

Research Article

Dermatoglyphics Study of a Group of Violent Criminals & Sexual Offenders in Erbil City

Karim J. Karim¹, Saifadin Khder Mustafa^{2*}, Mohammed A. Saleem³, Rebin A. Omar⁴

^{1,4}Department of Biology, Faculty of Science and Health, Koya University. Koya KOY45, Kurdistan Region – F.R. Iraq.

²Department of Medical Microbiology, Faculty of Science and Health, Koya University. Koya KOY45, Kurdistan Region – F.R. Iraq.

³Department of Biology, College of Science, University of Salahaddin-Erbil, Kurdistan Region – F.R. Iraq.

Abstract: According to scientists dermatoglyphics proved that is a very useful tool for identification of various gene-linked abnormalities and many human diseases. The aim of this study is to compare the differences in the finger ridge count (FRC) and fingerprint pattern. The study was conducted on 30 prisoners (15 violent criminals and 15 sexual offenders) and 30 students as a control group in Erbil city, Kurdistan Region, Iraq. Exemplar prints of prisoners were obtained from the Directorate of Erbil Central Prison, while for the control group fingerprints were obtained from the students of the biology department, Koya University by ink method to examine the differences between the fingerprint patterns. The result of fingerprint patterns showed that there was no significant difference between violent criminals and controls. The results of fingerprint patterns in sexual offenders showed a significant decrease of ulnar loop in both hands (right and left) ($P=0.001$) ($P=0.035$) respectively, when compared to the control group, while double loop increased significantly in both right and left hands ($P=0.001$) ($P=0.006$) respectively, when compared to normal social behaviors. Fingertip ridge counts of violent criminals showed no significant difference in most digits of both hands with exception of middle finger that increased significantly ($P=0.006$) ($P=0.022$) respectively, when compared with control group, while for the sexual offenders also there was no significant difference in most digits only index and little finger of right hand showed significant increase ($P=0.034$) ($P=0.033$) respectively, when compared with control group.

Keywords: Fingerprint patterns, Finger ridge count, Violent Criminals, Sexual offenders.

1. Introduction

Dermatoglyphics is utilized as a way to measure gene expression calculated by the prenatal environment (Ravindranath *et al.*, 2005). The fingerprints of both hands of each fingertip the number of ridges count provide a measure of fingertip growth activity during the early stage of fetal development (Kahn *et al.*, 2009). Dermatoglyphics patterns are developed during 12th to 13th week of intrauterine life and remain unchanged throughout life (Kiran, 2010). Exemplar print is a typical or standard specimen from a subject for the enrollment in a system during suspected criminal offense (Jahanbin *et al.*, 2010). In olden days commonly in case of criminal offense, there was specific type of fingerprint ink on paper cards to collect and make permanent exemplar fingerprint. This was

done by rolling each finger from one edge of the nail to the other. However, nowadays there is an up-to-date tool to collect fingerprint patterns such as live scan.

Sex chromosomal abnormalities are found more commonly among aggressively behaved and sexually disturbed prison inmates than in the general population, with the excess varying between 2 and 10 percent compared to the general population (Razavi, 1975). There is a correlation between the pattern of fingerprints and personalities of individuals, which is in consort upon previous works there was an interrelationship between the fingerprint patterns and personalities of individuals (Agarwal *et al.*, 2012). This kind of study has been beneficial for both analysis and recognition of some genetic disorder and this is based on the variation of fingerprint patterns as well as total finger ridge count (Sarviya *et al.*, 2011). In recent

years, interest in the medical application of dermatoglyphic analysis has increased among the clinicians (Andani *et al.*, 2012; Pal *et al.*, 2013). There is no documented work concerning dermatoglyphics in criminal behaviors and sexual offenders in Kurdistan Region (KRG).

The aim of this research is to initiate the dermatoglyphics patterns as well as parameter values of asocial behaviors in Erbil city, Kurdistan region, North of Iraq.

2. Materials and Methods

In the present study, 30 exemplar prints (15 violent criminals and 15 sexual offenders) were selected as test group in Directorate of Central Prison in Erbil city, also 30 students were selected as control group. The control groups were above 20 years of age and there was no significant personal social behavior. For obtaining fingerprints from control group, modified Purvis-Smith ink method was applied to record the fingertip patterns (ulnar loop, radial loop, double loop, pocket loop, arch and whorl) as shown in Fig. (1) and finger ridge counts (FRCs). Fingers were soaked and pressed on normal A4 paper. Only understandable and clear prints were categorized into digital patterns whorls, arches and loops, as well as ridge counting, were performed using a hand lens. Each fingerprint was counted autonomously by two observers. Our data was analyzed statistically using the student's t-test for each sample which appropriates for FRC. According to *P*-value (<0.05), there were significant differences.

