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Full Length Research Paper

Morphogenetic traits combination pattern amongst the population of Ekpoma, Nigeria: Focus on tongue rolling, ear lobe attachment, blood groups and genotypes

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The ABO and Rh blood groups are among the most important blood group systems inherited variably amongst populations with different genotypes (AA, AS and SS). On the other hand, those who cannot roll their tongue or have a free hanging ear lobe are said to be recessive and dominant for the traits, respectively. Indeed, there are growing concerns in genetic epidemiology that many findings are failing to replicate because many of the claimed associations are false positive and these false positives are seen because of our inability to study many genetic variants in relation to many disease outcomes without knowing the precise bio-cultural background of the groups being studied. This study is therefore a preliminary attempt to determine the pattern of combinations between these morphogenetic traits amongst 193 residents of Ekpoma, Nigeria, whose tongue rolling, earlobe attachment, blood group and genotype status were determined. The results suggest that certain morphogenetic traits combinations might be rare. Although seemingly ambitious, it is our believe that such results may one day play a role in 'predictive human screening' like the preliminary screening process for an emergency blood donation and transfusion, especially the rare blood types.

Key words: Morphogenetic traits, tongue rolling, ear lobe attachment, blood groups.

INTRODUCTION

Individual's genotype (AA or AS or SS) and blood group (A, B, AB, and O/ Rhesus factor [Rh^+ and Rh^-]) differ amongst the world's population (Seeley et al., 1998; Pramanik and Pramanik, 2000; Das and Sengupta, 2001; Mawuangi, 1999; Omotade et al., 1999; Bhalti and Amin, 1996; Nwafor and Banigo, 2001). Interestingly, it was the description of the ABO blood group in 1900 by Karl Landsteiner that signalled the beginning of blood banking and transfusion medicine (Ali et al., 2005). Significantly, the ABO and Rh blood groups are among the most important blood groups (Seeley et al., 1998) and even after 100 years, the single most important test performed in blood banking services is the determination of ABO blood groups to avoid morbidity and mortality (Honig and Bore, 1980).

Of interest however, is the fact that genetic mechanism on morphogenetic traits is still not clearly understood as it is seen to occur with variable frequency in different populations and thus useful in evaluating and analysing evolutionary forces and classification as well (Das and Sengupta, 2003). In fact, population diversity provides a unique opportunity to study the morphogenetic variation among the endogamous populations living in different geographical and ecological conditions (Bhasin and Khanna, 1994). Indeed, marked inter-individual variability in genetic and non-genetic factors has been said to posses that ability to influence the disposition of many endobiotics and xenobiotics affecting health (Lamba et al., 2002).

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However, efforts to identify key genes influencing multi-factoral complex phenotypes such as many of the psychiatric disorders continue to be less than satisfactory (Inoue and Lupski, 2003; Van de Bree and Owen, 2003). On one hand, scientists are beginning to understand how genes interact with each other and with environmental factors in ways that impact on health (Xu et al., 2001) while on the other, there is a growing sense in genetic epidemiology that many findings are failing to replicate, because many of the claimed associations are false positive and these false positives are seen because of our inability to study many genetic variants in relation to many disease outcomes without knowing the precise bio-cultural background of the groups being studied (Cardon and Bell, 2001; Colhoun et al., 2003).

In this study therefore, a preliminary attempt is made to determine the possible combination patterns between morphogenetic traits (ABO blood groups, Rhesus factor, tongue rolling, and attached earlobe), amongst the population of Ekpoma, Edo State, Nigeria.

MATERIALS AND METHOD

Study area and population

This study was carried out in Ekpoma, the administrative headquarters of Esan West Local Government area of Edo State. It lies between latitude 60 40^0N and 60 45^0N longitude 60 05^0E and 60 10^0 (Obabori et al., 2006). The inhabitants of Ekpoma speak the language known as 'Esan' and are predominantly farmers whose main produce are rice and cassava. However, the study population comprised one hundred and ninety three men and women (193) who were randomly selected amongst the native and the non-native residents of Ekpoma.

Data/sample analysis

The ear lobe attachment and tongue rolling status of the study population were determined by physical examination. For tongue rolling, a person was classified as positive (+) or negative (-) depending upon his/her ability to turn up the lateral edges of the tongue as described by Sturtevant (1940).

