Indian J. Applied & Pure Bio. Vol. 29(2), 283-290 (2014).

A study on Inheritance of Dermatoglyphic traits (a-b Line) in Kurdish Tribes of Northern Khorassan Province

Hossein R. Nezhad[1] and Nasser M. Shahri[2]

[1]Department of Biology, Shirvan Branch, Islamic Azad University, Shirvan, Khorassan (Iran)
[2]Department of Biology, Faculty of Sciences, Ferdowsi University of Mashhad, Mashhad (Iran)

Abstract

The inheritance of dermatoglyphics has been examined for a long time. There is a plenty of evidence provided by different researchers showing inheritance of several dermatoglyphic traits.

In this study, 184 samples (48 households) were examined. These samples included Kurdish tribes residing in Northern Khorasan Province. In this method, the palms (of the subjects) were mixed with printing ink placed on a paper with a revolving cylinder moving forwards. After that, the similarities between dermatoglyphics (a–b line) of parents and children were explained using correlation coefficient (index of coefficient) and Index R.

The similarity between the palms of parents and children were explained in this study.

Considering the similarity of dermatoglyphic traits (a–b) between parents and children, the inheritance of dermatoglyphics among Kurdish Tribes in Northern Khorassan Province can be documented.

Key words: Dermatoglyphic traits, Kurdish tribes, Index of Coefficient.

The Genetics of Dermatoglyphics :

Dermatoglyphics are cutaneous ridges on fingers,palm and soles formed in the course of early intrauterine life from the 7th to the 27th week[1].

The inheritance of dermatoglyphics

has been discussed for a long time. Galton has written in *Fingerprint Book* "some researchers on inheritance of dermatoglyphics believe in this trait while some refute it"[6].

A few contemporary scientists and authors were dubious about this trait. Forgeot (1892) argued that there was no evidence proving the inheritance in fingerprints even in three successive generations. Locard and Saint (1906) concluded from their studies that the traits of fingerprints could not be inherited through the successive generations. Stokis (1908) also argues that the inheritance of dermatoglyphics was only a myth. The mentioned scientists and others regarded the inheritance of dermatoglyphic traits and fingerprints as the repetition of the same sizes and forms of fingers of parents inherited by children. It is clear that their conclusion was wrong due to their inappropriate method[3].

There are several studies carried out by different researchers proving the inheritance of dermatoglyphic traits. These studies have shown that genetic disorders could be observed among monozygotic twins. These twins have more similarities in different dermatoglyphic traits such as genetic and physical ones compared to non-twin individuals.

Hereditary studies relating to qualitative traits of Dermatoglyphics :

Galton studied the types of dermatoglyphics in the fourth fingertip among 105 pairs of brothers and sisters. He compared the obtained results with a non-relative group and finally concluded that the similarity of this forms between the brothers and sisters was more than the non-relative individuals and also more considerable statistical probability.

Galton[6] regarded the obtained results as the inheritance of dermatoglyphic traits.

Wilder has provided another genealogy in which family members have dermatoglyphic forms in the region of heel with low probability which rarely happen. The probability of such forms is almost 1 percent among ordinary people. Also, we can conclude from this genealogy that this trait can be inherited from generation to generation and most likely through autosome[14].

Heindle made no attempt to discover different types of inheritance relating to fingertips and he just carried out an analysis of proximal loop form towards the little finger in the fourth left finger of a patient from the third generation and concluded that its mother had the same form in the three fingers of hers.

Bonnevie examined about two hundred people plus some twins. Then, he developed his study in 321of their children and concluded that three independent factors can be inherited from generation to generation as follows:

(1) The quantitative value of the forms or finger count ridge
(2) The proportion of width to the length leading to circular or oval form
(3) The way of twisting the lines

He also has indicated that some other factors such as structure, form and dermatoglyphics can be inherited from generation to generation. Bonnevie also argued that the difference between various forms of fingertips indicates that not only different fingers are not

independent but also each one makes up a part of complicated genetic mechanism[1].

Also, Gronberg studied similar fingers in 390 pairs of monozygotic and dizygotic twins and concluded that 80 percent of monozygotic ones were similar and 63.4 percent of dizygotic twins were similar to their family data. The percentage reaches 80.9 when their parents have loop form and 70.8 percent of them inherit the forms from their parents when their fingertips are whorl. He also argued that these similarities indicated the inheritance of fingertips and finally concluded that the types of fingertips were generated by the two factors of pairs *i.e.* XY and YY with nine genotypes[7].