3. Results and Discussion

The formation of dermal ridges takes place in the fetus during the third month of the intrauterine life as a result of the physical and the topological growth forces (Cummins & Midlo, 1926). The dermal ridges and the configuration which is once formed are not affected by age, development and environmental changes in post-natal life and therefore have the potential to predict various genetic and acquired disorders with a genetic influence (Bhu and Gupta, 1981).

The present study was aimed to evaluate dermatoglyphic differences in fingertip patterns in asocial behaviors and normal behavior controls. The distribution of fingertip patterns revealed in table (1) of violent criminals shows no significance difference in all patterns of both hands. In principle, some peculiarities in the frequencies and morphological characteristics of dermatoglyphics may be expected in all kinds of disorders associated with early embryological deviations in the organogenesis. The dermal and epidermal structures throughout embryogenesis develop

from the ectodermal layer, it likes acceptable to study their differentiation as indication of a morphogenetic disturbance in the nervous system (Gustavson *et al.*, 1994).

From the results of our study, it appears that dermatoglyphic patterns in violent criminals do not differ significantly from those in normal controls. Thus the asocial behavior of this group may possibly be attributable to environmental factors - either single or multifactorial, rather than early prenatal genetic or non-genetic influences on the development of the central nervous system. Table (2) shows significant decrease of ulnar loop in sexual offenders in both right and left hands ($P=0.001$) ($P=0.035$) respectively, when compared to the control group, while double loop increased significantly in both right and left hands ($P=0.001$) ($P=0.006$) respectively, when compared to normal social behaviors, this is agreed with Gustavson *et al.*, 1994 study that ulnar loops decreased significantly in sexual offenders, when compared with control groups, while whorls increased significantly in sexual offenders (Bhu and Gupta, 1994).

The observed differences in the frequencies of dermatoglyphic types in our study of sexual offenders compared with normal individuals may indicate early prenatal pathological influence on the ectodermal development, as of the central nervous system in sexual offenders. Table (3) shows FRC for each digit of right and left hands of violent criminals and control group that showed no significant difference in all fingers except middle finger of right and left hand that increased significantly ($P=0.006$) ($P=0.022$) respectively. In the case of FRC of sexual offenders in table (4) showed no significant difference in all digits of left hand, while index and little finger of right hand showed significant increase ($P=0.034$) ($P=0.033$) respectively in finger ridge count when compared with control groups.

Characteristic of the study group of sexual delinquents in this investigation is the reduced and increased number of ulnar loops and whorl-pattern respectively (Ghodsi *et al.*, 2012), who found more whorls in fingers of German and Danish noncriminals than in sexual criminals. The result of this study asserts the gravity of a very rigorous collection of the samples to be tested and the requirement to compare with normal material.

It demonstrates to be huge argument among scientists; this is due to small amount of sample size chosen, incomplete diagnoses and statistical errors. To conclude, though dermatoglyphics generally do not play any major role in diagnosis of asocial behaviors, it can serve as a ready screener to select individuals from a larger population for further investigations to confirm or rule out asocial behaviors.