Relying on informed consent, blood samples were obtained from the study population that was willing to know their blood groups and genotype status. Blood sample collections were by veni-puncture using disposable syringes and then stored temporarily in refrigerated heparanised containers pending laboratory determination of genotype and blood group types. The laboratory analysis of the blood samples collected from the study population was done at Blossom Medical Laboratory, Uromi, Edo State, Nigeria.

For the heamoglobin genotype test, the cells were washed 2 to 3 times in a test tube containing normal saline after which a drop of the washed cells was placed on a tile. This is followed by the haemolysis of the blood on the tile and the placement of the AS and AA control. With an applicator stick, the controls AA test and control AS in that order were placed on a cellulose acetate paper. After making sure that the Tris buffer inside the electophoresis tank covered the electrode, the cellulose acetate paper carrying the test and controls was then placed in the tank. At this point, the tank is covered and the mains (current) switched on. After 5 – 10 min, the reading was taken and recorded.

For the blood group and rhesus (Rh) test, the tile technique was used. This was done by preparing a 10% cell suspension followed by the addition of one volume of cells and sera. This was then mixed well and the tile rocked. The mixing process was performed with the aid of a wooden stick rocker. After 5 min, the reading was taken and recorded.

RESULTS

The distribution of morphogenetic traits amongst the study population showed that a higher percentage of the population (123; 63.73%) were in the class of individuals with blood group O, while those with blood group A, B and AB numbered 34 (17.62%), 32 (16.58%) and 4 (2.07%), respectively (Table 1). Deductively therefore, those with blood group AB were the least while those with blood group A and B numerically followed those of blood group O in that order, respectively. On the other hand, it was observed that a higher percentage of the population (188; 97.41%) were rhesus positive while a lower percentage of the population (5; 2.59%) were rhesus negative (Table 1). Also, a higher percentage of the population (145; 75.13%) were in the class of individuals with genotype AA while the rest of the population (48; 24.87%) were in the class of individuals with genotype AS. None in the population under study were in the class of individuals with genotype SS (Table 1).

On the distribution of the population with the ability or inability to roll the tongue and the presence or absence of an attached ear lobe, it was observed that a higher percentage of the population (100; 51.81%) could roll their tongue while a lower percentage of the population (93; 48.19%) could not (Table 1). Similarly, a higher percentage of the population (132; 63.39%) did not present an attached earlobe while a lower percentage of the population (61; 31.61%) had attached ear lobes (Table 1).

On the possible morphogenetic traits combination patterns, the study population were subdivided into different classes: (i) can roll the tongue (CRT) and have attached earlobe (AEL) with either genotype AA or AS and with either blood type A, B, AB and O; (ii) can roll the tongue (CRT) and do not have attached earlobe (uAEL) with either genotype AA or AS and with either blood type A, B, AB and O; (iii) cannot roll the tongue (cRT) and have attached earlobe (AEL) with either genotype AA or AS and with either blood type A, B, AB and O; and (iv) cannot roll the tongue (cRT) and do not have attached earlobe (uAEL) with either genotype AA or AS and with either blood type A, B, AB and O (Table 2). None in the population presented the morphogenetic combinations: CRT + AEL + Rh^- and CRT + uAEL + Rh^- irrespective of the blood group or genotype and so might be a rare combination pattern (Table 2). Except for individuals with blood group O and genotype AA, none in the population presented the morphogenetic combination: CRT + AEL + Rh^+; cRT + uAEL + Rh^+ and cRT + uAEL + Rh^-. Again, these might be rare combination patterns amongst the study population (Table 2). However, individuals with cha-

Table 1. Distribution of morphogenetic traits amongst the population under study.

Morphogenetic traits		Number	Percentage (%)
Blood Group	A	34	17.62
	B	32	16.58
	AB	4	2.07
	O	123	63.73
	Total	**193**	**100**
Genotype	AA	145	75.13
	AS	48	24.87
	SS	0	0
	Total	**193**	**100**
Rhesus	Positive	188	97.41
	Negative	5	2.59
	Total	**193**	**100**
Tongue Rolling	Can	100	51.81
	Cannot	93	48.19
	Total	**193**	**100**
Ear lobe attachment	Present	61	31.61
	Absent	143	63.39
	Total	**193**	**100**

Table 2. Population size with different combination of phenotypic traits.