Gronberg studied the line of loop and whorl forms among the twins and non-relative individuals. 92.8 percent of the similar fingers had the same forms and lines among monozygotic twins while this proportion was 48.7 percent among dizygotic ones and 73.4 percent among non-relative individuals. So, considering the difference among monozygotic and dizygotic twins and non-relative one we can conclude that the lines of forms can be inherited from generation to generation.

Correlation Coefficient :

Coefficient of correlation indicates the relationship for one trait in two samples and is used in genetic studies[12].

Correlation is referred to the relationship between two variables and correlation coefficient represents the value of this relationship. Thus, correlation coefficient is a parameter to express co linear changes between two distributions. The value of correlation coefficient ranges from -1 to +1; therefore, its absolute value must not be greater than 1. The sign of correlation coefficient determines the direction of changes. The positive values of correlation coefficient indicate direct relationship and correlation between two variables i.e. the increase or decrease in two variables has the same direction. The negative values of correlation coefficient indicate the reverse relationship and correlation between two variables so that the increase or decrease in the two variables is in an opposite direction i.e. when a variable increases, the other one decreases and vice versa. If the absolute value of correlation coefficient is close to 1, the correlation between the two variables will be complete.

The values of zero or close to zero of correlation coefficient indicate that changes in a variable give us no information about changes in the other one. Of course, notice that correlation coefficient of zero must not be regarded as the independence of the two variables from each other[5].

The most common correlation coefficient is *Pearson correlation coefficient* and it is used when the observations measured on a value scale. The correlation coefficient between the two variables of X and Y can be obtained from the following formula:

$$R = \frac{N \Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N \Sigma X_2 - (\Sigma X^2)][N \Sigma Y_2 - (\Sigma Y^2)]}}$$

The following chart provides a general outline for the concept of correlation coefficient:

General concept	correlation coefficient
Very Weak	0 – 19
Weak	0.2 – 0.39
Medium	0.4 – 0.59
Strong	0.6 – 0.85
Very Strong	0.86 – 1

This research has been carried out amongst Kurdish tribes that are living in Northern Khorassan Provice. The origin of the kurds has been a source of controversy and uncertainty. After the Arab defeat of Iranian forces and conquest of the area in the seventh century, outsiders increasingly used the (Kurd) to refer to all people inhabiting the zagros mountain range to western Iran[4].

This research is an observational analytical and practical study. We studied the fingerprints of 48 families (184 samples).

The simplest method for printing ridge lines is ink printing method. To take prints using this method the following tools are needed: a smale fabric ink pad, a glass plate, an ink tube and a white sheet of study or cardboard.

First a few drops of ink are poured on the ink pad and then the ink pad is softly rolled on the glass plate until the ink uniformly spreads over its surface. Then the palm is completely inked using the ink pad and imprinted on the center of sheet.

In order to record all palm friction ridge details with clarity, light pressure is applied in the back of the hand. Biodata including, name, age, gender of the person whose palm prints are being recorded should also be written in the corner of the page[13].

Traditionally the ridge count is defined as the number of ridges that interseat or touch the line drawn from the easily triradius (where three ridges meet),[11].

In this study, the correlation coefficient of right hand count ridges between mother and daughter is r = 0.57, mother's left hand dermatoglyphics and daughter's right hand is r = 0.63, father's hands and son's left hand is r = 0.80, mother's right hand and son's hands is r = 0.51, mother's hand and son's right hand is r = 0.45, mother's hands and son's left hand is r = 0.71, father's hands and son's hands is 0.43, father's hands and children's hands is r = 0.29, mother's hands and children's hands is r = 0.60, parents' hands and son's hands is r = 0.58 and finally parents' hands and daughter's hand is r = 0.54.