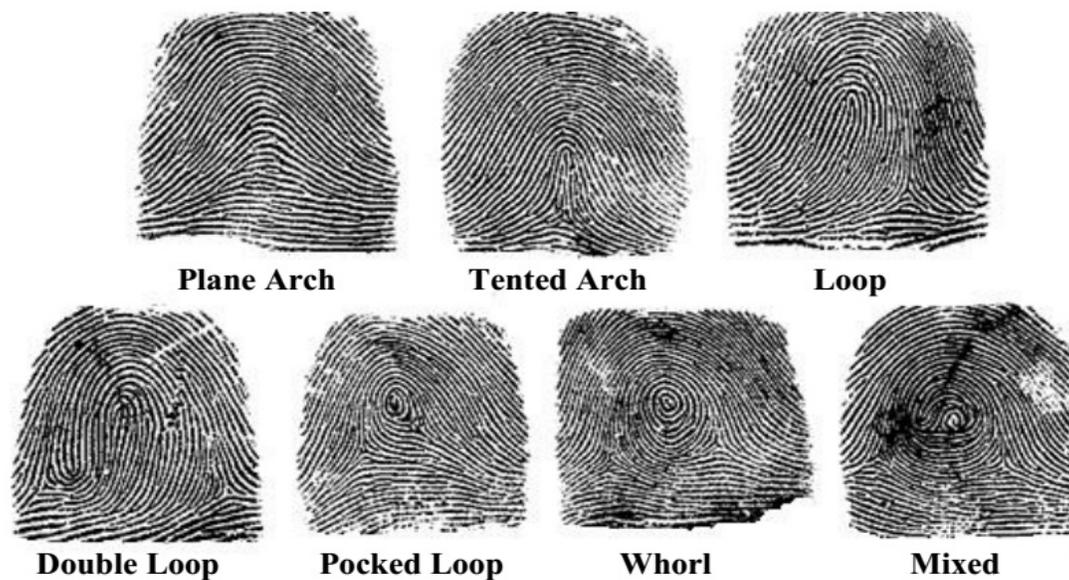


Fig. (1): Basic Human Finger Print Patterns.

Table (1): Comparison of distribution of fingertip patterns in violent criminals and controls (Mean ± S.E).

| Patterns | Right Hand | | | Left Hand | | |
|-------------|-------------|-------------|---------|-------------|-------------|---------|
| | Controls | Criminals | P-Value | Controls | Criminals | P-Value |
| Ulnar Loop | 2.70 ± 0.30 | 2.73 ± 0.27 | 0.580 | 2.56 ± 0.30 | 3.00 ± 0.24 | 0.424 |
| Radial Loop | 0.23 ± 0.09 | 0.20 ± 0.07 | 0.481 | 0.33 ± 0.13 | 0.13 ± 0.06 | 0.513 |
| Double Loop | 0.26 ± 0.09 | 0.40 ± 0.11 | 0.124 | 0.33 ± 0.11 | 0.53 ± 0.11 | 0.308 |
| Pocked Loop | 0.06 ± 0.04 | 0.33 ± 0.08 | 0.052 | 0.20 ± 0.08 | 0.53 ± 0.13 | 0.110 |
| Arch | 0.26 ± 0.12 | 0 | 0.152 | 0.33 ± 0.16 | 0 | 0.152 |
| Whorls | 1.43 ± 0.30 | 1.33 ± 0.28 | 0.194 | 1.26 ± 0.27 | 0.80 ± 0.24 | 0.342 |

Table (2): Comparison of distribution of fingertip patterns in sexual offenders and controls (Mean ± S.E).

| Patterns | Right Hand | | | Left Hand | | |
|-------------|-------------|------------------|---------|-------------|------------------|---------|
| | Controls | Sexual Offenders | P-Value | Controls | Sexual Offenders | P-Value |
| Ulnar Loop | 2.70 ± 0.30 | 0.93 ± 0.21 | 0.001 | 2.56 ± 0.30 | 1.53 ± 0.17 | 0.035 |
| Radial Loop | 0.23 ± 0.09 | 0.06 ± 0.04 | 0.367 | 0.33 ± 0.13 | 0.13 ± 0.09 | 0.367 |
| Double Loop | 0.26 ± 0.09 | 1.33 ± 0.25 | 0.001 | 0.33 ± 0.11 | 1.33 ± 0.24 | 0.006 |
| Pocked Loop | 0.06 ± 0.04 | 0.66 ± 0.22 | 0.057 | 0.20 ± 0.08 | 0.66 ± 0.17 | 0.073 |
| Arch | 0.26 ± 0.12 | 0 | 0.152 | 0.33 ± 0.16 | 0.06 ± 0.04 | 0.368 |
| Whorls | 1.43 ± 0.30 | 2.00 ± 0.23 | 0.157 | 1.26 ± 0.27 | 1.26 ± 0.17 | 0.615 |

Table (3): Comparison of distribution of F.R.C of right and left hand of violent criminals and controls. (Mean ± S.E).

| Fingers | Right Hand | | | Left Hand | | |
|---------|--------------|-------------------|---------|--------------|-------------------|---------|
| | Controls | Violent criminals | P-Value | Controls | Violent criminals | P-Value |
| Thumb | 16.53 ± 0.92 | 19.26 ± 0.91 | 0.847 | 15.20 ± 0.80 | 19.26 ± 1.76 | 0.335 |
| Index | 9.13 ± 1.03 | 14.26 ± 1.23 | 0.235 | 9.66 ± 1.08 | 14.26 ± 1.23 | 0.200 |
| Middle | 10.66 ± 1.07 | 13.06 ± 0.76 | 0.006 | 10.73 ± 1.09 | 13.06 ± 0.76 | 0.022 |
| Ring | 13.96 ± 0.93 | 15.00 ± 1.13 | 0.855 | 13.30 ± 0.92 | 15.00 ± 1.13 | 0.603 |
| Little | 11.03 ± 0.61 | 12.06 ± 0.94 | 0.681 | 12.26 ± 0.73 | 12.06 ± 0.94 | 1.000 |