*A^+		*A^-		*B^+		*B^-		*AB^+		*AB^-		*O^+		*O^-		>*Blood Groups
**AA	AS	AA	AS	AA	AS	AA	AS	AA	AS	AA	AS	AA	AS	AA	AS	>**Genotypes
Number of individuals with different Morphogenetic trait combinations																>***Alternate traits combination pattern
***0	0	0	0	0	0	0	0	0	0	0	0	4	1	0	0	>***CRT + AEL
2	2	0	1	0	3	0	0	0	0	0	0	10	0	0	1	>***CRT + uAEL
0	0	0	0	0	0	0	0	0	0	0	0	3	0	8	0	>***cRT + AEL
1	0	0	0	1	1	0	0	0	0	0	0	15	4	0	1	>***cRT + uAEL

A^+, A^-, B^+, B^-, AB^+, AB^-, O^+, O^- = Blood groups with rhesus positive and negative, respectively; CRT = can roll the tongue; cRT = can not roll the tongue; AEL = have attached earlobe; uAEL = do not have attached earlobes; AA and AS = Genotypes.
>* = Blood groups; >**genotypes; >***alternate traits combination pattern.

racteristic trait combination of CRT + uAEL + Rh^+ with blood group A and either genotype AA or AS were in the ratio of 1:1 (Table 2).

For the characteristic trait combination CRT + uAEL + Rh^+, there were no individual with blood group B and genotype AA in the class but those with blood group B and genotype AS were encountered in the study (Table 2). Individuals in this class with blood group O were encountered irrespective of their genotype although those with genotype AA were higher. Those with blood group AB, irrespective of the genotype, were not encountered indicating none existence in the study population and so might be a rare possibility (Table 2). Only individuals with genotype AS and either blood group A or O, presented the characteristic traits combination: CRT + uAEL + Rh^- (Table 2).

About those within the class cRT + uAEL + Rh^+, it was observed that the individuals with blood group B irrespective of the genotype (AA or AS) were in the ratio of 1:1. Those with blood group A but genotype AS were none existent as compared to those with the same blood group but with genotype AA. Those with blood group O and genotype AA in comparison with their counterparts with genotype AS were however observed to be in the approximate ratio of 4:1 (Table 2). Finally, there was a zero computation for individuals with blood group AB as evident in all the classes (Table 2; Figures 1- 4). Also, the highest population of individuals with blood group O^+ (15) were observed in the class AA + cRT + uAEL+ Rh^+ irrespective of the genotype (see Figures 1 - 4). Only

