



Original Research Article

Inheritance pattern of hairline shape amongst Nigerian population

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ABSTRACT

Keywords

Inheritance;
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This study was done to investigate the inheritance pattern of hair line shape in a cross section of Nigerian population using 300 Nigerians from 100 families comprising 200 parent and 100 offspring. The expression of hair line shape in the families were observed and noted. It was noticed that hair line shape is a morphogenetic trait controlled by two contrasting allele curved and straight hairlines. The trait follows simple dominant -recessive pattern of inheritance with the curved dominant over the straight hairline shape. 86.3% and 13.7% of the population had straight and curved hairline respectively despite the straight hair line being recessive. This is might be due to inbreeding resulting from intermarriage. No significant difference in the gender distribution of the trait in the population. The Results obtained suggest that observation of hairline shape trait might be suitable for genetic analysis and can be used to determine possible percentage.

Introduction

Hairline is the line demarcating the hairs of the scalp from the forehead. It can either be straight or curved (also known as Widow's peak) in shape. People with curved hairlines (Widow's peak) have a prominent v-shaped point at the front of their hairline. Those with straight hairline have hairline that goes straight across the front of the face. These represent two alleles that control hairline shape (McDonald, 2011).

Alleles are alternative characteristics controlling a trait. They share the same loci in the chromosome so control the same gene (Feero et. al, 2010; Malats and Calafell, 2003). Gene is the unit of heredity, which is the transmission of traits from parents to offspring. This is responsible for the resemblance observed in generations. The manner and forms in which transmission occurs is called pattern of inheritance.

The patterns include; Autosomal Dominant-Recessive, Polygenic, X-Y Linked and Mitochondrial inheritance. Autosomal Dominant-Recessive inheritance involves 2 pairs of contrasting alleles controlling one trait where the recessive allele is manifested phenotypically in homozygous forms only but masked by the dominant allele when they occur in heterozygous forms (Molly et. al, 2010; Hartl and Jones 2005). Polygenic inheritance a trait is controlled by multiple gene pairs. So there is a gradual variation of the trait in the population without a clear distinction. Examples include height, skin colour etc. X-Y Linked inheritance results when the gene is located in the sex chromosomes (X or Y). Mitochondrial inheritance is when the chromosome is located in the mitochondria of the cell instead of the nucleus like in the egg cells of humans (Nussbaum et. al, 2007).

The curved hairline has been shown to be dominant and straight hairline recessive (Hugo, et al, 2003; Carlos, 2007; McDonald, 2011), so the curved hairline do not really skip generations (Dougherty, 2007).

Materials and Methods

A total of 300 individuals were studied; 200 parents and 100 offspring (45 were male and 55 female) from a cross section of 200 Nigerian families. After a well informed consent, the hair line shapes of the subjects were observed under a bright light and recorded according to their respective families for straight and curved hairline shapes. Results were then arranged according to gender, offspring, and parents and analysed.

Results and Discussion

12 families that had 12 fathers curved hairline and 12 mothers straight hairline produced 12 offspring of which 7 had curved hairline (3 males and 4 females) and 5 had straight hairline (1 male and 4 females). 5 offspring (2 female curved and 3 male straight hairline) are products of 5 families that had 5 mothers curved hairline and 5 fathers straight hairline. When both parents 6 each had curved hairline 6 offspring with 3 each having either curved and straight hairline were seen. All 77 offspring (34 female offspring and 43 male) seen from when 77 parents both with straight hairlines had only straight hairline.

Table 1 shows the distribution of the sample population, 86.3% are observed to have straight hairline while 13.7% are curved implying that straight hair line is more in the population. This agrees with the findings of Nwaopara et al (2009), who observed, in his study on the pattern of morphogenetic traits combination amongst the population of Ekpoma, Nigeria, that a higher percentage of the study population (57.51%) had straight hairline while a lower percentage of the population (42.9%) had curved hairline. This might be because the two studies were in the same geographical location. The study is also in conformity with 3% of the observed photographs of undergraduates by Cohen having curved hairline and 97% had straight hairline (Smith and Cohan, 1973). But in contrast to the findings of researchers from the University of Utah (2006) and study by Nussbaum and Fuentesfria (2009) when they observed the hairline of women in hair salon and found 81% of them having curved hairline.

