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INHERITANCE PATTERN OF MID-DIGITAL HAIR AMONGST IGBO TRIBE OF NIGERIA

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ABSTRACT

The inheritance pattern of mid-digital hair among Igbo tribe was investigated. A total of 648 individuals were studied comprising 400 parents and 248 offspring (121 males and 127 females) from Igbo families. The expression of mid-digital hair trait was observed, noted and pictures taken. After analysis of data obtained from the 200 families, it was observed that mid-digital hair was more common in males than females. The presence of mid-digital hair was found to be dominant over its absence following an Autosomal Dominant-Recessive pattern of inheritance. It was concluded that observation of mid-digital hair trait might be suitable for genetic analysis.

Key Words: Inheritance, Pattern, Mid-digital hair, Igbo.

INTRODUCTION

Most mammals have digits found at the upper and lower extremities (www.wekipedia.org/wiki/digit_anatomy).

There are five digits on each extremity. Each digit is formed by several bones called phalanges, joined at the interphalangeal joints and surrounded by soft tissues (McMinn, 1994). The proximal phalange articulates with the carpal bones at the metacarpophalangeal joint (Agur and Lee, 1991). Every human finger normally has a nail on its distal phalanx. In between the joints is the mid digit. On the middle segment of fingers there can be presence or absence of hair. The presence or absence of mid-digital hair in human beings is a trait that is determined genetically (Danforth, 1921).

Genetics is the study of genes; the basic unit of hereditary (William and Dianne, 2005). Hereditary is the process of transmitting biological traits from parents to offspring through genes (Thomas and Maugh, 2008). The manner and ways in which these traits are passed from parents to offspring is known as pattern of inheritance.

The patterns of inheritance described includes; Autosomal Dominant-Recessive, Polygenic, X-Y Linked and Mitochondrial

inheritance. Autosomal Dominant-Recessive inheritance inheritance involves 2 pairs of contrasting characters (allele) controlling one trait where one of the allele (recessive) is masked by another allele (dominant) when they occur together. The recessive can only manifest in homozygous forms (Molly et. al, 2010). In 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).

Danforth (1921) examined the genetic basis of mid-digital hair by comparing parents and offspring. The presence of hair on the middle segment of fingers is found to be an autosomal dominant trait (Radhakrishnan, 2009) Bernstein and Burks (1942) and Bernstein (1949) suggested a hypothesis of five different alleles, having increasing dominance in phenotypes A_0, A_1, A_2, A_3 and A_4, to govern the distribution of middle phalangeal hair. The subscript corresponds to the number of fingers the alleles cause to be affected. Thus, according to them, a person without middle phalangeal hair would be known A0 phenotype having A_0 A_0 genotype. (Dutta, 1965).

The second largest group of people living in the southern parts of Nigeria is the Igbo.
They make up Abia, Anambra, Ebonyi, Enugu and Imo states, as well as, parts of Delta, Akwa Ibom and Rivers states (http://www.umunna.org/igbos.htm). The official population count of ethnic groups in Nigeria has remained controversial. The Central Intelligence Agency (CIA) World Fact book however, puts the Igbo population (including the various subgroups of the Igbo) at 18% of a total population of 152 million or approximately 27 million (http://en.wikipedia.org/wiki/Igbo_people).
They are culturally and socially diverse consisting of several sub groups of Igbo speaking people. They are located in southern Nigeria occupying about 15800 square miles (4100sq km) at latitude 9.10N and longitude 8.65E. They occupy the low lying deltas and riverbanks, central belt high planes and the Udi highlands. The predominant occupation is farming though many have diversified into business world both at home and abroad.

MATERIALS AND METHOD

A total of 648 individuals were studied; 400 parents and 248 offspring (121 were male and 127 female) from 200 Igbo families; residing in Imo, Enugu, Abia and Anambra States. Digital Camera; used to obtain pictures of subjects exhibiting the various traits. Data sheet for recording the absence or presence of observed traits.
Data collection was always preceded by detailed explanation of the significance of the study to the subjects as most individuals were reluctant to have their pictures taken. Subjects were asked to stretch out their hands and careful examination of the middle segment of their fingers for the presence or absence of hair was done under bright light.