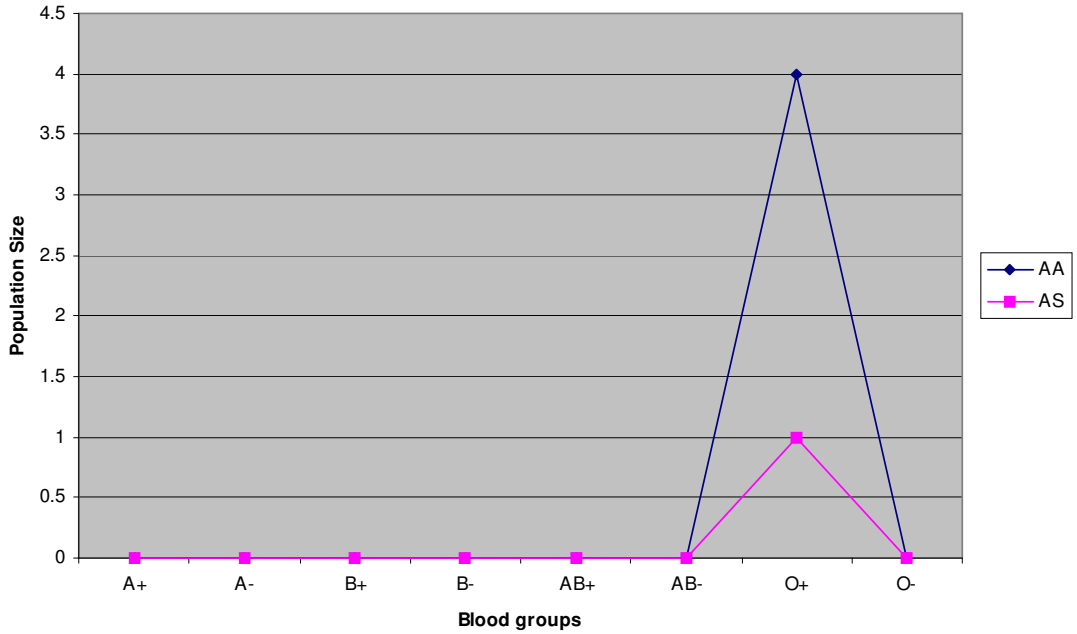

Figure 1. Individuals with different blood groups and genotype but with the same morphogenetic traits combination (CRT + AEL).

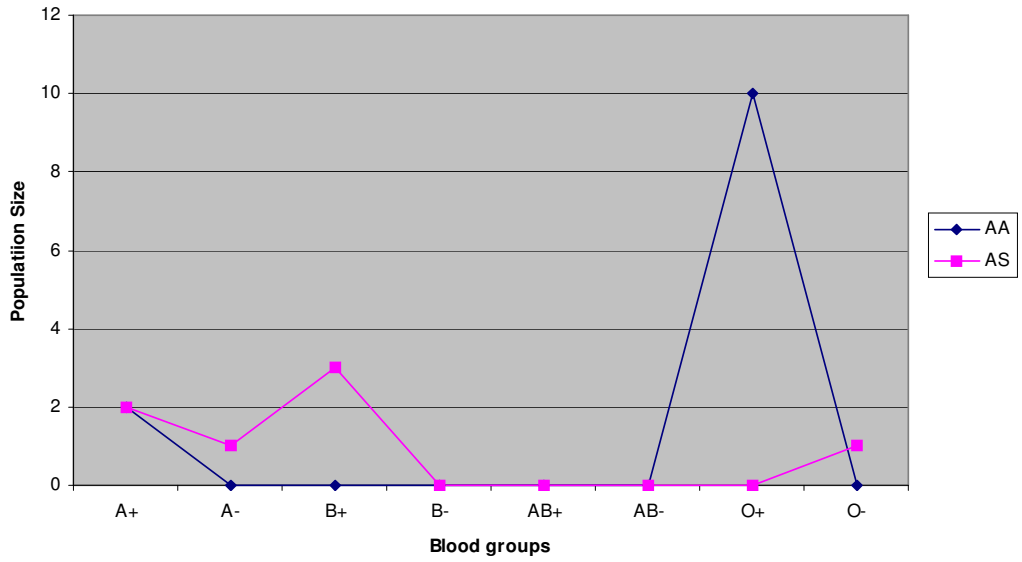

Figure 2. Individuals with different blood groups and genotype but with the same morphogenetic traits combination (CRT + uAEL).

those with blood group O^+ and genotype AA were represented in all the classes (Table 2 and Figures 1 - 4) while in the class AA + cRT + AEL+ Rh^-, those with blood O and Rh negative were the highest (8) (Table 2 and Figure 3).

DISCUSSION

On the distribution of the population based on genotype, the result of this study is in line with the reports by Nwafor and Banigo (2001) and Reid and Famodu (1988) as cited in Adeyemo and Soboyejo (2006). Similarly, the findings of this study on the distribution of blood groups are in line with the findings by Adeyemo and Soboyejo (2006) in a study involving 150 students of the University of Lagos. They reported that the frequency of blood group O was the highest, followed by blood group A, and then B, while the least was amongst the individuals with blood group AB. Similar proportions were also recorded in Oyo state, Nigeria, in a study by Bakare et al. (2006). Interestingly,

