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Review Article

COMPARATIVE RELATIONSHIP BETWEEN ABO,Rh BLOOD GROUP AND GENOTYPE AMONG INDIGENOUSE RESIDENTS OF OGBIA LOCAL GOVERNMENT AREA AND ENVIRONS IN BAYELSA STATE, NIGERIA

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Publication history: Received on 17/02/2021, Accepted on 16/03/2021, Published online 17/03/2021 ABSTRACT:

This study was aimed to investigate the ABO, Rhesus blood group and genotype among residents of Ogbia local government area and its environs in Bayelsa State, Nigeria. The study subjects comprise one thousand female and six hundred male subjects randomly selected. Three milligrams of blood through veni puncture were collected and introduce into EDTA sample bottles containing anticoagulant for the analysis of the parameters mentioned above using tile/tube method and electrophoresis. The analysis from the results obtained indicate a higher prevalence frequency of the O blood group in females(33.75%) and males ((16.75%).This was closely followed by A blood group (14.25%),(9.25%) and B being the next with (12.75%),(10%) with AB having the least prevalence of (1.75%) and (1.5%) among the female and male subjects respectively. However, the prevalence of female and male subjects with Rhesus factor negative was (2.5%) and (1.25%) Whereas Rhesus positive were (32.5%) and (15.5%).Furthermore, the prevalence of AA genotype among female and male subjects was (51.12\$),(26.63%) and (11.37%),(10.62) AS with (0.25%) SS being the least among them. We recommend public enlightenment campaign to acquaint female with Rh-ve of the danger of marrying a Rh+ve males if they have had abortion in the past and also the ugly trend of SS genotype.

KEYWORDS: Blood, ABO, Rhesus, Antigen, Antibodies, Genotype, Hemoglobin, RBC

INTRODUCTION

Blood is a vascular and a lifesaving tissue fluid that usually transport life sustaining gases such as oxygen, vital nutrients extracts from digested food, chemicals such as hormones to their target organs' and metabolic waste such as carbon dioxide from tissues to the respiratory airways through the effort of the power house of the cardiovascular system - the heart. It is characterized by either presence or absence of some particular antigens that attached to the surface of red blood cells membrane that produce antibodies for or against



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a particular blood type [1,2]. Karl Landsteiner cross test some blood samples with others during the twentieth century and observed a clear reaction i.e agglutination of the red blood cells while others shows no sign of clumping together within the cells. He concluded that due to the presence of an antigen in the membrane surface of red blood cells and the existence of antibody in the serum result in the agglutination [3]. Alfred Van Decastello and Adrian Sturdi discovered the AB that is the fourth type of blood group in 1902. However forty years later a breakthrough in the history of blood transfusion medicine was achieved by Landsteiner and Weiner who discovered the RhD antigen [4,5]. Since then more than thirty distinct blood groups have been discovered but the ABO and the Rhesus blood group remain the clinically most important. The antibodies in ABO blood group occurs naturally among subjects who have not undergo blood transfusion that does not correspond with their own blood group [6]. Exposure to RhD antigens during pregnancy and when transfused result in the build-up of antibodies by the mothers memory cells to cause massive disintegration of red blood cells when its bind to Red Blood Cells that are not compatible with its own, [7]. These substances-antigens are recognized as foreigners introduced into the body to trigger an immune response that produce antibodies i.e proteins formed from amino acid molecules held by peptide bond that will react with that antigen alone. The RhD gene usually build or read the D-antigen which are large molecular proteins found in the membranes of red blood cells. There are some humans who lacks the gene that produce the D antigen making the RhD protein to be absent in the surface membrane of their red blood cells.

However, the presence or absence of an inherited protein known as Rh^{+ve} or Rh^{-ve} within blood group defines blood group into eight different types such as A^{-ve} , A^{+ve} , B^{-ve} , B^{+ve} , O^{+ve} , O^{-ve} , etc [8]. Errors in blood grouping and poor testing for compatibility result in morbidity and increase in mortality rate among patients. This is because when patients received transfused blood their immune system will attack any red blood cell donors that contains any antigens that are different from their own self antigens. Hence it is of utmost important to know the exact antigens in red blood cells to be transfused in order to ascertain clearly if they correspond with that of the recipient antigens so as to prevent any transfusion reactions or complications that may lead to death [9].

MATERIALS AND METHODS

Location of study: Residents within Ogbia local Government area communities and its environs.