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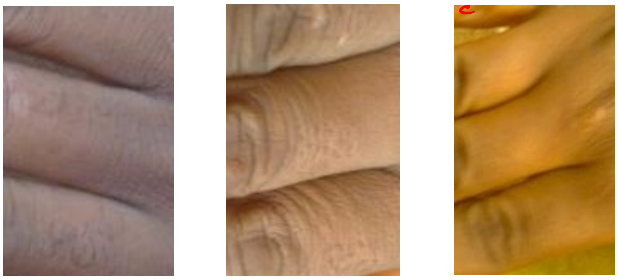
RESULTS

Below are family prototypes under which other families fall:

Father (absent) Mother (absent) Child (absent)

Figure 1: The trait is the same in father, mother and child



Father (present) Mother (present) Child (absent)

Figure 2: The trait is the same in both parents but different in child

Father (absent) Daughter (absent) Mother (present)

Figure 3: The trait is the same in father and daughter but different in mother

Father (present) Mother (absent) Son (present)

Figure 4: The trait is the same in father and son but different in mother

Father (present) Mother (absent) Daughter (absent)

Figure 5: The trait is the same in mother and daughter but different in father

Father (present) Mother (absent) Son (absent)

Figure 6: The trait is the same in mother and son but different in father

Table (i) Showing Distribution and Frequency of Mid-digital Hair in the General Igbo Population

	Mid-digital hair present		Mid-digital hair absent	
	No.	%	No.	%
Father	150	75%	50	25%
Mother	74	37%	126	63%
Male offspring	61	50.4%	60	49.6%
Female offspring	39	30.7%	88	69.3%
Total	324	50%	324	50%

Table (ii) Presence of Mid-Digital Hair

	No. of families	Total no. of offspring	Male offspring	Female offspring
Present in father alone	41	48	29	19
Present in mother alone	6	6	3	3
Present in both parents	36	42	25	17
Absent in both parents	4	4	4	0
Total		100	61	39

Table (iii) Absence of Mid-Digital Hair

	No. of families	Total no. of offspring	Male offspring	Female offspring
Absent in father alone	7	8	3	5
Absent in mother alone	57	64	25	39
Absent in both parents	35	45	19	26
Present in both parents	30	31	13	18
Total		148	60	88

From tables 4.1.2 and 4.1.3 above, when mid-digital hair was present in both parents, both offspring with mid-digital hair (42) and offspring without mid-digital hair (31) were found. Although when mid-digital hair was absent in both parents, both offspring without mid-digital (45) and offspring with mid-digital hair (4) were also found. The number of offspring with mid-digital hair (4) is almost insignificant when compared to the other figures.

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DISCUSSION

From table 1, the presence and absence of mid-digital hair among Igbos in this study have an equal frequency of 50%. This is in contrast to the results obtained by Danforth (1921), Beckman and Book (1958) and Matsunaga (1956) who all found that the frequency of mid-digital hair in North America, Sweden and Germany respectively is about 70%. Matsunaga (1956) also found that the frequency of mid-digital hair in the Japanese is 40%. Saldanha and Guinsburg (1961) reported that over 10% of a sample of Brazilians had mid-digital hair on one hand but not the other. They found that the population frequency of people with mid-digital hair ranges from 2% in Eskimos to about 75% in people of northern European ancestry (McDonald, 2010). This shows that there is geographical variation in the frequency of mid-digital hair.

Mid-digital hair was found to be more common in males (75% of fathers and 37% of mothers). This may be as a result housework such as washing and cooking. Despite this difference in the frequency in males and females, from tables (ii) and (iii), mid-digital hair was passed almost equally to male and female offspring. That is, there was father to son, father to daughter, mother to son and mother to daughter transmission, as shown in figs (i-vi), implying that mid-digital hair is not X-linked.

When mid-digital hair was present in parents, 42 offspring with mid-digital hair and 31 offspring without mid-digital hair were found. When mid-digital hair was absent in both parents, 45 offspring without mid-digital and 4 offspring with mid-digital hair were also found. This is similar to the results obtained by Bernstein and Burks (1942). They noted that the 20 offspring with mid-digital hair they found when both parents did not have mid-digital hair could be explained if some of the mothers were really women whose mid-digital hair follicles had been worn away by housework. This may also be the case in this study as the number of offspring with mid-digital hair (4) found when mid-digital hair was absent in both parents is insignificant when compared to the other figures and the total number of offspring in the population. Also since no tests were done to ascertain the true parentage of the offspring, hidden adoption or false paternity may also be the reason for the deviation of the four offspring.