Another important factor is P-Value which its value is p = 0.002 (between the count ridges of mother's right hand and daughter's hand) and mother's hand and the average of daughter's hands is P = 0.004, mother's left hand and daughter's right hand is P = 0.001, mother's left hand and daughter's hand is P = 0.001, mother's hands and daughter's right hand is P = 0.001, father's hand and son's left hand is P = 0.016, mother's right hand and son's hands is P = 0.028, mother's hands and son's right hand is P = 0.083, mother's hand and son's left hand is P = 0.046, father's hands and son's hands is P = 0.044, father's hands and children's hands is P = 0.047, mother's hands and son's hands is P = 0.005, mother's hands and daughter's hands is P = 0.001,

mother's hands and children's hands is P = 0.001, parents' hands and son's hands is P = 0.004, and finally parent's hands and daughter's hands is P = 0.001.

Considering the above-mentioned values, we can see that most of the P coefficients' values are lower than 0.05; in other words, the relationship is meaningful. (Figs. 1-4)

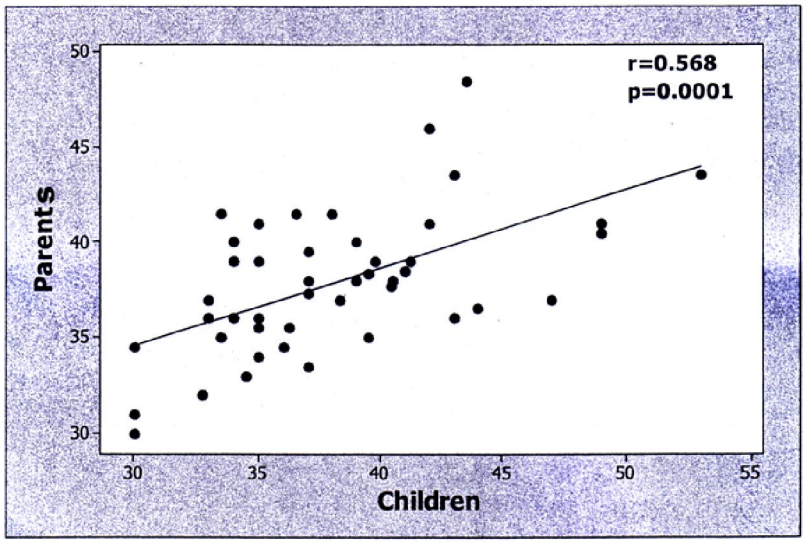

Fig 1. Correlation between count ridges of parents and children

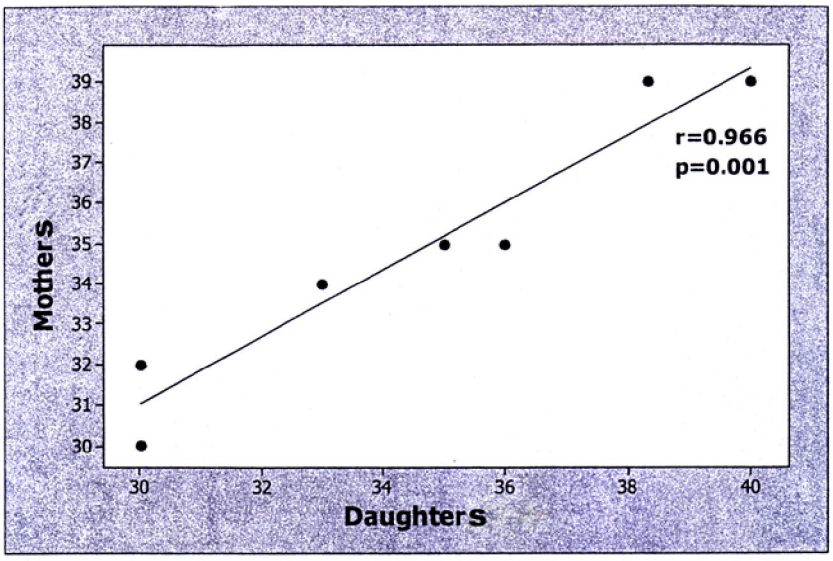

Fig 2. Correlation between of count ridges of mothers' left hands and daughters' right hands

