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A Study of Genetics Using Two Simple Mendelian Inheritance

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ABSTRACT

A study was carried out to create an awareness of the significance of genetics and show how people differ.Three hundred and fifty five Students of DELTA STATE UNIVERSITY from the Niger Delta region of Nigeria were examined to know the percentage of the population that had inherited traits such as widow's peak and unattached ear lobes and those that had the two dominant features together. Their ages ranged from 16 years to about 35years. The ratio of widow's peak to straight hairline of the same sex were approximately 1: 1 meaning that the number of people with widow's peak when compared with those having straight hairline approximately the same for both sexes though the percentage of those with straight hairline were more than those with widow's peak in both sexes. Most of the subjects had the unattached earlobe variety in both sexes. The females however showed a remarkably higher incidence of unattached earlobe than the males. The percentage of those with the dominant features of both widow's peak and unattached earlobe were approximately at the same ratio in both sexes and was not up to 50% of the population studied, meaning dominant traits are not necessarily seen more in the population.

KEY WORDS: Widows Peak, Straight Hairline, Earlobe Attachment, Niger Delta

The hairline is where the hair begins on the head; it is a line across the top of the forehead behind which the hair grows. This hairline could be V shaped as in a widow's peak or straight. (Microsoft Encarta.2006). A widow's peak is a V shaped hairline across the top of forehead behind which the hair grows. Evan Morris word detective site goes on to explain that according to the English Folklore a widow's peak is destined to outlive her husband. The male counterpart being called a widower's peak. The sharp point of hair growth in the midline of the anterior scalp margin usually results from recession of the hair of the temple areas or occurring as congenital configuration of scalp hair. When the forehead hairline has no downwards dip it is known as a straight hairline.

The earlobe is the soft fleshy part of the external ear. It is the lower most portion of the human ear projecting below the antitragus. In humans the earlobe can be free hanging that is unattached or attached earlobe. Attached earlobe is characterized by the attachment the lower part of the ear directly onto the head. For quantitative analysis or earlobe variations, the classification of earlobe shape into two types (pendulous or non pendulous) was found to be a better method (Nakamura et al 1995) and makes it easy to distinguish earlobe differences. The unattached earlobe variety occurs more frequently than the attached variety (Singh and Sengupta 2004, William and Hughs 1987)

Widow's peak, straight hairline and earlobe attachment are inherited as examples of simple genetics dominance relationship where a single gene is responsible for the expressed traits. (Microsoft ENCARTA 2006). A single gene with two alleles controls this inheritable trait.

If a person inherits the allele for widows peak or unattached ear lobe from one parent and the allele for straight or attached ear lobe from the other parent, the allele for widow's peak (unattached earlobe) dominates the gene pair and so its trait is expressed. According to the laws governing heredity, when a dominant allele (in this case a widow's peak or unattached ear lobe) and a recessive trait (a straight hair line or attached earlobe) combine, the trait will always be dictated by the dominant allele. The straight hairline or any other recessive trait will only occur in an individual who inherits the two recessive alleles. The dominant recessive pattern of inheritance, a relatively simple pattern involves paired alleles that influence one trait. In this pattern one of the two alleles contains information for a certain characteristics: E.g. widow's peak.(Microsoft Encarta 2006). We wanted to observe the expression of series of genes (Dominant vs Recessive) in Niger Delta Student phenotype and thereby understanding more of the genetic basis of

human diversity. We also wanted to demonstrate and create an awareness of a small part of the range of human variation and similarities.

MATERIALS AND METHODS

Data for the present study was collected from students of Delta State University, Abraka. Their ages range between 16 years and 35 years with a mean age of 22.1±3.55 years. We wanted to compare and contrast the dominant versus the recessive traits. We look out for students with widow's peak, the fore head hairline having a downward dip in it at the centre (Genetics by Howard Huges, Pre College Science Education Year 1987), and those with straight hairline having no dip at the centre. We then followed the two fold classification of ear lobe attachment types by Powell and Whitney (1937). Earlobe hanging freely being Unattached or earlobe Attached directly to the head. We then compared the percentage population of those with the combined dominant features of both widow's peak and unattached earlobes to those who have the recessive traits of attached earlobe and straight hairline.

RESULT

We studied 355 students, 215 were males (60, 56%) while 140 were females (39.43%). The total number of males with widow's peak was 83 (38.6%) and with straight hairline was 132 (61.39%).For the females the total number of females with widow's peak was 58 (41.43%) while those with straight hairline was 82 (56.57%). The incidence of widow's peak for both male and female was 140 (39.44%) while the incidence of straight hair line for both sexes was 214 (65.42%). The total number of male with attached earlobes was 91 (42.33%) while unattached was 124(57.67%) The total number of female with attached ear lobes was 31(22.14%) and for unattached was 109 (77.86%). The total percentage of those with attached ear lobes for both sexes were 34.36%(122) while the total percentage for those with unattached earlobes was 233.(65.63%).

