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RESEARCH ARTICLE

GENETIC AND MORPHOLOGICAL TRAITS AMONG THE BINIS

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ABSTRACT

The objective of this study is to determine the distribution of genetic and morphological traits among the Binis, an ethnic group in the Southern part of Nigeria. Genetic and morphological traits studied include blood group and rhesus factor, tongue rolling and tongue folding, widows peak, facial dimple, earwax type, earlobe attachment and tooth occlusion pattern. A total of 250 Binis between the age of 15 and 44 (male and female) were used for this research. Data was collected by physical observation and examination. The result showed that no significant gender difference exist in the distribution of morphogenetic traits except for tongue folding. Findings from the study will be useful in clinical practice, emergency cases and in forensic medicine.

INTRODUCTION

Morphological traits are measurable characteristics of individual organisms. This includes aspects of the outward appearance (shape, structure, colour, and pattern) as well as the form and structure of the internal parts like bones and organs. ABO and rhesus blood groups are known to be clinically very important (Khan *et al*., 2009). Landsteiner first described the ABO blood group in 1900 and it served the beginning of a blood banking and transfusion medicine (Ali *et al*., 2005). Individuals are divided into four major blood groups namely A, B, AB and O groups depending on the antigen present on their red blood cells. Type A blood have type A antigens and type B antibodies while type B blood has type B antigens and type A antibodies. Blood type AB has both A and B antigens and none of their antibodies while type O blood has neither A nor B antigens but both A and B antibodies (Adeyemo and Soboyejo, 2006). The human red cells that carry antigen D are referred to as rhesus positive (Rh^+) while those without it are rhesus negative (Rh^-) (Bakare *et al*., 2006). This antigen is immunogenic, inducing an immune response in 80% of D negative individuals when transfused with D-positive blood. It is also the major cause of hemolytic disease of newborns (Egesie *et al*., 2008). Generally only a few percentages of humans are rhesus negative. This condition has been reported to be 5.5% in South India. 5% in Nairobi. 4.8% in Nigeria and 7.7% in Rawalpindi (Adeyemo and Soboyejo, 2006). The dominant gene is responsible for folding and rolling of the tongue lateral edges while the inability to roll and fold the tongue is associated with the recessive gene. Some other researchers have opined that these traits are not genetically controlled but learned. These traits are of enormous value from physical anthropological window especially in studying population variation and human diversity (Odokuma *et al*., 2008). Dimples are small visible indentations on the surface of the skin. They may appear on various parts of the body like the cheek. Dimples tend to accentuate a smile, thus increasing the perception of attractiveness, sociability and facial beauty (Omotoso *et al*., 2010). Dimples on cheek enhance facial beauty and expression. They occur with no particular preponderance, may express unilaterally or bilaterally and are genetically inherited as a dominant trait (Pentozos *et al*., 2004). Widow's peak refers to the descending v-shaped point at the middle of the heads hairline just above the forehead of some individuals (Nwaopara *et al*., 2009).

Widow's peak is a dominant inherited trait and typically doesn't skip generations. There are varying degrees of the peaks. People who do not have widows peak have a hairline that run straight across (Dougherty, 2007). Earwax is a normal product of the ear which protects the skin of the ear from water and infection. Earwax is formed from wax glands in the external ear canal as well as other component such as dead skin, sweat and oil. The primary component of earwax is Keratin (derived from dead skin). Earwax thus differs slightly from cerumen which is the secretory product of the ceruminous gland in the external auditory canal (Hawke, 2002). Different individuals vary considerably in the amount and constituency of their earwax. There are two types described, wet and dry, which are inherited. Dry wax is common in Asia, while wet wax is common in Western Europe. Dry wax also known as