Table.1 Showing the Frequency Distribution of Hairline Shape amongst Population of Nigeria

Hairline Trait	No. of Populations	Males	Females	Fathers	Mothers	Offspring	Male Offspring	Female Offspring
Straight	259(86.3%)	122(40.6%)	137(45.7%)	82(82%)	89(89%)	88	40(88.9%)	48(87.3%)
Curved	41(13.7%)	23(7.7%)	18(6.0%)	18(18%)	11(11%)	12	5(11.1%)	7(12.7%)
Total	300	145(48.3%)	155(51.7%)	100	100	100	45	55

Table.2 Showing Number of Offspring that Lacked or Exhibited a Trait from Different Parent Combinations of Trait in the Respective Families in the Population

Hairline Shapes of Parents	No. of Families	Total No. of Offspring	Male Offspring		Female Offspring		
			Straight	Curved	Straight		
Father curved & Mother straight	12	7	5	3	1	4	4
Mother curved & Father straight	5	2	3	0	3	2	0
Both Parents curved	6	3	3	2	2	1	1
Both Parents straight	77	0	77	0	34	0	43
Total	100	12	88	5	40	7	48

In the study population more females 45.7% than males 40.6% had straight hairline. 7.7% and 6.0% males and females had curved hairline respectively while 11.1% male offspring and 12.7% female offspring had curved hairline. This change in gender frequency might be due to loss of hair as the female ages.

From table (ii) when both presents had curved hairline, 3 offspring with curved hairline and 3 offspring with straight hairline were found. But all 77 offspring had straight hairline without any one with curved hairline when both parents had straight hairline. Using the transmission pattern observed by Mendel on the assumption that the allele for curved

hairline is dominant (W) and that for straight hairline is recessive (w). So an individual that expresses the curved hairline may have the genotype WW (homozygous) or Ww (heterozygous) while one that expresses straight hairline will have the genotype ww (Batul, 2010).

This means that when both parents had curved hairline, the cross may be; WW x WW ---- giving rise to only WW offspring or WW x Ww ---- giving rise to both Ww and WW offspring in the ratio 1:1 or Ww x Ww ---- giving rise to WW, Ww and ww offspring in the ratio 1:2:1 with a phenotypic ratio of 3:1 (curved: straight). So from the table only the third cross is possible since there were offspring with

curved and straight hairline. They produce 6 offspring with 3 curved hairline and 3 with straight hair (table ii row 3). This is not exactly in conformity of with the results of the cross above but the discrepancy would have resulted from different genetic constitution of the parents which might not have been Ww x Ww.

When both parents had straight hairline (table ii row 4), they are controlled by a pair of recessive gene each as suggested by Debopriya (2008). The cross is; ww x ww -- they produce only ww offspring (straight hairline) The 77 offspring with all straight hairline resulting from when both parents were straight hairline agrees with above cross.

The pattern of inheritance cannot be sex-linked because a critical look at table ii shows that both male and female offspring had curved and straight hairline and vice versa despite whatever trait possessed by either of the parents (mother or father). The different degrees of shapes of the hairline might suggest polygenic but not because there are no intermediate hairline shapes noted.

Therefore the inheritance pattern of hairline shape follows the dominant-recessive pattern in tandem with mendelian principles with the curved hairline shape being the dominant allele and the straight hairline shape being the recessive allele despite the recessive (straight hairline) seen more in the population. This is supported by findings of Debopriya (2008), who stated that a widow's peak (curved hairline) is a dominant trait, and a straight hairline is recessive and Odion et al (2008) when they carried study with 355 students of Delta State University from the Niger Delta region of Nigeria, and found that the

percentage of those with the dominant feature of curved hairline were approximately at the same ratio in both sexes and was not up to 50% of the population studied meaning that dominant traits are not necessarily seen more in the population.

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