PHENOTYPICAL EXPRESSION OF FINGER PRINT PATTERNS A HYPOTHESIS

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Summary The finger print patterns (F.P.Ps.) were studied in 1120 healthy individuals of Bundelkhand region. It was found that the type of F.P.Ps. in one particular hand, is dependent upon the finger on which the pattern is manifested, and the specific print patter on the corresponding finger of the other hand. It is discussed that the phynotypical expression of F.P.P. is due to the interaction between various factors including the hypothetical 'F.P.P. Genes' among themselves and/or with the 'specific finger genes'.

Key words : Finger Print Pattern (F.P.P.) phenotypical expression

INTRODUCTION

The F.P.Ps. are permanently established by the 17th week of intra uterine life (2). They develop into basic patterns namely Whorl (W), loop (L) and Arch (A); the first two patterns have been further subdivided into whorl (W) whorl composite, (WC) and Ulnar loop (UL) and Radial loop (RL) respectively (1). Their genetic interrelationship is well documented (5). Slatis *et. al.* (7) found that variety of genes can affect the phenotypical expression of F.P.Ps. Blood Group (3) and prenatal disturbances in metabolism (8) have already been reported to affect the F.P.Ps. Two more factors affecting the phenotypical expressions of F.P.Ps. are evaluated and discussed in this study.

MATERIAL AND METHODS

The F.P.Ps. of both left and right hands of 1120 healthy individuals of either sex from the Bundelkhand region were selected for the present study.

For collecting the data, the impressions of finger prints were recorded by first smearing the finger tips with Indian ink and then rolling them from left to right over the glossy paper as described by Saha (6). Using the magnifying hand lens, the patterns were studied and classified into various types based on the nature of triradius and the shape of the central core.

RESULTS

The distribution of F.P.Ps. in different fingers of both hands were tabulated. As there were little note worthy differences between the findings of left and right hands, we merged together the values in a fingerwise manner (Table I). The statistical significance for the association of F.P.Ps. with the fingers was studied. We found that a particular type of pattern occurs more frequently in a specific finger rather than to be randomly present in all the fingers. The association is highly significant ($P<0.001$).

To study the association frequency of each F.P.P. with all print patterns in the corresponding fingers of both hands in the same individual, Table II was formulated.

TABLE I : Showing the distribution of F.P.Ps. in different fingers.

Finger print patterns	*Fingers*				
	Thumb	*Index*	*Middle*	*Ring*	*Little*
W	560	756	470	1296	458
WC	552	152	82	68	16
UL	1074	888	1560	846	1704
RL	16	244	16	6	4
A	38	200	112	24	58

TABLE II–A: Showing the association frequency of F.P.Ps.

Finger print patterns of one hand	*Finger print patterns in the corresponding fingers of other hand of the same individuals*		
	L(UL + RL)	*W(W + WC)*	*A*
L(UL + RL)	2530	1026	130
W(W + WC)	1026	1734	0
A	130	0	180

TABLE II–B : Showing the association frequency of F.P.Ps.

F.P.P. in the finger of left hand	*Corresponding finger in the right hand*	
	F.P.P. which can be present	*F.P.P. which cannot be present*
1. Whorl	Whorl, Loop	Arch.
2. Loop	Whorl, Loop, Arch.	——
3. Arch.	Arch, Loop	Whorl

F.P.P. = Finger Print Pattern.

The tables indicate a significant finding that whenever Arch pattern is present in a particular finger of one hand, the whorl/whorl composite patterns is found absent from the corresponding finger of the opposite hand and viceversa.

DISCUSSION

Though the F.P.Ps. are genetically determined, the simple relationship between gene and phenotype that occur for biochemical factors cannot be observed here. They may be the most complex example available of the genetic determination of a normal morphological characteristic in people (7).

The observed tendency of particular type of F.P.P. to be frequently present in a specific finger could be due to the influence of hypothetical 'specific finger genes' which by suppressing and/or favouring the parental F.P.P. genes permit any one of the specific pattern to be expressed phenotypically.

Theoretically the association frequency of five print patterns taken together with the corresponding fingers of the opposite hand can give rise to fifteen possible associations i.e. W-W, W-WC, W-UL, W-RL, W+A, WC-WC, WC-UL, WC-RL, WC-A, UL-UL, UL-RL, UL-A, RL-RL, RL-A and A-A. Out of these thirteen associations were seen, while W-A and WC-A associations were not observed at all (4). We put forward a hypothesis to explain the complete non-occurance of W-A and WC-A combinations by assuming that the Arch genes and whorl or whorl composite genes are responsible for the appearance of their respective patterns and during the intra uterine life, there is interaction between Arch genes of a finger with the whorl or whorl composite genes of the corresponding finger of the opposite hand to the extent of suppressing one set of genes from expressing phenotypically. It could not be ascertained which set of genes act as a dominant and which one act as a recessive. To get a possible clue we are pursuing our studies by examining the F.P.Ps. in three successive generations.

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