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"rice-bran wax" contain by weight about 20% lipid (fat). Oddly enough, rice-bran wax is associated with a lower incidence of breast cancer (Hawke, 2002). Wet wax consists of approximately 50% lipid (Burkhart *et al*., 2000). Wet wax can be either soft or hard, the hard wax being more likely to be impacted. While earwax is generally simply felt to be a nuisance, in medieval times, earwax was used as a component of pigment for illumination of manuscripts (Petrakis, 2000). Earlobes can be classified into two categories namely free and attached with the allele for free earlobes being dominant. Free earlobes are those that hang below the point of attachment to the head. Attached earlobes are attached directly to the side of the head (Nwaopara *et al*., 2008). Eveleth in 1972 classified tooth occlusion into four models which include; Edge to edge bite, Mild overbite, severe overbite and Negative overbite. Normally, when viewed from the facial approximately, the incisal thirds of mandibular incisors are covered by the vertical overlap of maxillary incisors. The amount of vertical overlap is called overbite. When this overbite is more than three millimeters where the maxillary incisors overlap the mandibular incisors, it is referred to as severe overbite (Schied, 2007). When the incisors have no vertical overlap, the result may be an edge to edge relationship where there is space between the incisal edges (Scheid, 2007).

Bulliyya (2003) carried out a study on anthropogenetic traits such as tongue rolling and tongue folding of the Vannekula Kshatriya Caste population of Andra Pradesh in a sample of 125 male and 90 female subjects aged over 20 years. The frequency distribution of tongue rollers and tongue folders is lower than non-rollers and non-folders. The proportions of rollers and folders among males are much less than their female counterparts. These traits fail to establish statistically significant bisexual variation. Singh and Sengupta (2004) conducted anthroposcopic study on some morphogenetic and behavioural traits among the Assamese Sikhs. The result showed that Assamese Sikh has the highest frequency of group O (37.5%) followed by group A (29.8%), group B (24.04%) and group AB (8.65%) respectively. Of the 104 individuals tested, 7 were found to be Rh negative, giving a frequency of 6.73% for phenotype. Dry/flaky cerumen is highly frequent in the males (61.54%), while the wet or waxy type predominates in females (55.77%). The frequency of free earlobes (83.65%) is higher than attached earlobe (16.35%). In females, frequency of free earlobe show relatively higher incidence (90.38%) than in the males (76.92%). The frequency of mild overbite type of tooth occlusion is found to be the highest (males 44.90 %, females 54.00%) which is closely followed by edge to edge bite (male 36.73%, females 32.0%). The incidence of negative overbite is observed more in males (16.33%) than females (10.00%). The severe overbite type is rare among them (male 2.04%, female 4.00%). Adeyemo and Soboyejo (2006) carried out a study to determine the frequency of distribution of ABO, RH blood groups and blood genotypes among the Cell Biology and Genetics students of University of Lagos, Nigeria. 150 students were randomly selected among the students and tested. This consisted of 97 Females and 53 males between ages 16 and 25. The result showed that blood group O was the highest with the percentage frequency of 55.3%, followed by blood group A (25.3%), B (16.7%) and the least percentage frequency was blood group AB which is 2.7%. The total percentage of Rh D positive was 94% and that of Rh D negative was found to be 6%. They concluded that this information is useful for medical diagnosis, genetic information, and genetic counseling and also for the general well being of individuals.

Pearson (2006) carried out anthroposcopic study of facial dimples on dimples that are present even when the face is at rest. After a few weeks, the dimples became less evident while at rest and deepen with smiling. About 380 healthy white Italians between the ages of 7-35years were studied. Egesie *et al*. (2008) conducted a study to determine the distribution of ABO and Rhesus blood groups among 200 registered undergraduate students of Niger Delta University, Bayelsa State, Nigeria randomly selected. This consisted of 124 males and 76 females between ages 16 and 26. The result showed that blood group O had the highest percentage distribution of 49% followed by blood group A and B with 22% respectively and the least percentage distribution was blood group AB which is 7%. Rh D positive rate was 98% and that of Rh D negative was found to be 2%. Odokuma *et al*. (2008) studied tongue rolling and tongue folding traits amongst unrelated volunteer students of Delta State University, Nigeria who were all of Urhobo tribe (71 males) and (72 females) aged between 18 years and over. The result showed that the incidence and distribution of tongue rolling and tongue folding trait was relatively higher in females than their male counterparts and they concluded that no significant difference exist between gender and tongue movement. Nwaopara *et al*. (2008) carried out a study to determine the pattern of combination between these morphogenetic traits amongst 193 residents of Ekpoma, Nigeria, whose tongue rolling, blood group and genotype status were determined. The result suggested that certain morphogenetic trait combinations might be rare and also play role in predictive human screening like the preliminary screening process for emergency blood donation and transfusion especially the rare blood types. Nusbaum and Fuentefria (2009) looked at 360 women in hair salons and concluded that 81% of them had a widow's peak.