Sample of Study population: A sample size of one thousand females and six hundred males were randomly selected from communities within the local Government area and its environs for the study between 2018 and 2021 in Bayelsa state.

Data Analysis: The collected data's were statistically analyzed using Microsoft Excel version 2016 and a simple percentage calculation.

Genotype and the ABO blood group determination

Three milligrams of blood was collected through venipuncture and immediately introduced into Ethylenediamine-tetra acetic acid from the participants. The ABO and Rhesus blood group were determined using the tile/tube method with Anti A, Anti B, and Anti D IgD and IgM antisera's reagents manufactured by Lorne laboratories Ltd United Kingdom. A test indication of either A or B antigens on the red blood cells and in the Anti A or B serum was employ to confirm the accuracy of the grouping [10]. The genotype was determined using electrophoresis method and electrophoretic machine



United Kingdom as describe by Ochei and Kolhatkar 2000 and alkaline cellulose acetate in alkaline buffer of pH 8.7.

Informed consent and ethical approval: Inline with Helsinki declaration on biomedical research, consent was obtained from each prospective participant before they can be involve in the study. Each prospective participant was presented with a request for consent with explanation regarding the nature of the research and their questions were fully entertained, after which they voluntarily decided to participate. Also there was approval from the ministry of health and community leaders.

RESULTS

Out of the one thousand si hundred volunteer subjects, one thousand were females (62.5%) and six hundred males (37.5%) giving a ratio of 2:1 females and males that voluntarily participated in the study. The results are presented in tables and figure. **TABLE 1: ABO AND RHESUS BLOOD GROUP DISTRIBUTION AMONG**

Blood Group	Female	Male	Female	Male	Total Prevalence No (%)			
	Rh ^{-ve}	Rh^{+ve}	Rh ^{+ve}	Rh ^{-ve}	Female	Male		
	No (%)	No (%)	No (%)	No (%)				
Α	-	148 (9.25)	228 (14.25)	-	228(14.25)	148(9.25)		
В	16 (1)	156 (9.75)	188 (11.75)	4(0.25)	204(12.75)	160(10)		
AB	4 (0.25)	24 (1.5)	24(1.5)	-	28(1.75)	24(1.5)		
0	20 (1.25)	248 (15.5)	520(32.5)	20(1.25)	540(33.75)	248(16.75		
)		
Prevalence	40 (2.5)	576 (36)	960(60)	24(1.5)	1000(62.5)	600(37.5)		
(%)								

MALE AND FEMALE SUBJECTS

TABLE 2: Relationship between genotype in male and female subjects

Genotype	Female	Male	Total Prevalence No (%)				
	No (%)	No (%)					
AA	818 (51.12)	426(26.63)	1244(77.75)				
AS	182 (11.37)	170(10.62)	352(22)				
SS	-	4(0.25)	4(0.25)				
Prevalence (%)	1000 (62.5)	600 (37.5)	1600 (100)				

Table 3: Comparison of Blood group and genotype in male and female subjects



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	Female		Male		Female		Male		Female		Male		Female		Male		Prevalence
be	A.	A ^{+ve} No(A.	B ^{+ve}	B.	B ^{+ve} No(B.	B ^{+ve} No(AB-	AB ^{+ve}	AB ⁻	AB ^{+ve}	0.	O ^{+ve} No(0.	O ^{+ve} No	No (%)
for	""No(%	%)	^v ⁼No(No(%)	""No(%)	""No(%	%)	™No(%)	No(%)	""No(No(%)	"⁰No(%	%)	™No(%	(%)	
00)		%)		%))				%)))		
AA	-	184	-	114	12	160	-	114	4	19	-	12	17	422	16	170	1244
		(11.5)		(7.12)	(0.75)	(10)		(7.12)	(0.25)	(1.18)		(0.75)	(1.06)	(26.37)	(1)	(10.62)	(77.75)
AS	-	44	-	34	4	28	4	42	-	5	-	12	3	98	-	78	352
		(2.75)		(2.12)	(0.25)	(1.75)	(0.25)	(2.62)		(0.31)		(0.75)	(0.18)	(6.12)		(4.87)	(22)
SS																	4
	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	-	(0.25)
Total	-	228	-	148	16	188	4	156	4	24	-	24	20	520	20	248	1600
No(%)		(14.25)		(9.25)	(1)	(11.75)	(0.25)	(9.75)	(0.25)	(1.5)		(1.5)	(1.15)	(32.5)	(1.25)	(15.5)	(100)



