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The Role Of Genetic Inheritance In The Development Of Palmar Creases

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ABSTRACT

The study investigated the role of genetic inheritance in the development of palmar creases. Various generations of ten families involving 128 in the South Eastern part of Nigeria were studied. The pedigree of the first family affecting four generations was subjected to statistical analysis to determine the influence of inheritance in the pattern of palmar creases of the family members. The role of genetics was found to be highly significant ($p < 0.001$) furthermore a careful observation of the pedigrees of the other families gave a clear indication of the role of genetics in the development of creases. Therefore, genetics is seen to have a positive role in the formation of palmar creases. However, the mode of inheritance, whether monogenic or polygenic needs to be determined.

Keywords: Palmar crease, pedigree, genetic inheritance.

Palmar creases are generally regarded as flexion creases occasioned by the folding of the foetal hand in-utero. There has been some controversy whether these creases are mere incidental occurrences or are controlled by genetic factors. Tay J.S. (1979) in his study posited that genetic factors are responsible for the pattern of palmar creases observed in any particular individual. It was the purpose of this study to investigate this matter in an African population using generations of some families.

MATERIALS AND METHODS

The palmar creases of members of ten families were studied. In 4 families the study covered four generations involving parents, children, grandchildren and great grand children designated as P, F1,F2, and F3 generations respectively. In 3 families the study covered up to the third generation (ie F2 generation) while in 3 families it stopped at the second (F1) generation. Because of the resentment people have in this environment towards studies involving the investigation of their palms, all those involved in this study were thoroughly briefed on the purpose of the study and their consent was obtained. They were reassured that the study was purely for scientific and not for palmistry purposes. The patterns of their creases were drawn on an empty sketch of a hand (fig.1). the names and positions occupied in the families were carefully recorded. Chi squared (x^2) test was used to ascertain the statistical significant of the observations.

RESULTS

There were ten families studied involving a total number of 128 subjects. Among the 4 families with 3 generations of children studied, there were 63 subjects while the families with 2 generations of children had 44 subjects. The last 3 families with only the F1 generation has 21 subjects.

In a previous study of the general pattern of palmar crease in this population (Okoro and Uloneme 2004), five different patterns were identified. They were designated **a to e in this manner (Fig.2).**

a. 2 palmar creases
b. 3 unjoined palmar creases
c. 3 creases joined at a distance from the radial border of the palm
d. 3 creases joined at the radial border of the palm
E. 4 palmar creases.

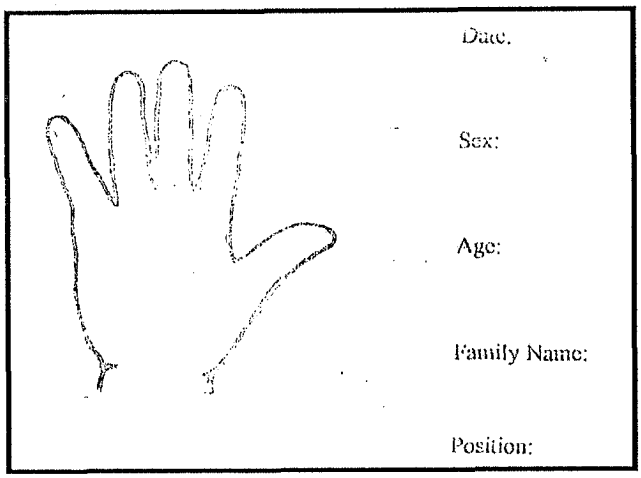

Fig. 1: Empty sketch of the right hand for the study.

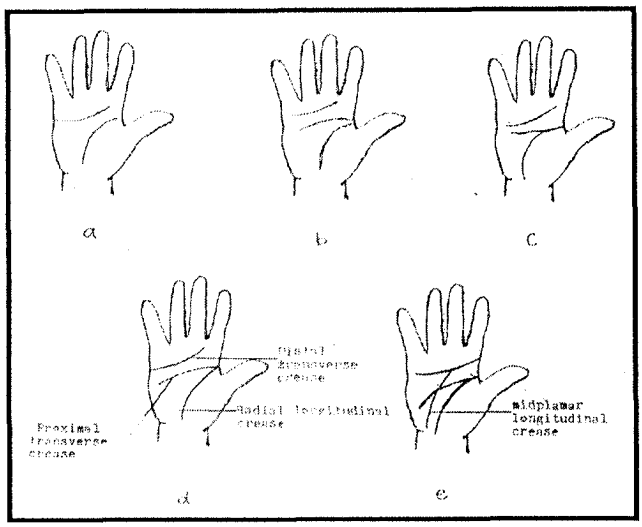

Fig. 2: Patterns of major palmar creases observed in the subjects.