A recent study done by Omotoso *et al*. (2010) among the Yoruba population of south-western Nigeria studied the prevalence of facial dimple. 500 south-western Nigerians, comprising 250 females and 250 males were observed for the presence of co-existing cheek and chin dimples, by means of physical examination and structured questionnaire. The result showed that only 36(7.2%) of the 500 respondents had both cheek and chin dimples co-existing in the same individual, out of which 22(4.4%) were females and the remaining 14 people (2.8%) were males. Most people with facial dimples had bilateral cheek dimples. More than one-fifth of the population had only cheek dimple(s), while eighteen (18) respondents had only chin dimple trait. They concluded that the incidence of facial dimples differ from population to population. Ohashi *et al*. (2011) used patterns of variation at two nearby microsatellite loci and established that the allele for dry earwax originated as a new mutation about 2000 generations ago and has spread due to natural selection, with dry earwax individuals having a relative fitness about one percent higher than wet earwax individuals.

Although several populations have been investigated, very little data exist among the Binis, an ethnic group in the South of Nigeria, hence this study was done to determine the distribution of morphogenetic traits; blood group and rhesus factor, tongue rolling and tongue folding, earwax type, widows peak, dimples and tooth occlusion pattern among the Binis.

MATERIALS AND METHODS

This study was conducted among the Binis between the ages of 15 and 44years both male and female. Parameters examined are blood group and Rhesus factor, tongue rolling and tongue folding, dimples, earlobe attachment, widow's peak, earwax type and tooth occlusion pattern.

The sample size used for this research work is 250 and it was calculated using the formula;

$$n=\frac{z^2\times p\times(1-p)}{c^2}$$

Where n=sample size
p=percentage of population picking a choice expressed as decimal
c=confidence interval expressed as decimal
z=z value (e.g 1.96 for 95% confidence level)

$$n=\frac{1.96^2\times 0.2\times(1-0.2)}{0.052}=245.86=246.=250$$

Multi-stage sampling technique was used. The simple random sampling technique was used to select the Bini ethnic group. The stratified sampling technique was used to classify them into males and females.

Relying on informed consent, blood samples were collected from each of the subjects via venipuncture by the use of disposable syringes and taken to the laboratory for the blood group and rhesus test. A drop of blood from each subject was placed on a clean white tile in three places. Then a drop of each of the antisera, anti A, anti B and anti D was added and mixed with each blood sample, with the aid of glass rods. Blood groups were determined on the basis of agglutination and recorded. Tooth occlusion pattern was classified following Eveleths (1972) four models. Subjects were asked to bite and swallow their saliva to see if they have the mild overbite, edge to edge bite, severe overbite or the negative overbite. Widow's peak was determined by physical examination. A researcher looked at the subject forehead to know whether the hair runs straight across or descends downwards. Cerumen type was determined by visual examination. Each subject was given cotton bud to clean the ear canal to check if the earwax was wet or dry. Data on dimple was collected by physically examining subjects. They were asked to talk and smile. Tongue rolling and tongue folding was also determined by physical examination. Individuals were asked to bring out the tongue between the teeth and roll and fold into a tube-shape. Data on earlobe attachment was collected by physical examination also. The earlobe of each subject was checked to know if it is attached or unattached. Details of each subject were noted and recorded along with their ethnicity, age and gender in a data form.

RESULTS

A total number of 250 individuals (100 males and 150 females) were used.

