

ABO AND RHESUS BLOOD GROUPS AND THEIR ASSOCIATION WITH TYPE II DIABETES MELLITUS AMONG THE URHOBOS

Abstract:

Typing of red blood cells is a prerequisite for blood transfusion. In 1901 the Austrian pathologist Karl Landsteiner classified blood types (A, B, AB and O) and discovered that they may be respectively distributed and transmitted by Ethnicity and Mendelian heredity. The goal of this study was to determine amongst the Urhobos, the possible association between the ABO/Rhesus blood groups and type II diabetes mellitus. To achieve this, a total of 410 (200 diabetic and 210 non-diabetic) subjects were randomly sourced within the Urhobos; ethnic nationalities in south-south geopolitical zone of Nigeria. Using syringe and EDTA, Blood samples were obtained from each subject for specific anti-sera test (anti-A, anti-B and anti-D). Using the chi-square test, statistical measure of association was performed on obtained data, with $p\text{-value} > 0.05$ adjudged as statistically significant. Upon careful observation, Study found no significant difference in the distribution of ABO blood group between Diabetics and Non-Diabetics (control) at $p > 0.05$. Apparently, while diabetics had less distribution of blood group A (as against control), Blood group AB was commoner in non-diabetics. These observations were however, not statistically significant at $p > 0.05$, as Blood groups B and O showed similar distribution in both groups respectively.

Keywords: Blood, Blood group, Diabetes Mellitus, urhobos

INTRODUCTION

There is now a formidable body of evidence to support the hypothesis that humans originated from Africa, and to inform the timescale of various migrations that have led to the world's population of today¹. Simply by overlaying the known distribution of blood group frequencies on the world map of human migrations, the potential significance of genetic drift and founder effects is apparent¹. Blood types do not just exist to create conversation between people; they actually have vital immunological functions. They help us fight diseases. A blood type (also called blood group) is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of the red blood cells (RBCs). These

antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the blood group system².

In recent times, strong evidences exist to suggest an association between ABO blood group and certain diseases^{3&4}. In peptic ulcer and gastric cancer for instance, Doll *et al* had reported an uneven distribution of the ABO blood groups between respective sufferers⁵. Similarly, the intricacies in the aetiology of Diabetes mellitus (DM), especially secondary DM, has prompted recent investigations and findings that links it with such conditions as chronic pancreatitis, total pancreatectomy, Cushing syndrome and Acromegaly⁶.

Diabetes Mellitus is old with man. Globally, there are different prevalent levels from country to country, race and ethnic groups. The International Diabetes Federation in its recent publication came up with prevalence and incidence values around different regions and countries of the world; with Nigeria showing 3.9% in its current database atlas.

Aim of Study

This study aimed at determining the association between type II diabetes mellitus and ABO/Rhesus blood groups among the Urhobos. Specifically, study attempted to determine:

- i. Blood groups of diabetic patients using ABO and Rhesus grouping systems.
- ii. Blood groups of normal subjects using ABO and Rhesus grouping systems.
- iii. The effect of gender on the relationship between type II diabetes mellitus and blood group (ABO and Rhesus).

Methodology

Study Area

Study was conducted at the Eku Baptist Government Hospital, Eku and Central Hospital, Ughelli, both in Delta State, Nigeria. Delta State is a 16,842/km² area of land that lies approximately between Longitude 5⁰ 00 and 6⁰ 45' East and Latitude 5⁰ 00 and 6⁰ 30' North

(National gazette, 2007). Within the state, the selected hospitals (aforementioned) are located in Ethiopia East and Ughelli North Local government areas; each with an estimated population size as 202,712 and 309, 484 respectively⁷.

Study Population

Study population was target at the Urhobos, an indigenous ethnic group of over 3million + who are major residents of the study area.

Study Design

A case study kind of research design, where in subjects' ABO blood group patterns (Type II Diabetics) were determined and compared with those of normal healthy (control) group.

Selection Criteria

Non-type II diabetics (DM) patients were excluded from the study. Selection also excluded non- Urhobos, as well as subjects whose age were below 25 years.

Resources and Sources

Humans

Using the simple random sampling technique, a total of four hundred and ten humans (410) were recruited from selected hospitals within the Study areas.