Therefore, the presence of mid-digital hair is an autosomal dominant trait (single gene or Mendelian inheritance pattern). Using the transmission pattern observed by Mendel to further prove this on the assumption that the allele for the presence is dominant (H) and that for its absence is recessive (h). As shown, the presence of mid-digital hair is dominant over its absence so an individual that expresses the presence of mid-digital hair may have the genotype HH (homozygous) or Hh (heterozygous) while one that expresses absence of mid-digital hair will have the genotype hh (Port, 2007).

This means that when both parents have mid-digital hair, the cross may be; HH x HH ---- giving rise to only HH offspring or HH x Hh ---- giving rise to both Hh and HH offspring in the ratio 1:1 or Hh x Hh ---- giving rise to HH, Hh and hh offspring in the ratio 1:2:1. They produce both 42 offspring with mid-digital hair and 31 offspring without mid-digital hair (tables' ii and iii). When both parents don't have mid-digital hair, they are controlled by a pair of recessive gene each as suggested by Saldanha and Guinsburg (1961). The cross

is; hh x hh ---- they produce only hh offspring (offspring without mid-digital hair) and 4 offspring in table ii with mid digital hairs. These 4 offspring is actually a deviation from the mendellian crosses but might be due to the reasons already given above.

REFFERENCES

Agur, A.M.R & Lee, M.J (1991).Grants Atlas of Anatomy, 9th ed. Williams & Wilkins, Maryland USA, pp 256-258.

Beckman, L. and Book, J.A. (1958). Distribution and Inheritance of Mid-digital Hair in Sweden, The State Institute for Human Genetics, Uppsala, Sweden, Retrieved 14/07/2011.

Bernstein, M.M. (1949): The mid-digital hair genes,Journal of Heredity **40**, 127-131.

Bernstein, M.M. and Burks, B.S. (1942).The incidence and Mendelian transmission of mid-digital hair in man, Journal of Heredity **33**, 45-53.

Brothwell, D. and Molleson, T. (1965). The frequency of Middle Phalangeal Hair in Britain, The Eugenics Review **3**, 131-135.

Danforth, C.H. (1921). Distribution of hair on the digits of man, American Journal of Physical Anthropology **4**, 189-204.

Digits in Anatomy, www.wekipedia.org/wiki/digit_anatomy, Retrieved 29/10/12.

Dutta, P.C. (1965): Variability of Middle Phalangeal Hair among Indian Populations, JSTOR: The Journal of the Royal Anthropological Institute of Great Britain and Ireland, Page 115.

Hatiboğlu, M.T. (1983): The Hair Distribution of the Phalanges of the Hand among Turks, Journal of Anatomy, (137) **3**: 537-540.

http://en.wikipedia.org/wiki/Igbo_people, Retrieved 20/06/2011.

http://www.umunna.org/igbos.htm, Retrieved 26/06/2011.

http://www.wiki.answers.com/topic/inheritance-pattern, Retrieved 20/06/2011.

Ikoma, E. (1973). A genetic study on digital hair, Japanese Journal of Human Genetics **18:** 259-273.

McMinn, R.M.H (1994). Last's Anatomy Regional and Applied, 9thed, Churchill Livingstone United Kingdom, pp 137-140.

Molly, K., Houghton, M. and Dawei, J. (2010).Observation of Alleles.International Publication on Dominant and Recessive Alleles, **5**: 45-47.

Nussbaum, R.L., Roderick R.M. and Huntington F.W. (2007). Genetics in Medicine, 7thed, Philadelphia, Saunders, pp 205.

Port, T. (2007). Complete Dominance of Mid-digital Hair, Hand clasping and Bent Finger, Suite 101, Retrieved 11/06/2011.

Radhakrishnan, B. (2009). How Genetics Influences Hair Growth: The Development of Mid-digital Hair, Bright Hub, Paul Amold, Retrieved 30/06/2011.

Saldanha, P.H. and Guinsburg, S. (1961). Distribution and inheritance of middle phalangeal hair in a white population of Sao Paulo, Brazil, Human Biology **33**, pp 237-249.

Thomas, H. and Maugh II (2008) "Hereditary". Microsoft@student2008redmond, WA, Microsoft Corporation.