Table 1. Blood group distribution for both male and female

Gender	A (%)	B (%)	AB (%)	O (%)	Total (%)	P-value
Female	34 13.6	18 7.2	12 4.8	86 24.4	150 60	0.115
Male	29 11.6	6 2.4	3 1.2	62 24.	100 40	

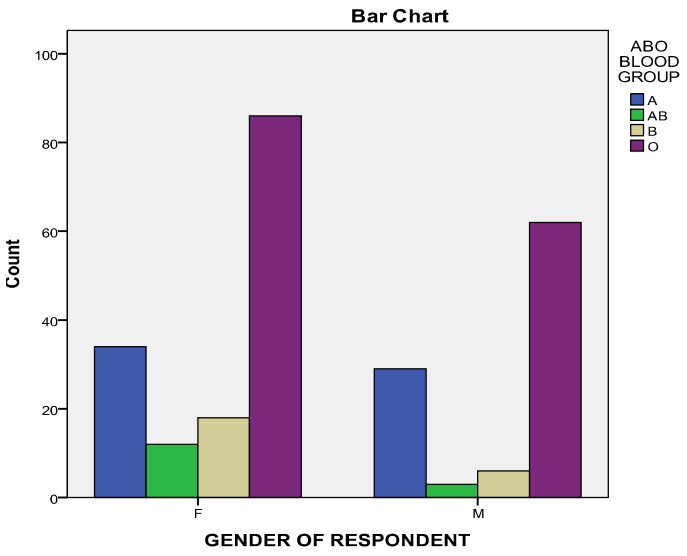

Figure 1. Bar chart showing blood group distribution in both male and female

As shown in Table 1, blood group O has the highest percentage distribution followed by blood group A and B. Blood group AB have the least percentage distribution in both male and female. There is no significant gender difference with cramer test (df=3; chi-square=5.926; P≥ 0.05).

Table 2. Rhesus factor in both male and female

Gender	Rh positive (%)		Rh negative (%)		Total	(%)	P-value
Female	135	54.0	15	6.0	150	60	0.067
Male	82	32.8	18	7.2	100	40	

As shown in Table 2, the percentages of rhesus positive individuals are more than the percentage of rhesus negative individuals in both male and female. There is no significant gender difference with cramer test (df=1; chi-square=3.351; p≥0.05).

Table 3. Tongue rolling in both male and female

Gender	can	(%)	cannot (%)		Total	(%)	P-value
Female	104	41.6	46	18.4	150	60	0.955
Male	69	27.6	31	12.4	100	40	

As shown in Table 3, the percentage of those that can roll tongue in both male and female are more than the percentage of those that cannot roll their tongue. There is no significant gender difference with cramer test (df=1; chi-square=0.003; p≥0.05).

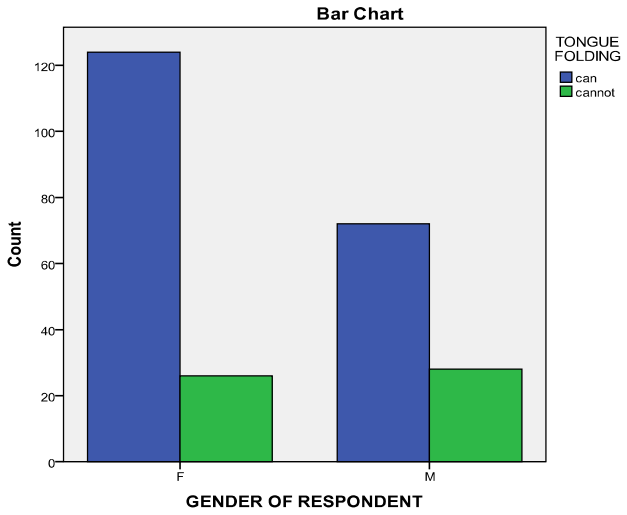

Figure 2. Bar chart showing tongue folding distribution in both male and female

Table 4. Tongue folding for both male and female

Gender	can	(%)	cannot	(%)	Total	(%)	P-value
Female	124	49.6	26	10.4	150	60	0.045
Male	72	28.8	28	11.2	100	40	

As shown in Table 4 and Figure 2, the percentage of those that can fold tongue in both male and female are also more than the percentage of those that cannot fold their tongue. There is a significant gender difference with cramer test showing positive association (df=1; chi-square=4.031; p<0.05).

Table 5. Earlobe attachment in both male and female

Gender	present	(%)	absent	(%)	Total	(%)	P-value
Female	53	21.2	97	38.8	150	60	0.168
Male	44	17.6	56	22.4	100	40	

As shown in Table 5, the percentage of those with unattached or free earlobes is more than the percentage of those with attached earlobes in both male and female. There is no significant gender difference with cramer test (df=1; chi-square=1.898; p≥0.05).