The decision to sample 410 humans was informed by the Slovin's statistical relation:

$$SS = \frac{Z^2 P \times (1 - P)}{C^2}$$

Where →

SS = Sample Size

Z = confidence level as z-score (95% = 1.96 from z-table)

P = Population proportion variance. (Maximal at 0.5 from binomial distribution table)

C = Confidence interval or margin of error (0.05).

Above relation⁸ returned a minimum of 384 samples for a minimal population size as 202,712, the towns under study.

Other Resources

Syringes, EDTAs, white tiles, and antisera (anti-A, anti-B and anti-D) reagents were used to obtain blood samples and conduct agglutination tests for sampled subjects. In each case, new syringe and/or EDTA were applied for each subject.

Protocol

Ethical Approval was sourced from the Research and Ethics Committee of the Faculty of Basic Medical Sciences, College of Health Sciences, Delta State University, Abraka, Delta State. Prior to actual investigation (test), formal consent for eligible subjects was also obtained without contempt.

Procedure

Using the simple random sampling technique, a total of 410 subjects were drawn (from the population) for the study. They comprised of 200 diabetics (male and female) and 210 non-diabetics (control); with non-diabetics accounting for 63 males and 147 females. For each subject, a syringe and needle were used to collect blood sample. Collected samples were then kept in an EDTA container to avoid quick coagulation. A white tile was then demarcated into four (4) with each quadrant containing a drop of the sampled blood. ABO blood grouping was done by agglutination test, using anti-A, anti-B, and anti-D human sera. Since gender differences have not been known to exist in the ABO blood group type, obtained samples (from both males and females) were pooled for the analysis.

Analytical Approach

Using Microsoft's Excel (version 14.0.4760.1000), Evaluation of collected data for statistical significance was made. Obtained data was for chi-square tests of independent variables, with P-values less than 0.05 adjudged as statistically significant.

Results

TABLE 1: Distribution of ABO blood group amongst diabetics and non-diabetics (control)

	A	B	AB	O	N	X²
Diabetics % (n)	15.50 (31)	24.00 (48)	4.00 (08)	56.0 (113)	200	7.140
Control % (n)	23.33 (49)	22.38 (47)	1.42 (03)	52.85 (111)	210	p > 0.05
Total Subjects	19.51 (80)	23.17 (95)	2.68 (11)	54.63 (224)	410	

Values are expressed as Mean of Percentage Distribution for Blood Groups. N = 410 = 200 Diabetics and 210 non-diabetics. Chi-square returned 7.140. Statistically, Distribution of blood groups between diabetics and control was insignificant at p>0.05.

TABLE 2: Distribution of Rhesus blood group in diabetics and non-diabetics (control)

	Rh⁺	Rh⁻	N	X²
Diabetics % (n)	96.50 (193)	3.50 (07)	200	0.000
Control % (n)	96.60 (203)	3.33 (07)	210	p > 0.05
Total Subjects	396	14	410	

Values are expressed as Mean of Percentage Distribution for Blood Rhesus. N = 410 = 200 Diabetics and 210 non-diabetics. Chi-square returned 0.000. Distribution of blood Rhesus between diabetics and control was statistically insignificant at p>0.05.

TABLE 3: Distribution of combined ABO and Rhesus positive blood group in diabetics and non-diabetics (control)

	A ⁺	B ⁺	AB ⁺	O ⁺	N	X ²
Diabetics % (n)	15.00 (30)	23.50 (47)	3.50 (7)	54.50(109)	193	4.518
Control % (n)	21.62 (46)	22.09(47)	1.41(3)	50.76(108)	204	
Total Subjects	76	14	10	217	397	p>0.05

Values are expressed as Mean of Percentage Distribution for Blood Group/Rhesus. N = 397 = 193 Diabetics and 204 non-diabetics. Lower percentage of Diabetics had A⁺ than control as data proved insignificant at p>0.05.

TABLE 4: Distribution of combined ABO and Rhesus negative blood group in diabetics and non-diabetics (control)

	A ⁻	B ⁻	AB ⁻	O ⁻	N	X ²
Diabetics % (n)	0.50 (01)	0.50 (01)	0.50 (01)	2.00(4)	7	3.000
Control % (n)	1.41 (03)	0.00(0)	0.00(0)	1.41(3)	6	
Total Subjects	76	14	10	217	13	p>0.05

Values are expressed as Mean of Percentage Distribution for Blood Group/Rhesus. N = 13 = 7 Diabetics and 6 non-diabetics. Chi-square returned 3.00,0 proving insignificant at p>0.05.