ABO PHENOTYPE

Figure 1: Percentage Distribution of ABO Blood group

DISCUSSION

This study was done to ascertain the percentage number of male and female subjects ABO and Rhesus Factors indices among residents in Ogbia Local Government area and its environs in Bayelsa State. The results of the complex interplay and comparative study of the prevalence of the ABO and Rh blood group are tabulated in table 1-3 and figure 1 This study reveals a low prevalence of Rh-ve among the male and female subjects (1.5% and 2.5%) but The prevalent rate of Rh+ve in male and female subjects during this study was higher (36% and 60%) thus indicating a consistent agreement with Falusi et al (2000) [11] who observed a similar report from his ABO blood group research study in Nigeria ie 94.3% and 5.70% Rh+ve and Rh–ve respectively. The genotype known as the genes inherited from both parents chromosomes gives rise to an observable effect known as blood group or phenotype.

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However, the percentage number of female and male subjects with Blood group A and B was (14.25%, 9.25%) and (12.75%, 10%). Furthermore the prevalence of "AB" and "O" blood group among the female and male participants in the study was (1.75%, 1.5%) and (33.75%, 16.75%) respectively. The results so far shows a higher percentage of the participant having blood group "O", followed by blood group "A" and the least among them was the so called blood group AB. Our findings is consistent with the observation of Erhabor et al (2014) [12] who had 41.2% O, 27.6% A, 27.2% B and 6% AB blood group from his research study in a Sokoto state Nigeria. Adienbo et al (2010) [13].

Our results also conform to World Health Organization (2009) [14] percentage values of blood group O (49%), A (27%), B (20%) and AB (4%) among blacks in the United State of America. Though our study shows a slight difference in the male 'A' blood group and the 'B'.

In Rh-ve mothers, the amount of antibodies in the mothers circulation and type i.e. Igm, IgG etc determine their binding abilities to antigens that can result in a hemolytic disease of the new born also known as erythroblastosisfetalis. Sensitization of the mother's immune system occurs during the first exposure to an antigen of Rh+ve either through blood transfusion, delivery, miscarriage, abortion, complicated and prolonged labor etc. [15]. The results also show a percentage frequency of (51.12%) and (26.63%) genotype AA in female and male bringing a total prevalence of (77.75%) among the participants. The prevalence of "AS" genotype in females and males was (11.37) and (10.62%) making an overall prevalence of (22%) "AS" and (0.25%) "SS" among those who participated in the study. Onuoha et al (2015) [16] observed a prevalent rate of (1.3%) "SS" from his research subjects in Yenagoa Bayelsa State when compared with 1.5% in Rivers State. Akingbe et al (2009) [17] also observed a prevalence frequency of (0.54%)SS among his research participants in Ladoke University, Ogbomosho, Nigeria. Our study shows a slight decline in SS subjects among residents in Ogbia local government area and its environs in Bayelsa State. The dominance of the O blood group cannot be over emphasize and can thus contribute to the reduction in the formation of resettle by plasmodium falciparum [18]. . Our results regarding Rhesus D positive of (96%) from both sex group congruent with Christian et al (2020) [19] who observed (92.07%) Rhesus D-positive blood group among indigenes of Ogoni ethnic group in Rivers State Nigeria [20]. It is therefore imperative for all to know their genotype status before getting into marriage because individuals with sickle cell anemia suffers severe pains (crisis) in body parts such as humerus, tibia, ileum etc due to rapid breakdown of red blood cells that impede the Oxygen supply to tissues within the body since the tissues of the body does not have the potentials of storing oxygen they require constant supply of oxygen without interruption. This happens when the red blood cells loose the elastic nature within their membranes, become so rigid, and stocked up as they break apart within tight blood vessels such as capillaries etc.

CONCLUSION

The present study reveal a high prevalent frequency of the O (50.5%) blood group and (0.25%) SS genotype from the combined subjects that participated in the study. This research study provide a day light to both male and female subjects in the study region to avail themselves willingly for genetic counseling and testing before getting involve in marital life and contemplating having children.



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Conflicting Interest: Authors have declared non-existence of conflicting interest.