Table 6. Tooth occlusion pattern for both male and female

Gender	edge to edge	(%)	mild overbite	(%)	severe overbite	(%)	negative overbite	(%)	Total	(%)	P-value
Female	37	14.8	101	40.4	6	2.4	6	2.4	150	60	0.002
Male	47	18.8	44	17.6	3	1.2	6	2.4	100	40	

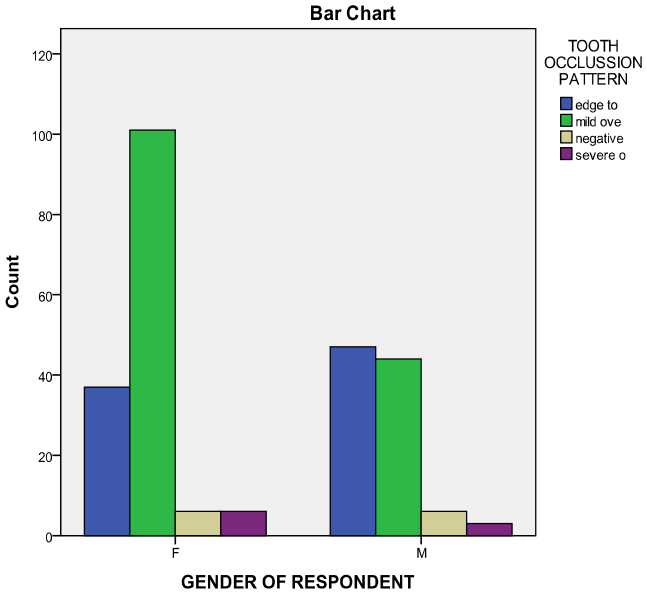

Figure 3. Bar chart showing distribution of tooth occlusion pattern in both male and female

As shown in Table 6 and Figure 3, the females have the highest percentage of mild overbite occlusion pattern followed by the edge to edge bite. They have equal distribution of the severe overbite and negative overbite occlusion pattern. Among the males, the edge to edge bite is slightly higher than those with mild overbite occlusion pattern followed by the severe overbite and negative overbite. There is a significant gender difference with cramer test showing a very weak association (df=3; chi-square=15.206; p<0.05).

Table 7. Distribution of widow's peak for both male and female

Gender	positive	(%)	negative	(%)	Total	(%)	P-value
Female	56	22.4	94	37.6	150	60	0.671
Male	40	16.0	60	24.0	100	40	

As shown in Table 7, the percentage of those without widow's peak is more than the percentage of those with widow's peak in both male and female. There is no significant gender difference with cramer test (df=1; chi-square=0.180; p ≥0.05).

Table 8. Cheek dimples in both male and female

Gender	positive	(%)	negative	(%)	Total	(%)	P-value
Female	53	21.2	97	38.8	150	60	0.057
Male	24	9.6	76	30.4	100	40	

As shown in Table 8, the percentage of those without cheek dimples are more than the percentage of those with cheek dimples in both male and female. There is no significant

gender difference with cramer test (df=1; chi-square=3.616;p≥0.05).

Table 9. Distribution of cerumen type in both male and female

Gender	wet	(%)	dry	(%)	Total	(%)	P-value
Female	123	49.2	27	10.8	150	60	0.027
Male	70	28.0	30	12.0	100	40	