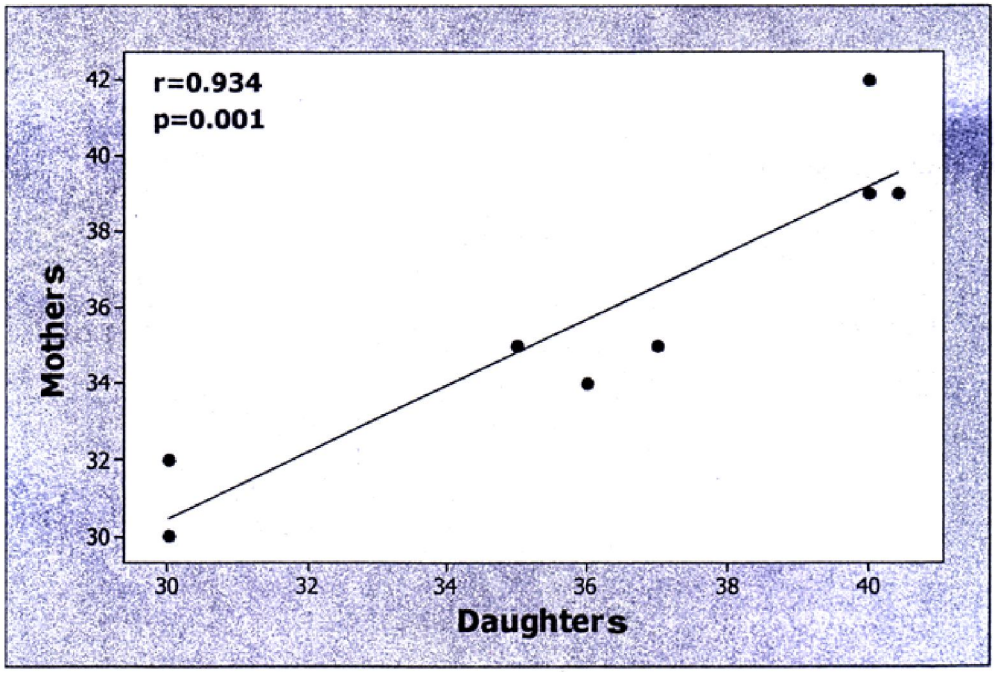

Fig 3. Correlation between of count ridges of mothers' left hands and daughters' hands

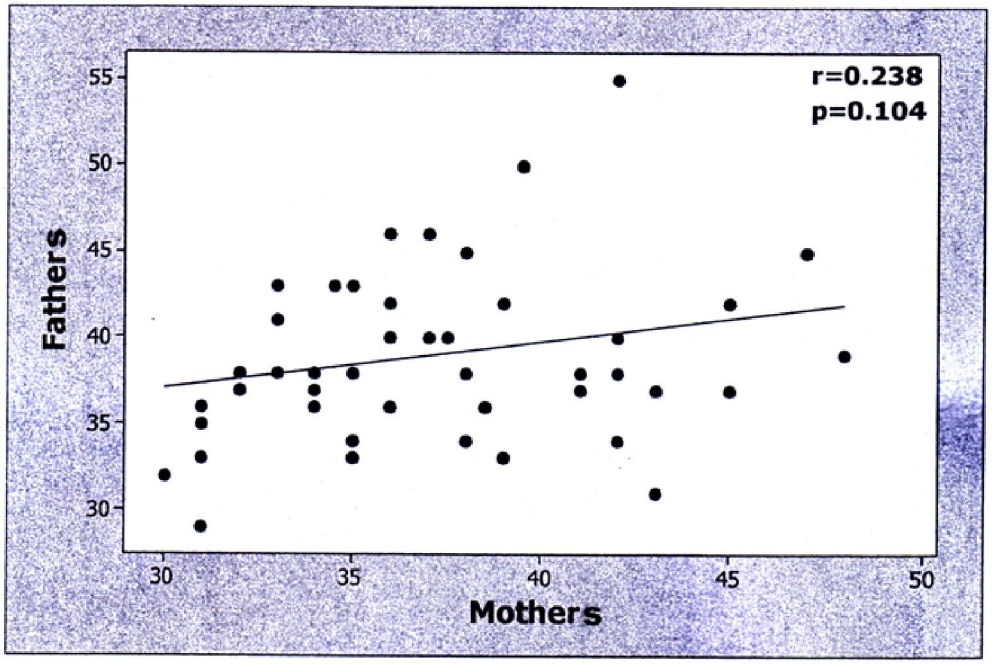

Fig 4. Correlation between of count ridges of fathers' and mothers' hands

Regardless of correlation coefficient in this study, we will find out that this coefficient of dermatoglyphics between mother's and daughter's right hand is r = 0.63 and due to the results obtained from Fang's Study about mother's and daughter's dermatoglyphics, we will have: r = 0.23 indicating strong correlation[8]. Also, considering the correlation coefficient between mother and child which measured up to r = 0.31 in Pons' Study[10]; in this project, this coefficient between mother and son is r = 0.57 indicating strong correlation.