The total percentage for those with both Dominant features of widow's peak and unattached ear lobes together was 86(24.23%), male alone being (49) 22.79% female alone being (37) 26.43%. From above the ratio of both sexes for inheriting a widow's peak or straight hairline is approximately one meaning approximately the same. However more had straight hair line compared to the widow's peak. More female had the unattached variation of earlobe (77.86%) than males (57.67%) and this sex variation was found to be statistically significant ($P<0.05$). The total percentage of the population with the Dominant traits of both widow's peak and unattached earlobes in both sexes was 24.23% which is less than half of the population. This is also statistically significant.

Plate 1: Free or unattached or pendulous earlobe

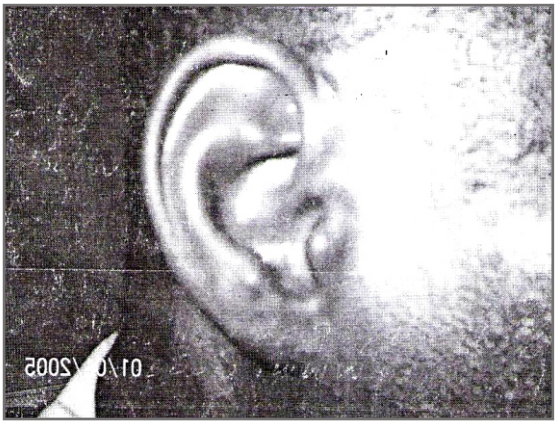

Plate 2: Attached or non-pendulous earlobe

Table 1: Incidence of subjects with widows peak and straight hairline.

Subjects	Percentage
Total number of females	140 (39.43)
Number of females with widow's peak	58 (41.43)
Number of females with straight hairline	82 (56.57)
Total number of males	215 (60.56)
Number of males with widow's peak	83 (38.6)
Number of males with straight hairline	132 (61.39)

Table 2: Incidence of subjects with earlobe attachment

Subjects	Percentage
Total number of females	140 (39.43)
Number of females with attached earlobes	31 (22.14)
Number of females with unattached earlobes	109 (77.86)
Total number of males	215 (60.56)
Number of males with attached earlobes	91 (42.33)
Number of males with unattached earlobes	124 (57.67)

Table 3: Incidence of subject with dominant inheritance

Subjects	Percentage
Total number of females	140 (39.43)
Number of females with both dominant inheritance of Widow's peak and unattached earlobes	37 (26.4)
Total number of males	215 (60.56)
Number of males with both dominant inheritance of both widow's peak and unattached earlobes	49 (22.7)
Total number of males and females	355 (100)
Number of males and females with both dominant inheritance of widow's peak and unattached earlobe	86 (24.23)

DISCUSSION

The traits or characteristics of an organism are determined by genes. The gene for a particular trait can have two or more different forms which are called alleles. For a specific trait some alleles may be dominant while others may be recessive. The phenotype of a dominant allele is expressed regardless of what the other allele is while the phenotype of a recessive alleles is expressed only when both alleles are recessive. (www.accessexcellence.org inheritance ht.ml 9/3/05). An autosomal dominant gene is one that occurs on an autosomal (non sex determining) chromosome (Campbell and Reece 2002), meaning there is no sex variation in the expression of traits. An example of human autosomal dominant trait is the widow's peak. From the results of our studies it tallies that it is inherited by a simple mendelian gene effect. The incidence for widow's peak in both sexes were approximately the same: 38.6% for males and 41.43% for females hence there is no remarkable sex variation in the expression of the traits. This is also the same for the straight hairline; 61.39% for males and 56.57% for females. The incidence of earlobe attachment is similar to findings of other studies (Emore et al 2007, Singh and Sengupta 2004, William and Hughes 1987) where the incidence of free or unattached earlobe is higher than that of attached earlobe. Unlike Williams and Hughes (1987) where males and females in the population were equally affected by the traits, females were found to have statistically significant number of the unattached earlobes than males. This is similar to that of Emore et al (2007) in Delta State and of Singh and Sengupta (2004) in India. Since there is a sex variation in the expression of these traits which is not supposed to be in a dominant trait inheritance it tilts towards the suggestion that a simple mendelian gene effect is unlikely to be responsible for the earlobe types (Dutta and Ganguly 1965, Lai and Walsh 1966, Emore et al 2007). In our research, females had 77.86% of unattached earlobe while males had 57.67%. It may be due to the environmental cultural practices like heavy ear-rings.

From this research it is obvious that though a dominant gene makes the phenotype to be expressed even if the gene is heterozygous which constrast with recessive gene which needs to be homozygous to be expressed, it does not mean that the dominant trait is the most common in the population. In this research, those with the dominant traits of widow's peak and unattached earlobe combined was 24.23% which is less than half of the population studied.

In conclusion the widow's peak and straight hairline follows the simple dominant inheritance studied by Gregor Mendel (www.wikipedia2006). Its frequency in the population being approximately the same with the straight hairline in both sexes. Earlobe attachment inheritance could be multifactorial where the environment (in this case cultural practices) interact with the gene to produce the final result rather than simple mendelian inheritance (Emore et al 2007) and finally the dominant phenotype are not necessarily always the most commonly expressed in the population.

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