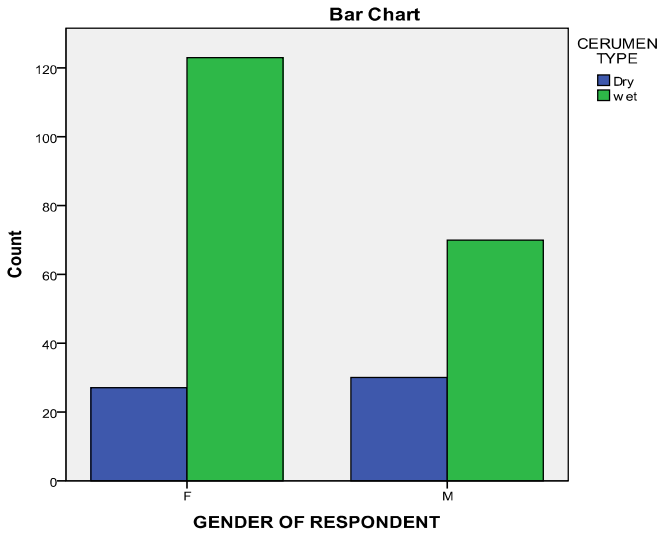

Figure 4. Bar chart showing distribution of cerumen type in both male and female

As shown in Table 9 and Figure 4, the percentage of those with wet cerumen type is more than the percentage of those with dry cerumen type in both male and female. There is a significant gender difference with cramer test showing a very weak positive association (df=1; chi-square=4.909; p<0.05).

DISCUSSION

This study was directed to investigate the distribution of morphogenetic traits among the Binis through visual inspection and examination. The Binis are a cultural group found in Benin-city, southern Nigeria. The Bini speaking people occupy seven out of the eighteen local government areas in Edo state which are Egor, Ikpoba central, Oredo, Ovia north east, Orhionwon and Uhunwonde. They speak the native the Edo language and constitute 57.54% of the entire population of the state which is estimated to be 3,218,332.

The findings in this study with regard to the distribution of ABO and Rh (D) blood groups is in line with the reports of Singh and Sengupta (2004), Adeyemo and Soboyejo (2006), Egesie *et al*. (2008) and Nwaopora *et al*. (2008) that the frequency of blood group O was the highest followed by blood group A and B with the least being those with blood group AB. The percentage of Rh (D) positive rate is higher than percentage of Rh (D) negative rate among them. The test of goodness of fit showed that there is no significant relationship between male and female Binis in their blood group. And the distribution of ABO and Rh(D) blood group varies from one population to another.

Results on the distribution of the population based on tongue rolling and tongue folding showed tongue folding was relatively higher than tongue rolling among the females in the study population which is similar to the reports of Odokuma *et al*. (2008) that tongue rolling and tongue folding was relatively higher in females than their male counterparts. This study differs from the report of Bulliyya (2003) that the distribution of tongue rollers and tongue folders is lower than non-rollers and non-folders. The Chi-square test indicates a significant relationship between male and female Binis in their tongue folding trait. Also from this study, the frequency of free or unattached earlobe is higher than attached earlobe. This agrees with the work carried out by Singh and Sengupta (2004) and Nwaopara *et al*. (2008). It was observed that the females have the highest percentage frequency of the mild overbite occlusion pattern followed by the edge to edge bite. And they have equal percentage distribution of severe overbite and negative overbite. The males have the highest percentage of the edge to edge bite followed by the mild overbite, negative overbite and severe overbite. A similar study done by Singh and Sengupta (2004) amongst the Assamese Sikhs shows a different result; the mild overbite type of tooth occlusion was found to be highest among them closely followed by the edge to edge bite. The negative overbite was observed more in their males than females and the severe overbite type is rare among them. There is a significant relationship between male and female Binis in their tooth occlusion pattern.

The frequency of those without widow's peak is higher than those with the widow's peak trait which corresponds to the research of Nwaopara *et al*. (2008) although Nusbaum and Fuentefria (2009) had a different report that 81% of the population had widow's peak. The study on cheek dimples shows that a higher percentage of the population do not have cheek dimples but a lower percentage have (both unilateral and bilateral cheek dimples) which is similar to the findings of Omotoso *et al*. (2010). Wet or waxy cerumen type is highly frequent among males and females in the study population than the dry/flaky cerumen type which disagrees with the research work of Singh and Sengupta (2004) and Ohashi *et al*. (2011) that dry/flaky cerumen is highly frequent in the males, while the wet or waxy type predominates in females. The test of goodness of fit (chi-square test) shows that there is a significant difference between male and female Binis in their cerumen type. Cerumen type varies in different population.

The distribution of morphogenetic traits among the Binis does not display significant gender variation. Using chi-square test (x^2) no significant difference was found between genders considering the morphogenetic traits in the studied population except in tongue folding which was relatively high among the females. The results of this study will be of great importance in many areas such as forensic medicine, emergency cases, clinical practice and anthropology to address future health challenges. And it will serve as a basis in further anthropological researches.

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