TABLE 5: Distribution of combined ABO and Rhesus negative blood group in Type II diabetic and non-diabetic (control) male and female

		A ⁻	B ⁻	AB ⁻	O ⁻	N	X ²
Diabetics % (n)	Male	0.50 (01)	0.00 (0)	0.00 (0)	1.00 (2)	3	10.651 p>0.05
	Female	0.00 (0)	0.50 (1)	0.50 (1)	0.50 (1)	3	
Control % (n)	Male	0.95 (02)	0.00 (0)	0.00(0)	0.48(1)	3	
	Female	1.43 (3)	0.00 (0)	0.00(0)	0.95(2)	5	
Total Subjects		6	1	1	6	14	

Values are expressed as Mean of Percentage Distribution for Blood Group/Rhesus negative. N = 14 = 6 Diabetics and 8 non-diabetics. Chi-square returned 10.651, proving insignificant at p>0.05.

TABLE 6: Distribution of combined ABO and Rhesus positive blood group in Type II diabetic and non-diabetic (control) male and female

		A ⁺	B ⁺	AB ⁺	O ⁺	N	X ²
Diabetics % (n)	Male	5.00 (10)	8.00 (16)	1.50 (3)	22.50 (45)	74	5.333 p>0.05
	Female	10.00 (20)	15.50 (31)	2.00 (4)	32.50 (65)	120	
Control % (n)	Male	6.67 (14)	6.67 (14)	0.48(1)	14.76(31)	60	
	Female	14.29 (30)	15.24 (32)	0.95(2)	37.14(78)	142	
Total Subjects		74	93	10	219	396	

Values are expressed as Mean of Percentage Distribution for Blood Group/Rhesus negative. N = 396 = 194 Diabetics and 202 non-diabetics. Chi-square returned 5.333, proving insignificant at p>0.05.

Discussion

This work associated the ABO/Rhesus blood group patterns and type II Diabetes Mellitus among the Urhobos. The Study found blood group O (54.63%)

as most prevalent, followed by groups B (23.17%), A (19.51%), and lastly, AB (2.68%). Apparently, this is similar to the findings of Odokuma, Okolo and Aloamaka (2007)⁹, who found corresponding predominance in similar order (O, B and AB). Current study also conforms to recent work in the Niger Delta, amongst the Benin ethnic group of Nigeria¹⁰.

Although the distribution of ABO blood groups varies from one population to the other, in most studies however, blood group O has also been reported as the predominant group. For example, amongst the Caucasians and Blacks in the United States, 47.0% and 46.0% prevalence was respectively reported¹¹.

This study also found that rhesus positive group was predominant in about 96.59% cases. This as well, is in agreement with some previously published works^{12, 13 & 14}.

For the combined ABO/Rh blood grouping, it was found that the most predominant group was O⁺, which accounted for 52.93%, B⁺ (22.93%), A⁺ (18.54%), AB⁺ (2.44%), O⁻ (1.70%), A⁻ (0.98%), and least being B⁻ and AB⁻ (0.24% each). This finding compares with that of Ladoke Akintola University, Ogbomoso¹⁵.

Diabetes Mellitus was observed to have occurred in all ABO/Rhesus blood groups. Many investigators have tried to identify a possible association between ABO & Rh blood groups and diabetes mellitus. The results have been variable, inconsistent and differed from one region to the other. Some people have identified an association (positive or negative) between blood groups and diabetes. But, there are studies where no association could be established. This study also revealed a lower percentage of blood group A among diabetic population as compared to control. This was however statistically insignificant as the rhesus

blood grouping pattern among diabetics and control was found to be of similar distribution.

In this study, it was also observed that there was a gender effect in the distribution of blood group in male and female diabetics as compared to control. This is consistent with the finding of Okon *et al*¹⁶, and could be due to hormonal differences in gender as in male and females.

The findings from this study could be due to the fact that blood grouping (ABO or Rhesus) is basically determined. Diabetes is a multi-factorial trait. The aetiology of diabetes mellitus is complex and appears to involve inter-actions of genetic, immunological and environmental factors¹⁷.

