Human Biology Review (ISSN 2277 4424) 12(1) 2023
Original Scientific Report (Ordu et al. pp. 44-58)
Revised and Accepted on December 19, 2022

The Pattern of Morphogenetic Traits combination among the Efik and Ikwerre tribes of a Nigerian Population

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Citation: Ordu KS, Orupabo CD, Erekosima BU, Ikenga V, Ordu S, Daka IR, Nonju I, Gbaranor BK Blessing AR. 2023. The Pattern of Morphogenetic Traits combination among the Efik and Ikwerre tribes of a Nigerian Population. Human Biology Review, 12 (1), 44-58.

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ABSTRACT

Background: *Human genetics are known as hereditary traits which include the dominant and recessive traits in humans which could be transmitted through both Mendelian and non-Mendelian fashion.*

Aim*: To determine and compare the pattern of morphogenetic traits common with the Efiks and Ikwerre tribes of Nigeria.*

Materials & Methods*: This was a cross-sectional study carried out within the space of 3 months in Rivers and Cross-rivers states of Nigeria. 461 subjects (306 Ikwerres and 155 Efiks) of*

Nigerian population who were within the ages of 10-65years were recruited for the study after informed consent. Materials for precision of measurement & photography such as hand lens, digital camera, measuring tapes and writing materials were adequately employed. Data on morpho-genetical traits were collected and analyzed from unrelated individuals belonging to both sexes from the study population groups; taking into consideration factors like tribe, consanguity, and age.

***Results**: The data collected from the study were statistically analyzed using SPSS version 17. The Ikwerre tribe who had dimples and who those who did not have were 98 (32%) and 208 (68%) respectively. The Efik tribe possession and absence of dimples were 53 (34%) and 102 (66%) respectively. The variation in the morphogenetic traits was significant ($p<0.05$) across the two ethnic groups tested. It can therefore be deduced that trait combination can be used to predict the tribe of an individual considering the most common traits present morphologically.*

Keywords: Morphogenetic traits, Nigerian, Ikwerre, Efik, Population

INTRODUCTION

Population diversity provides a unique opportunity to study the morpho-genetic variation among the endogamous populations living in different geographical and ecological conditions (Singh et al., 2004). Human genetics are known as hereditary traits which include the dominant and recessive traits in humans. Most of the genes are transmitted in the Mendelian pattern and a few are transmitted through the non-Mendelian pattern which includes: co-dominance, sex-linked genes and polygenes (Onyije 2012). Genetic variations that occur in humans are usually a result of a plethora of factors which may include selection, migration, gene - flow and genetic drift (Odokuma et al., 2008).

Physical traits are observable characteristics determined by specific segments of DNA called genes. Multiple genes are grouped together to form chromosomes, which reside in the nucleus of the cell. Every cell (except eggs and sperm) in an individual's body contains two copies of each gene. This is due to the fact that both mother and father contribute a copy at the time of conception. This original genetic material is copied each time a cell divides so that all cells contain the same DNA. Genes store the information needed for the cell to assemble proteins, which eventually yield specific physical traits (Stark et al., 2006). Many human traits have a complicated inheritance pattern that includes polygenic inheritance and influence by environmental factors. There are

however, some human characteristics that appear to be monogenetic or determined by variations of a gene at a single locus and are not subject to much environmental verification and a number of such human characteristics are autosomal.

Earlobe attachment: In most people the ear lobes are unattached – that is, they hang free. This is the dominant condition.

Widow's peak (Hairline): In some people the hairline drops downward and forms a distinct point in the center of the forehead. This is known as a widow's peak and results from a dominant allele. A straight hairline is due to the recessive condition.

Tongue Rolling: A dominant allele gives some people the ability to roll their tongue into a distinct U-shape.

Hitchhiker's Thumb (Thumb curvature): "Distal hyper extensibility of the thumb" or hitchhiker's thumb is due to a recessive condition. Those with this phenotype can bend the distal joint of the thumb back until it is almost at a 90 degree angle with the lower portion of the thumb.

Interlacing Fingers: Clasp your hands together so your fingers are interlacing without giving it much thought. Look at the placement of your thumbs. If your left thumb is over your right you have the dominant condition. If your right thumb is over your left, you have the recessive condition.