Author's contributions

This study was carried out in collaboration between all the authors. Author NCN and MSU wrote the protocol, draft and manage the experimental process. Author AAA Design the study. Author LBE and KBG Manage the literature search. Author MSU, NCN, AAA and LBG manage the pathophysiology. All authors read and approved the final manuscript.

REFERENCES

- 1. Denis M. Harmening (2018). Modern blood banking practices and transfusion practice.ISBN 9780803626829
- 2. Karl lansteiner, Weiner A.S (1940). An agglutination factor in human blood recognized by immune sera for rhesus blood.proc.soc. Exp. Biol.Med. 43-223-224
- 3. World Health Organization (2009). Safe blood and blood products: Geneva, Switzerland.
- 4. RO. Apercu, Edgar N Mulogo, Fred Bagenda, Andrew Biamungu (2016). ABO and Rhesus (D) blood group distribution among blood donors in rural south western Uganda; a retrospective study.DOI10.1186/s13104-016-2299-5
- 5. Eweidah M.H, Rahiman S (2011).Distribution of ABO and Rhesus (RhD) blood groups in Al-louf province of the Saudi Arabia. Anthropologist 13:99-102
- 6. Turgeon M.L. (2016). Linne and Ringsruds clinical Laboratory Science Concepts, procedures, and clinical application (7ed). Elsevier mostby ISBN 978-0-323-225458.
- 7. Jeffrey McCullough (2016). Transfusion Medicine. ISBN: 978-1-119-23652-8
- 8. Scott Frothingham (2019). What it means to have A Positive (A+) blood type https//www.Healthline.com/Authors
- 9. Laura Dean (2005).National center for biotechnology information,National library of medicine,National institute of health,Bethesda,MD20892-6510
- 10. J.Ochei, ArundhatiKolhatkar (2000). Medical laboratory science: Theory and practice ISBN 10:0074632239. Pub. Tbs New Delhi.
- 11. Falusi A.G, Ademowo O.G, Latunji C.A, Okeke A.C, Olatunji P.O, Onyenkwere T.O,JimmyE.O,Raji Y (2000).Distribution of ABO and Rh genes in Nigeria.Afr.J.Med.sci.29:23-6.
- OsaroOrhaborBabangida S, Festus UchechukuUniugwe, YakubuAduiraham (2014). ABO and Rhesu D blood groups distribution among student in UsmanDanfodiyo University Sokoto, North Western Nigeria 53 Emergen Med. 1 (2): 008.
- O.M. Adienbo, A. Nwafor, J.N.Egwurugwu, U.A Okon (2010). The distribution of ABO and Rhesus blood groups among indigenes of Ijaw ethnic group in Niger Delta Region Nigeria. Global Journal Of Pure And Applied Sciences Vol 16, NO. 3, 2010: 345-348
 - World Health Organization (2009). Safe blood and blood products: Geneva, Switzerland
- 14. Urbaniak S.J,Greiss M.A (2000).RhD hemolytic disease of the fetus and the new born blood Rev.14:44-61 PubMed PMID:10805260
- 15. OnuohaEC,EledoBO,YoungDedeEU,Agoro ES (2015).Distribution of ABO,Rhesus blood groups and hemoglobin variants among residents of Yenagoa and environs,Bayelsa State Nigeria. Adv.life sci.Tech.34:26-31
- 16. R.E Akingbe S.F Ige A.O Afolabi, O.M Azeez, G.J Adegunlola J.O Bamidele (2009) prevalence of hemoglobin variants ABO and Rhesus blood groups in LadoleAkintola University of technology Ogbomoso, Nigeria. Trends Med. Res 4(2):24-20.
- 17. A.T Anifowoshe, OllubukolaAbibatOwolodun, Kehined Monica AkinseyeOluyinkaAjibolaLyiola, BolajiFataiOyeyemi (2016) Gene frequencies of ABO and RH groups in Nigeria: a review. Egyptian Journal of medical human genetics. 205-210.

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- 18. S G.Christian, Evelyn MgbeomaEze Anthony ChijikeUzoanyaEzimahFiekumoIgbidaBuseri (2020). International Journal of research and reports in Hematology 3(1): 1-7.
- 19. Eze Evelyn M., Nubari Nekabari S. (2016). ABO/Rhesus blood groups and hemoglobin electrophoretic pattern among subjects of Ogoni land and Ikwere ethnic groups in River state. Sokoto Journal of Medical Laboratory Science 2 (4), 5-14.

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