The pedigrees of the 4 families with 4 generations (P to F3) are thus demonstrated.

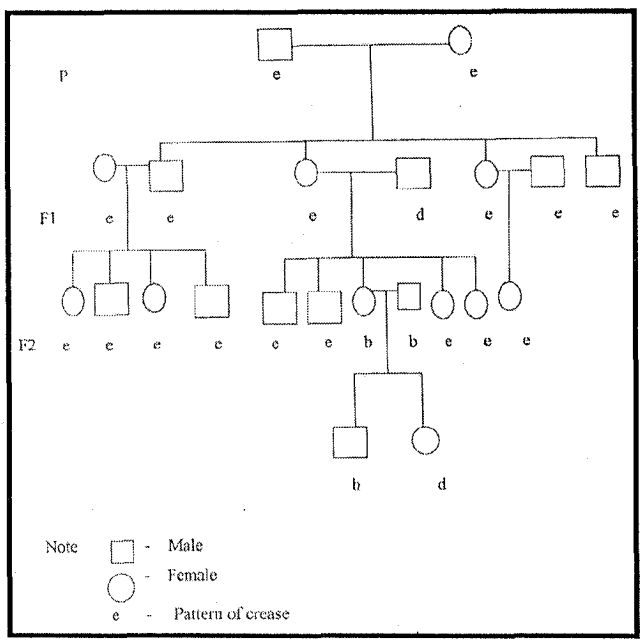

Fig. 3: Pedigree of Family 1.