Societal Advantage of Study

This study will be helpful to physicians and haematologists in the management of their patients and early diagnosis of diabetes mellitus while able to pre-empt the possibility of occurrence. Study will also add to the plethora of related literatures for which subsequent investigations on the ethnic group studied (Urhobos) may have basis.

Conclusion

From this study, the predominant blood group in the Urhobo nation was found to be O, with least being AB. Rhesus positive blood group also came prevalent with O⁺ being the most predominant of the combined ABO/Rhesus blood groups.

Recommendations

With increasing urbanization of our rural communities and the attendant increase incidence of diabetes mellitus, it is recommended that more work be done on the association of diabetes mellitus and other factors so as to raise the index of suspicion and thus early detection and management.

References

1. Wells S. (2002): The Journey of Man: A Genetic Odyssey. Princeton, NJ: Princeton University Press.
2. Anthea M., Hopkins J., McLaughlin C.W., Johnson S., Warner M.Q., LaHart D., Wright J.D. (1993): Human Biology and Health. Englewood Cliffs, New Jersey, USA: Prentice Hall.
3. Garratty G. (1994): Do blood groups have a biological role? In Garratty G, ed. Immunology of transfusion medicine. New York Dekker, 201-255.
4. Reid M. E and Lomas-Francis C. (2004): The blood group antigen facts book. New York, Elsevier Academic, 70-71.
5. Doll R., Swynnerton B.F., Newell A.C. (2000): Observation on blood group distribution in peptic ulcer and gastric cancer. *Gut*, 1:31-35.
6. Gardner D. G (2011): Greenspan's basic & clinical endocrinology (9th ed.). New York: McGraw-Hill Medical. Pp 128 Chapter 17.
7. National Population commission, NPC . (2006) : Nigeria Censorship result
8. Araoye M.O (2003): Research Methodology with statistics for health and social sciences. 1st Ed. Nathedex publishers, Sawmill, Illorin; pp 117-121.
9. Odokuma E.I., Okolo A.C., Aloamaka P.C. (2007): Distribution of ABO and rhesus blood groups in Abraka, Delta State, Nigeria. *Niger J Physiol Sci.*; 22(1-2):89-91.
10. Ikponmwon D.O., Nwogoh B., Isoa M.E. (2012): Distribution of ABO and Rhesus D blood groups among the Benin ethnic group of southern Nigeria. *Nigerian Journal of Physiological Sciences* 23 (1-2):1-3.
11. Seeley R.R., Stephens T.D., Tate P. (1998): Anatomy and Physiology. 4th edition. The McGraw Hill companies, Inc. USA p. 1098.
12. Bakare A. A., Azeez M.A., Agbolade J.O. (2006): Gene frequencies of ABO and rhesus blood groups and haemoglobin variants in Ogbomoso, South-West Nigeria. *Afr. J. Biotech.*, 5(3), 224-229.

13. Adeyemo O. A., Soboyemo O. B. (2006): Frequency distribution of ABO, Rh Blood groups and blood genotypes among the cell biology genetic students of University of lagos, Nigeria. *Afr. J. Biotechnology.*, 5(22), 2062-2065.

14. Jerimiah Z. A. (2008): Abnormal variants, ABO, and Rh blood group among students of African descent in PortHarcourt, Nigeria. *African Health Sci.*, 6(3), 177-181.

15. Akhigbe R.E., Ige S. F., Afolabi A.O., Azeez O. M., Adegunlola G. J., Bamidele J. O. (2009): Prevalence of haemoglobin variants, ABO and Rhesus blood groups in Ladoke Akintola University of Technology, Ogbomoso, Nigeria. *Trends in Med Res.*, 4(2), 24-29.

16. Okon U. A., Antai A. B., Osim E.E., Ita S.O. (2008): The relative incidence of diabetes mellitus in ABO/Rhesus blood groups in Southern-Eastern Nigeria. *Niger J Physiol Sci.*; 23(1,2):1-3.;23:1-3.

17. Ehoe J. M., Zimmet P., and Williams R. (2001): The epidemiology of Diabetes Mellitus: An International Perspective. John Wiley, Chichester.