Mid-digital hair: Some people have hair on the back of the middle segment of some fingers. Individuals with hair on the middle segment of at least one finger are considered to have the trait mid-digital hair (H); some others have no mid-digital hair (N). Mid-digital hair is often used to illustrate basic genetics; the myth is that the presence or absence of mid-digital hair is controlled by a single gene with two alleles, and the allele for H is dominant.

Second big toe length: In some people, the big toe is longer than the second toe (here called "L," for long big toe) while other people have the big toe shorter than the second toe ("S"). This is sometimes said to be controlled by one gene with two alleles, with the allele for S dominant to the allele for L. There is no good evidence for this myth.

Nose Shape: The type of nose shapes is influenced by a number of things. Some of the common factors that influence the type of a nose shape and size would include the following; genetics, cultural background, fractures, injuries sustained, evolution, climate.

Dimples: Dimples are reportedly due to a single gene with dimples dominant (people may exhibit a dimple on only one side of the face) and a lack of dimples recessive. Hence the presence of dimples is thought to be dominant as their absence is recessive (Stark et al., 2006).

MATERIALS AND METHOD

This was a cross-sectional study with 461 subjects (306 Ikwerres and 155 Efiks) of Nigerian population who were within the ages of 10-65years. Sex distribution for the Ikwerres was 158 females and 148 males, and for the Efiks was 68 females and 87 males. The study was carried out within the space of 3 months (July-September 2013) in Rivers and Cross-rivers states of Nigeria, where the focus ethnic groups of our study are predominantly located. Materials used include; hand lens, camera, measuring tapes and writing materials. Data on morpho-genetical traits were collected and analyzed from unrelated individuals belonging to both sexes from the following population groups; Ikwerre and Efik, by taking prior informed consent from the individuals, taking into consideration factors like tribe, consanguity, age, religion etc. The survey was conducted with healthy individuals from Ikwerre and Efik districts by house to house visit, which were selected on random a prior basis during the day time with the help of volunteers. Survey was also conducted in various schools in Ikwerre local government in Rivers and Cross-rivers state by taking prior permission from the respective headmasters and principal. For tongue rolling and tongue folding, subjects were determined as rollers and folders depending upon their ability to turn up the lateral edges of the tongue (Sturtevant 1940) and folding of the tongue (Liu & Hsu 1949). The ability to roll and fold lateral edges of the tongue in U- shape is reported to be due to a significant dominant gene while a recessive gene is responsible for its inability (Hsu 1948). Later Liu & Hsu (1949) have expressed that inability to fold tongue is due to a dominant gene and its ability to roll is due to a recessive gene. Widow's peak refers to the descending V-shaped point at the middle of the head's hairline just above the forehead of some individuals, while 'cheek dimples' are the small depressions that lie on the cheeks of some individuals especially when they smile. Genetically, both are dominant traits and those who do not express them are said to possess the recessive genes. It is believed that the presence of double or bifid zygomaticus major muscle may explain the formation of cheek dimples. The terms cleft chin, chin cleft, superhero chin, dimple chin, or a chin dimple refer simply to a dimple on the chin. It is a Y-shaped fissure on the chin with an underlying bony peculiarity. The chin fissure follows the fissure in the lower jaw bone resulting from the

incomplete fusion of the left and right halves of the jaw bone, or muscle, during the embryonal and fetal development. For other individuals it can develop over time, often because one half of the jaw is longer than the other, leading to facial asymmetry. This is an inherited trait in humans, where the dominant gene causes the cleft chin while the recessive genotype appears without a cleft. "Hitchhiker's thumb" is an autosomal recessive trait, more formally known as "distal hyper extensibility of the thumb" Homozygous carriers can extend the top of the thumb backwards by nearly 90° when the thumb is extended in a "thumbs up". The dimple, cleft chin, hitchhiker's thumb and widow's peak status of the subjects were determined by physical examination. The types of ear lobe attachment have been divided here into two categories: free and attached. "Free" means completely free ear lobes, while "attached" means completely attached lobes. The earlobe patterns attached or free were classified after Martin &Saller (1961).

Also, subjects were asked to clasp their hands and interlace the fingers. An observation of the thumb (right or left) on top was made and recorded alongside the observation of 2^{nd} toe length were made in relation to the 1^{st} big toe to determine if its longer or shorter. And all observation was recorded using data recording materials and taken for statistical analysis.