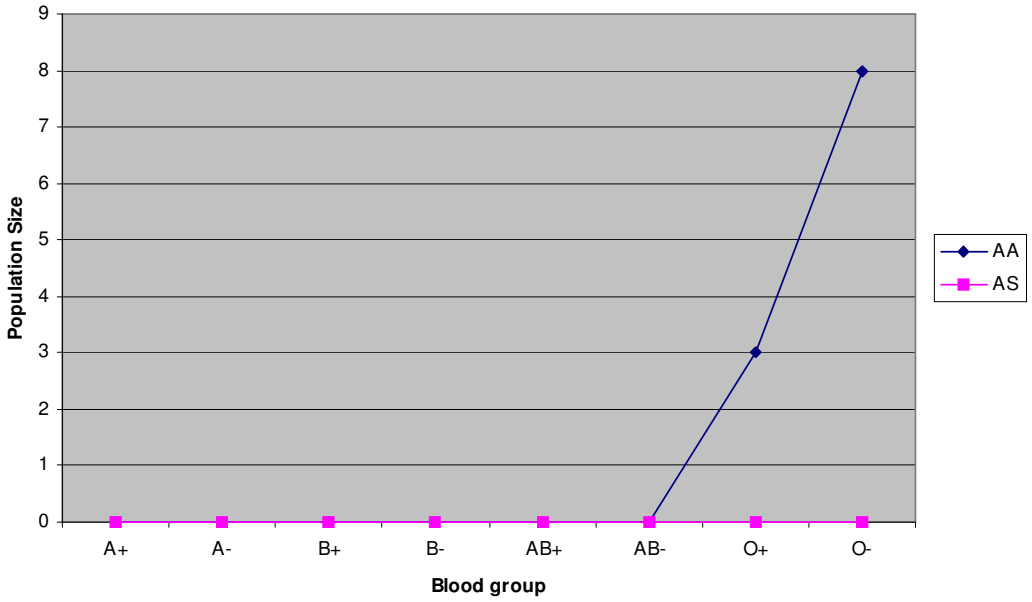

Figure 3. Individuals with different blood groups and genotype but with the same morphogenetic traits combination (cRT +AEL).

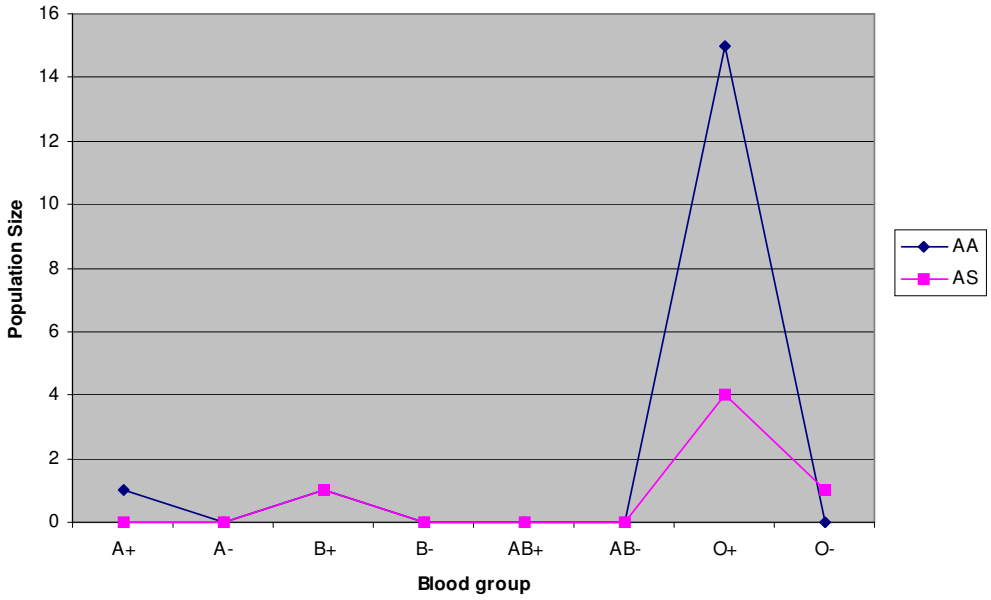

Figure 4. Individuals with different blood groups and genotype but with the same morphogenetic traits combination (cRT + uAEL).

the findings on blood group O is supported by Shandilya (2008) who stated that blood group O positive has been found to be the most common blood group. However, another significant aspect of this study is the attempt to classify the study population based on the possible combination pattern of blood types (A, B, AB, O, Rh+ and Rh-) with genotype, ability or inability to roll the tongue and the presence or absence of an attached earlobe. In this regard, the results showed that certain morpho-genetic traits combination patterns were not represented in the population thereby suggesting that such combinations may be rare and hence, become an important phenomenon that requires consideration in human variation (Table 2 and Figures 1 – 4).

