > A > AB.

Consent

The consent of the respondents was sought and obtained.

Ethical Approval

The ethical approval to carry out this work was sought for and obtained from the ethics and research committee of the University of Port Harcourt and preserved by the author(s).

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Competing interests

Authors have declared that no competing interests exist.

Authors' contributions

Author Ojeka, S.O, conceived the study, designed the protocol and contributed in the manuscript writing while author Dabirilagha, O.F coordinated the experiment, carried out the laboratory procedures. Finally, author Zabbey, V. Z performed the statistical analysis and data interpretation. All authors read through and approved the final manuscript.

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