Participants completed a consent form that explained the purpose of the survey.

The data obtained from this study, were analyzed statistically using a computer (SPSS version 17) with respect to gender, age (yrs.). It was expressed in percentage and analyzed using percentage frequency distribution table.

RESULTS AND ANALYSIS

Table 1: Morphogenetic trait distribution in the study population

Population	Ikwerre		Efik	
Traits	Yes	No	Yes	No
Dimples	98	208	53	102
Earlobe unattached	199	107	96	**59**
Tongue rolling	118	188	79	76
Interlacing finger	148	158	60	95
Thumb curvature	229	77	115	40
5th digit curvature	177	129	73	82
Shape of nose	151	155	43	112
Mid digital hair	89	217	61	94
Big toe length	192	114	94	61

Table 2: Descriptive statistics of distribution of morphogenetic traits

Tribe	N	Mean	SD	Variance	Z score	Critical Z Score at 0.05 level	P value	Inference
Ikwerre		155.67	15.94	2287.50	4.5542	1.6448	0.0002	Significant
Efik		74.89	7.77	543.86				

N=Sample size, SD=Standard deviation

Table 3: Anova for traits variation among tribes

Tribe	Df	SS	MS	F value	F Critical	P value
Ikwerre Efik	1	18300	18300	0.0002	0.00003	0.00002*

*= significant

Table 4: Frequency distribution for dimples among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	208	67.9	67.9
	Presence	98	32.1	100
EFIK	Absence	102	65.8	65.8
	Presence	53	34.2	100

Table 5: Frequency distribution for earlobe among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	107	34.9	34.9
	Presence	199	65.1	100
EFIK	Absence	59	38.1	38.1
	Presence	96	61.9	100

Table 6: Frequency distribution for tongue rolling among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	188	61.4	61.4
	Presence	118	38.6	100

EFIK	Absence	76	49.0	49.0
	Presence	79	51.0	100

Table 7: Frequency distribution for interlacing finger among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	158	51.6	51.6
	Presence	148	48.4	100
EFIK	Absence	95	61.3	61.3
	Presence	60	38.7	100

Table 8: Frequency distribution for thumb curvature among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	77	25.2	25.2
	Presence	229	74.8	100
EFIK	Absence	40	25.8	25.8
	Presence	115	74.2	100

Table 9: Frequency distribution for fifth digit curvature among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	129	42.2	42.2
	Presence	177	57.8	100
EFIK	Absence	82	52.9	52.9
	Presence	73	47.1	100

Table 10: Frequency distribution for shape of nose among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	155	50.6	50.6
	Presence	151	49.4	100
EFIK	Absence	112	72.3	72.3
	Presence	43	27.7	100

Table 11: Frequency distribution for mid digital hair among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	217	70.9	70.9
	Presence	89	29.1	100

EFIK	Absence	94	60.6	60.6
	Presence	61	39.4	100

Table 12: Frequency distribution for second: big toe length among the Ikwerre and Efik

		Frequency	Valid Percent	Cumulative Percent
IKWERRE	Absence	114	32.3	37.3
	Presence	192	62.7	100
EFIK	Absence	61	39.4	39.4
	Presence	94	60.6	100

Table 13: The distribution of trait combination among the Ikwerres

	Frequency	Valid Percent	Cumulative Percent
aBcDeFGhiJ (Male)	5	1.6	1.6
aBcDeFGhiJ (Female)	2	0.7	2.3
other traits	299	97.7	100
Total	306	100	

Trait combination common among the Ikwerre males had a frequency of 5% with no dimples(a), Earlobe unattached(B), no tongue rolling(c), presence of widow's peak(D), absence of interlacing fingers(e), Thumb curvature(F), 5^{TH} digit curvature(G), dominant nose shape(h), no mid-digital hair(i) and dominant big toe length(J).
This combination had a lower frequency in the Ikwerre females (2%).