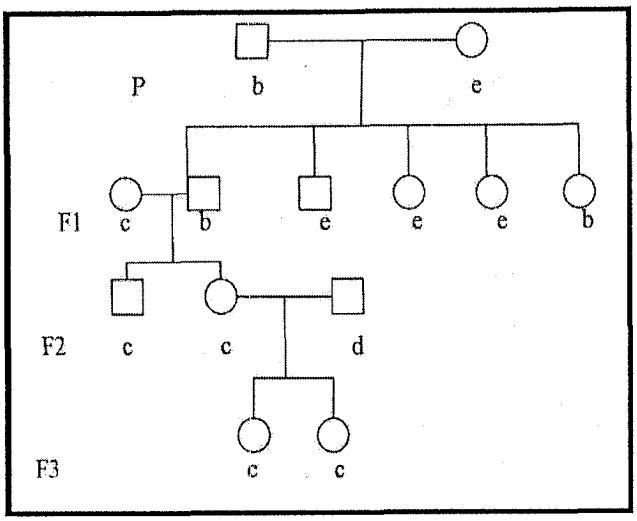

Fig. 4: Pedigree of Family 11

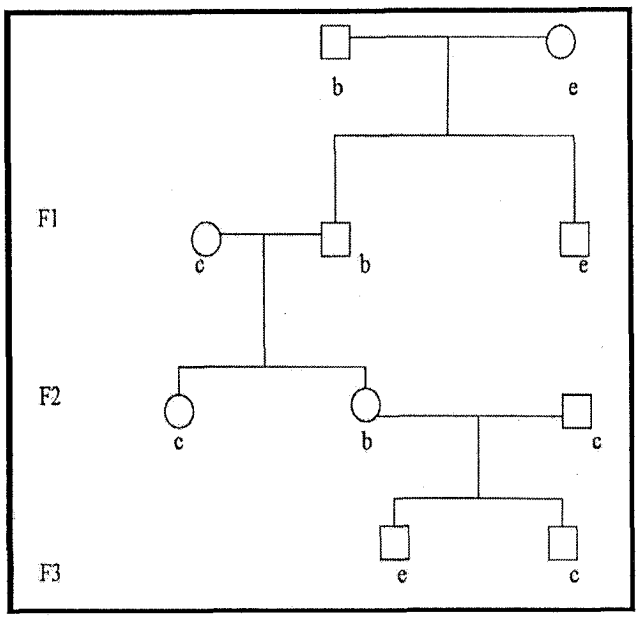

Fig. 5: Pedigree of family 111

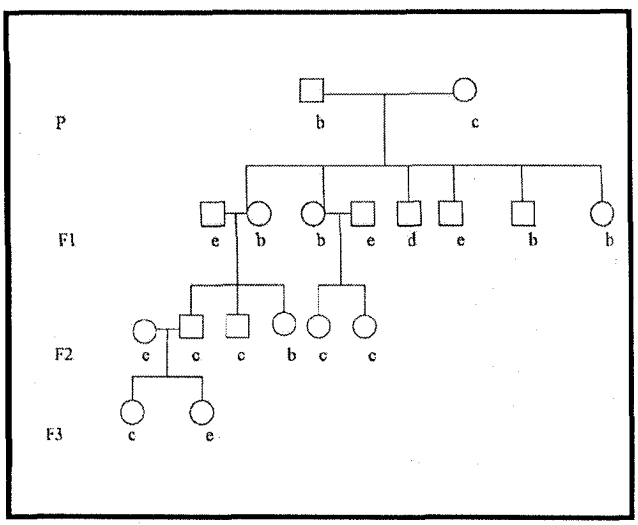

Fig. 6: Pedigree of family IV

Table 1. Chi-squared (X^2 values for family 1 (Fig.3)

No. of creases per hand	Observed numbers (o)	Expected Numbers (E)	$\frac{(O-E)2}{E}$
2 creases (a)	O	22(0.015) = 0.3	$\frac{(-0.33)^2}{0.33}$ = 0.33
3 creases (b c d)	5	22(0.64) = 14	$\frac{(5-14)^2}{14}$ = 5.78
4 creases (e)	17	22 (0.35) = 7.7	$\frac{(17-7.7)^2}{7.7}$ = 11.23
Total	**22**	**22**	

X^2 = 17.3
P = <0.001
Note: Expected figures were calculated from a previous study (Okoro and Uloneme 2004).

Frequencies In A Previous Study (Okoro & Uloneme 2004).

Table II: Frequencies of different crease patterns among the families with 4th generation.

Pattern of crease	Number	Percentage
2 creases (a)	0	0
3 unjoined creases (b)	15	23.8
3 joined for a distance (c)	17	27.0
3 joined at the radial border (d)	4	6.3
4 creases (e)	27	42.9
Total	**62**	**100**

Table III: Frequencies of different crease patterns among families with 2nd & 3rd generations

Pattern of crease	Number	Percentage
2 creases (a)	0	0
3 unjoined creases (b)	21	32.3
3 joined creases at a distance (c)	16	24.6
3 creases at radial border (d)	10	15.4
4 creases (e)	18	27.7
Total	**65**	**100.0**

DISCUSSION

This study was carried out to find the influence of genetic factors in the development of palmar creases in the foetus. It has been observed that these creases form in the foetus between the 8th and 13th foetal weeks of gestation (Steven et al 1988). However, what is responsible for their formation? Are they merely formed by the way the foetus folded its hand in the uterus or are they influenced by genetic factors?

In a study of 54 American Caucassian families, comprising of 1131 subjects, Morgan et al (1978), observed that there were similarities between the pattern of the creases of the parents and offsprings. They concluded that there must be genetic influence in the formation of the palmar creases and even went ahead to suggest that the inheritance may be by monogenic determination. Tay J.S.(1979) also studied 659 Chinese children and 613 first degree relatives with regard to four variations in palmar creases. He found that with the exception of the Sidney line, the studied variations occurred with

significantly increased frequency in the parents of the propositi compared with controls. He concluded that genetic contribution was important in the formation of the creases. Same for Plato et al 1976, who studied the pattern in twins and siblings.

In this study it was discovered that because both parents (P generation) of family 1 (Fig. 3), had the e (4 palmar creases) pattern, most of the offsprings in the subsequent generations had the same pattern. When subjected to statistical analysis the observation was found to be highly significant. Though the numbers in the other families were not enough to be subjected to statistical analysis, a careful study of the pedigrees of those families showed a high degree of similarities between the patterns of the parents and their offsprings thereby suggesting the influence of genetic factors in the development of palmar creases. Therefore, this study is in agreement with the previously cited ones. However, whether the mode of inheritance is monogenic or polygenic is yet to be determined and may involve the use of non-human subjects.

Though genetic factors have been found to play an important role in the development of palmar creases, other environmental factors that might affect limb formation in the foetus before the 8th week may significantly alter the pattern of the crease in that particular individual (Steven LA et al 1958; Kimura 1991).

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