Although it may appear like an ambitious projection, it is our belief that the results from this kind of study may one day play an important role in 'predictive human screening' for clinical purposes; for instance, the prelimi-

nary screening for emergency blood donation and transfusion. The findings of this study therefore serve as one of such contribution on Nigerians.

REFERENCES

Ali N, Anwar M, Bhalti FA, Nadeem M, Nadeem A, Ali M (2005). Frequency of ABO and Rh blood groups in major ethnic groups and casts of Pakistan. Pak. J. Med. Sci. 21: 26-29.

Bakare AA, Azeez MA, Agbolade JO (2006). Gene frequencies of ABO frequencies of ABO and rhesus blood groups and haemoglobin variants in Ogbomoso, south-west Nigeria. Afr. J. Biotechnol. 5(3): 224-229.

Bhasin MK, Khanna A (1994). Study o f behavioural traits among nine population groups of Jammu and Kashmir. J. Hum. Ecol. 5: 131-134.

Bhalti FA, Amin S (1996). Spectrum of ABO and D blood groups of donors at Rawalpindi/Islamabad. Pak. J. Pathol. 7(2): 26-28.

Cardon LR, Bell JI (2001). Association study designs for complex diseases. Nat. Rev. Genet. 2: 91-99.

Colhoun HM, McKeigue PM, Davey SG (2003). Problems of reporting genetic associations with complex outcomes. Lancet. 361: 865-72.

Das B, Sengupta S (2003). A Note on Some Morphogenetic Variables among the Sonowal Kacharis of Assam. Anthropologist 5(3): 211-212.

Honig CL, Bore JR (1980). Transfusion associated fatalities: a review of Bureau of Biologic reports 1976 – 1978. Transfusion, 20: 653-661.

Inoue K, Lupski JR (2003). Genetics and genomics of behavioral and psychiatric disorders. Curr. Opin. Genet. Dev. 13: 303-309.

Lamba JK, Lin YS, Thummel K, Daly A, Watkins PB, Strom S, Zhang J, Schuetz EG (2002). Common allelic variants of cytochrome P4503A4 and their prevalence in different populations. Pharmacogenetics. 12: 121-32.

Mawuangi J (1999). Blood group distribution in an urban population of patient targeted blood donors. East Afr. Med. J. 76(11): 615-618.

Nwafor A, Banigo BM (2001). A comparison of measured and predicted state, Niger. J. Appl. Sci. Environ. Manage. 5(1): 79-81.

Obabori AO, Ebosele R, Mokidi SK (2006). Decay problems in Cities: Renewal Options. JABS*;* 4(1 and 2): 144-153.

Omotade OO, Adeyemo AA, Kayode CM, Falade SL, Ikpeme S (1999). Gene frequencies of ABO and Rh (D) blood group alleles in a healthy infant population in Ibadan, Niger. West Afr. J. Med. 18: 294-297.

Pramanik T, Pramanik S (2000). Distribution of ABO and Rh blood groups in Nepalese students: a report. Eastern Mediterranean Health J. 6(1): 156-158.

Seeley RR, Stephens TD, Tate P (1998). Anatomy and Physiology. 4th edition. The McGraw Hill Companies, Inc. USA p. 1098.

Shandilya R (2008). Rare Blood Types. Retrieved 20th March, 2000 from Buzzle.com http://www.buzzle.com/authors.asp?author=12177.

Sturtevant AH (1940). A new inherited characters in man: Tongue rolling. Proceed. Natl. Acad. Sci. V.S. 26: 100-102.

Van de Bree MB, Owen MJ (2003). The future of psychiatric genetics. Ann. Med. 35: 122-134.

Xu J, Meyers DA, Ober C, Blumenthal MN, Mellen B, Barnes KC, King RA, Lester LA, Howard TD, Solway J, Langefeld CD, Beaty TH, Rich SS, Bleecker ER, Cox NJ (2001). Collaborative Study on the Genetics of Asthma. Am. J. Hum. Genet. 68: 1437-1446.