Table 14: The distribution of trait combination among the Efiks

	Frequency	Valid Percent	Cumulative Percent
aBcDeFGhiJ(Male)	1	.6	.6
AbCDeFGhiJ(Male)	2	1.3	1.9
ABCdeFGhiJ(Male)	2	1.3	3.2
Other Traits	145	93.5	96.8
aBcDeFGhiJ(Female)	3	1.9	98.7
AbCDeFGhiJ(Female)	1	.6	99.4
ABCdeFGhiJ(Female)	1	.6	100.0
Total	155	100.0	

The Efiks show various pattern of trait combination in both males and female populations unlike the pattern seen among the Ikwerres. The percentage frequency of the trait combination present was between 1 and 3 percent.

Table 15: The distribution of trait combination among the general population

	Frequency	Valid Percent	Cumulative Percent
aBcDeFGhiJ (Male)	6	1.3	1.3
AbCDeFGhiJ (Male)	2	.4	1.7
ABCdeFGhiJ (Male)	2	.4	2.2
Other Traits	444	96.3	98.5
aBcDeFGhiJ (Female)	5	1.1	99.6
AbCDeFGhiJ (Female)	1	.2	99.8
ABCdeFGhiJ (Female)	1	.2	100.0
Total	461	100.0	

This shows the pattern of trait combination for the general population irrespective of their tribe.