In this study, correlation coefficient between count ridges of father and son is r = 0.43 that indicates medium correlation but this coefficient between father and child in Fang's and Pons' Studies were assessed at r = 0.24 and r = 0.68 respectively.

Considering the above-mentioned points, it seems that this project has a higher value than the similar one (Fang and Pons). In other words, the inheritance of dermatoglyphics (a-b lines) in Kurdish tribes of Northern Khorassan Province has had better results than the similar tribes[9].

Therefore, correlation coefficient of count ridges of a-b between parent's and children's indicates a strong correlation on the whole. The highest value is related to mother's left hand and daughter's right hand *i.e.* r = 0.96 (very strong correlation) and the lowest value is related to fathers's hands and children's i.e.r=0.29(weak correlation)but generally, we can claim that correlation coefficient of count ridge between a-b line relating to parent's and children's is higher than 0.50 indicating a medium correlation.

There is another important factor i.e. P-Value which its value between mother's and daughter's hands is P = 00.01, mother's and children's is P = 00.01, parents' and son's hands is P = 00.04 and parents' and daughter's hands is P = 00.01.

Considering the above-mentioned values, we can see that the most of P's coefficients are lower than 0.05; in other words, there is no meaningful relationship among them.

The important point is the fact that Pearson's correlation coefficients indicate that there is a meaningful statistical relationship between parents' and children's hands (r = 0.58). Considering the correlation coefficient chart, we can find out that this value indicates a medium correlation and roughly reaching a strong correlation. Also, the value of P-Value between parents' and children's hands is P = 0.0001 which considerably lower than 0.05 indicating a meaningful relationship.

Pearson's correlation coefficient and P-Value indicate that there is no meaningful statistical relationship between father's (right, left and the average of the two hands) and mother's dermatoglyphics (right, left and the average of the two hands), because the values are r = 0.23 and P = 0.104 respectively indicating a weak correlation and the value of P is higher than 0.05. This point proves the inheritance of dermatoglyphics (a-b line). Although there is no genetic relationship between parents and they are genetically different, there is a genetic similarity between them and their children leading to a similarity in dermatoglyphics. Therefore, there must be a relationship between

dermatoglyphics and genes; in other words, the inheritance of dermatoglyphics has a genetic nature; otherwise, we cannot justify the similarity of dermatoglyphics between parents and children!

This paper is the result of a research project that has been funded by Islamic Azad University,Shirvan Branch .I am grateful to this university and its nursing students.

References:

1. Bonnevie, K., *J. Genet. 15:* 1-11.
2. Cummis, H. (1946) The ninth Harry Burr Ferris Lecture USA, p 561.
3. Cummins, H. and C. Midlo (1961) Fingerprints, Palms and Soles, An Introdoction to dermatoglyphics, Dover, New Yourk.
4. Entessar, N. (1992) Kurdish Ethnonationalism, Lynne Reinner, p 3.
5. Fang, T.C. (1950) Ph.D. Thesis, University of London, U. K.
6. Galton, F. (1982) Fingerprints, Mac Millan, London.
7. Gruneberg, H. (1928) *Abstamm. U. Vereb. Lehre. 46*: 285.
8. Holt, S.B. (1969) Genetics of Dermal Ridges, Spring field, p 400.
9. Kamali, M. S., D. Farhud (1989) Dermatoglyphics, Rasa Cultural Foundation, Iran, 1st Ed. P 96.
10. Pons, J. (1964) *Ann. Hum. Genet. 27:* 273.
11. Rezaei, H. and M.M. Shahri (2012) *Indian J. Applied and Pure Bio, 27 (2):* 185-190.
12. Saneii, S. H. (2012) Practical Biostatics, Andishmand, p 33.
13. Tafazoli, M., S. Dezfooli, T. Kazemi, H. Shahri and M. Mahdavi (2013) *Asian J. Med. Sci, 5 (2):* 19-25.
14. Wilder, H. (1904) *Am. J. Anat., 3:* 387.