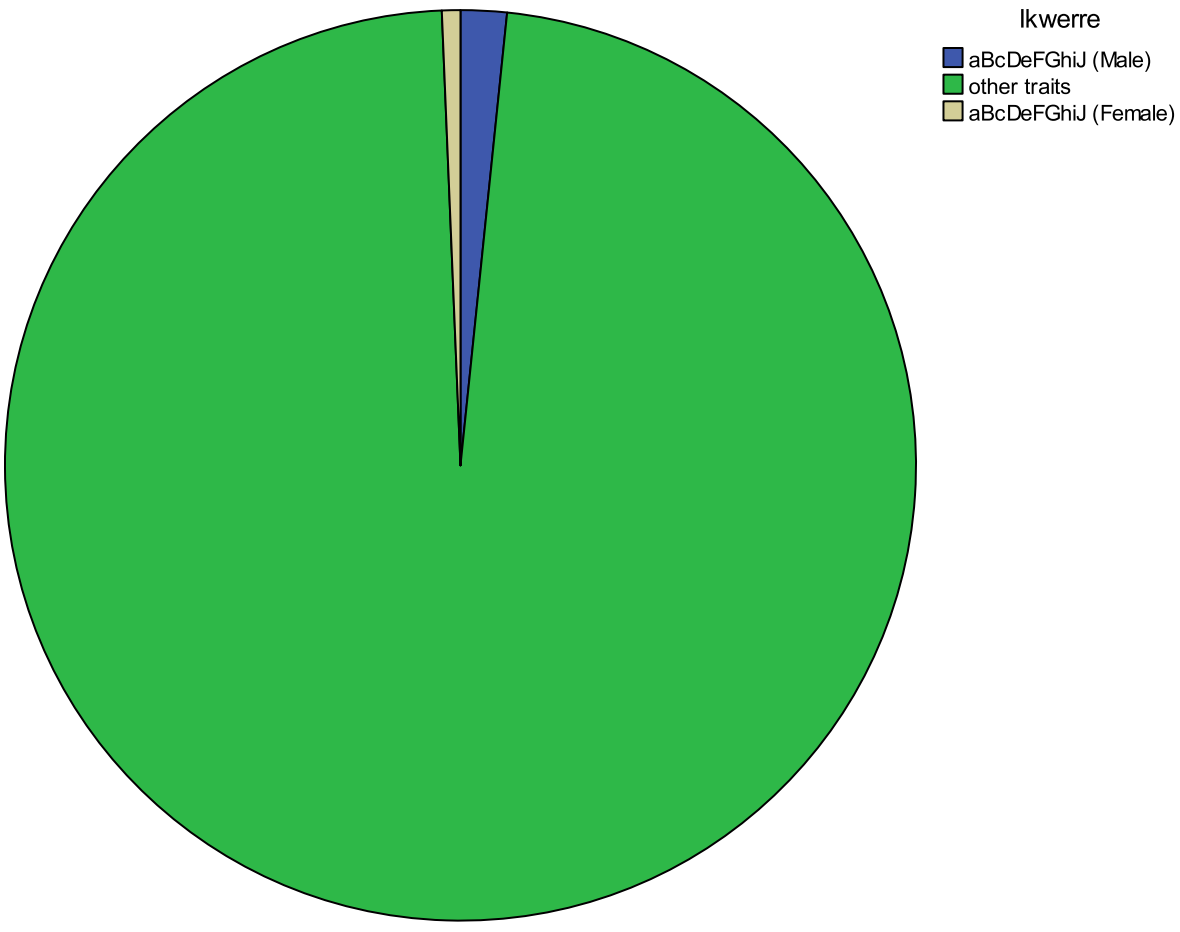

Figure 1: A Pie-chart showing the Ikwerre trait combination

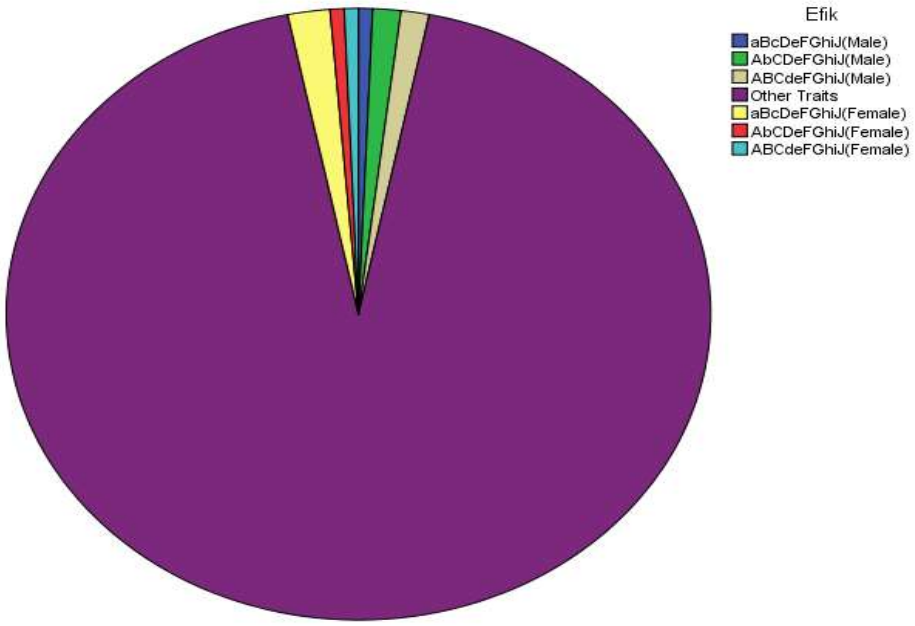

Figure 2: A Pie-chart showing the Efik's trait combination

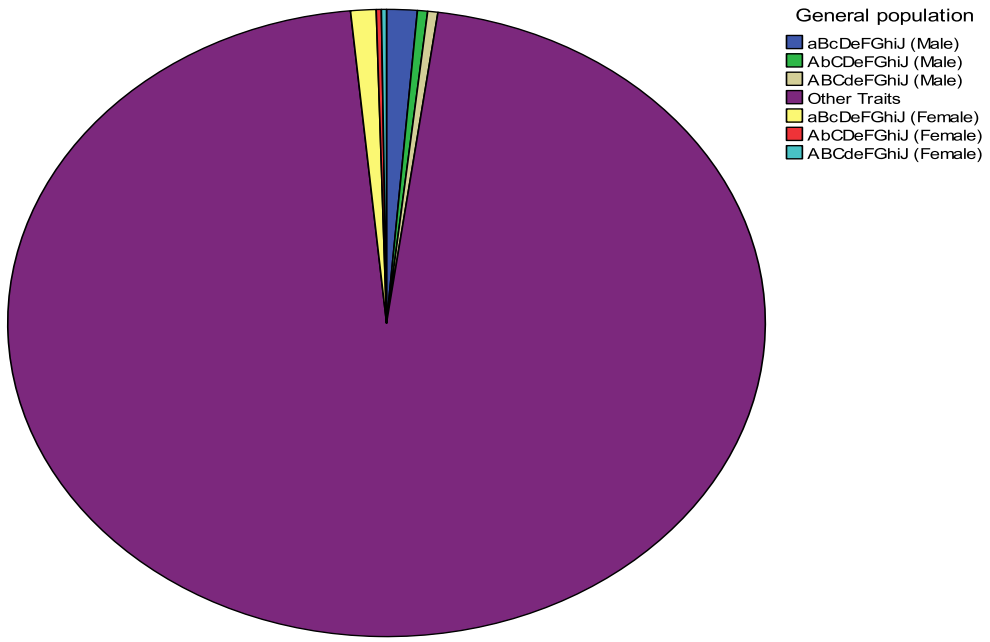

Figure 3: A Pie-chart showing the trait combination in the general population

DISCUSSION

Physical traits are observable characteristics determined by specific segments of DNA called genes. Multiple genes are grouped together to form chromosomes, which reside in the nucleus of the cell.

Every cell (except eggs and sperm) in an individual's body contains two copies of each gene. Parent organisms pass traits to their offspring so there are often similar characteristics seen in both parent and offspring (Onyije 2012).

The present study investigated these parents transferred traits and also checked trait combination in the population. The study revealed that the trait 'dimples' were higher amongst the Efiks 53/102 (34.2%) as compared to their Ikwerre counterparts 98/208 (32.1%). Although this variation is statistically not significant, it can be deduced from the data that only but a small percentage of the general population has dimples. This however may be attributed to the presence of a single dominant gene present in subjects who exhibit a dimple on their face (Nwaopara et al., 2008).

Tongue rolling was also studied and statistics showed that frequency of individuals showed a greater percentage in the Efiks (51%) than the Ikwerre (38.6) counterpart. Singh (2002) also reported absence of tongue rollers in Kom tribe of Manipur. Among Muslim populations, male shows the presence of this trait, Sheikh-61.7% vs.59.4%; Syed-37.5% vs 33.3%; Pathan-63.6% vs

58%; Mogul-40% vs 22.2% (Ahsana et al., 2012). Our findings on tongue rolling is similar to the report by Alsana and co-researchers. These findings suggest that tongue folding and rolling traits are possibly products of autosomal genes. However, Odokuma et al., 2008 documented diiferent views as to the possible reason for the presence of tongue rolling in their study population.

Considering thumb curvature, the Ikwerres recorded its presence with 229(74.8%) higher than the Efiks who recorded 115 (74.2%) and this seems to be higher than the findings by Ahansa et al., 2012 who recorded that the presence of thumb curvature (hitchhiker thumb) among Muslims is found to be more frequent among males except the Syeds, which doesn't follow the trend. In Naga tribes, males and females show almost similar phenotypic frequency (Males-46.2%, Females-46.9%).

Widow's peak in the Ikwerres 161(52.6%) is higher than the Efiks 60 (38.7%). Hence it can be said that the Ikwerres tends to have a dominant allele for widow's peak while the interlacing fingers recorded the Ikwerres as 148 (48.4%) making it higher than the efiks60 (38.7%).

Also, in the study, the mid digital hair was also studied and it was observed that the Ikwerres 115(74.2%) was greater than the Efiks 60 (38.7%). The nose shape of the Ikwerres (151(49.4%)) have a more dominant nose shape than the Efiks 61(39.4%) alongside the second big toe which the Ikwerres recorded as 62.7% in contrast to the Efiks 60%.

Finally, the trait combination was analyzed for the various tribes and result showed that the Ikwerres tend to have a particular common combination (aBcDeFGhiJ) which was found in both sexes. The trait combination is significantly higher in the Ikwerre male (1.6%) than their female counterpart (0.7%), while the Efiks recorded three different most common trait combination which are aBcDeFGhiJ (male 0.6% and female 1.9%), AbCDeFGhiJ (male 1.3% and female 0.6%), and ABCdeFGhiJ (male 1.3% and female 0.6%). In the general population, aBcDeFGhiJ traits combination seem to be common in both tribes studied, and this can be attributed to the dominant gene for these traits being common in both tribes. These traits (eFGhiJ) however seems to represent itself in all the common combinations.

CONCLUSION

Morphogenetic traits are genetically determined and they vary from one individual to another, as well as the frequency from one geographical area to another. Morphogenetic traits are of great importance to forensic pathologist and anatomist as well as the bioanthropologist. Thus the determination and investigation of such traits can help develop data regarding traits peculiar to certain cultures and tribes, which could aid forensic and criminal case investigations.

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