Table (4): Comparison of distribution of F.R.C of right and left hand of sexual offenders and controls (Mean ± S.E).

| Fingers | Right Hand | | | Left Hand | | |
|---------|--------------|------------------|---------|--------------|------------------|---------|
| | Controls | Sexual offenders | P-Value | Controls | Sexual offenders | P-Value |
| Thumb | 16.53 ± 0.92 | 19.06 ± 1.27 | 0.635 | 15.20 ± 0.80 | 15.40 ± 1.40 | 0.543 |
| Index | 9.13 ± 1.03 | 15.13 ± 0.86 | 0.034 | 9.66 ± 1.08 | 13.53 ± 1.39 | 0.446 |
| Middle | 10.66 ± 1.07 | 14.06 ± 1.59 | 0.871 | 10.73 ± 1.09 | 13.66 ± 1.22 | 0.242 |
| Ring | 13.96 ± 0.93 | 16.00 ± 1.10 | 0.566 | 13.30 ± 0.92 | 15.33 ± 0.87 | 0.059 |
| Little | 11.03 ± 0.61 | 15.13 ± 1.35 | 0.033 | 12.26 ± 0.73 | 14.93 ± 1.24 | 0.569 |

References

- [1]. Ravindranath, R., Joseph, A.M., Bosco, S.I., Rajangam, S. & Balasubramanyam, V. (2005). Fluctuating asymmetry in dermatoglyphics of non-insulin-dependent diabetes mellitus in Bangalore-based population. *Indian J. Hum. Genet.*, 11(3): 149-153.
- [2]. Kahn, H.S., Graff, M., Stein, A.D. & Lumey, L.H. (2009). A fingerprint marker from early gestation associated with diabetes in middle age: The Dutch Hunger Winter Families Study. *Int. J. Epidemiol.*, 38(1): 101-109. doi: 10.1093/ije/dyn158.
- [3]. Kiran, K., Rai, K. & Hegde, A.M. (2010). Dermatoglyphics as a noninvasive diagnostic tool in predicting mental retardation. *J. Int. Oral Health*, 2(1): 95-100.
- [4]. Jahanbin, A., Mahdavisahri, N., Naseri, M.M., Sardari, Y. & Rezaian, S. (2010). Dermatoglyphic Analysis in Parents with Nonfamilial Bilateral Cleft Lip and Palate Children. *Cleft Palate Craniofac. J.*, 47(1): 9-14. <https://doi.org/10.1597/08-045.1>.
- [5]. Razavi, L. (1975). Cytogenetic and dermatoglyphic studies in sexual offenders, violent criminals, and aggressively behaved temporal lobe epileptics. *Proc. Annu. Meet. Am. Psychopathol. Assoc.*, 63: 75-94.
- [6]. Agarwal, K.K., Dutt, H.K., Saxena, A., Dimri, D., Singh, D. & Bhatt, N. (2012). General Assumption of Psychological Behavior Based on Finger Print Pattern. *Journal of Biology and Life Science*, 3(1): 59-65. doi:<http://dx.doi.org/10.5296/jbls.v3i1.1499>.
- [7]. Sarviya, B., Chaudhari, J., Patel, S.V., Rathod, S.P. & Singel, T.C. (2011). A Study of Palmar Dermatoglyphics in Leprosy in Bhavnagar District. Study of Dermatoglyphics in Leprosy Patient. *National Journal of Integrated Research in Medicine*, 2(2): 46-49.
- [8]. Andani, R., Kubavat, D., Malukar, O., Nagar, S.K., Uttekar, K. & Patel, B. (2012). Palmar Dermatoglyphics in Patients of Thalassemia Major. *National Journal of Medical Research*, 2(3): 287-290.
- [9]. Pal, S., Chattopadhyay, S.K., Maity, P., Roy, S., Danda, T.K. & Bharati, P. (2013). A Comparative study of dermatoglyphic patterns in patients with primary glaucoma and control group. *Human Biology Review*, 2(3): 223-229.
- [10]. Cummins, H. & Midlo, C. (1926). Palmar and plantar epidermal ridge configurations (dermatoglyphics) in European-Americans. *Am. J. Phys. Anthropol.*, 9(4): 471-502. doi: 10.1002/ajpa.1330090422.
- [11]. Bhu, N. & Gupta S.C. (1981). Study of palmer dermatoglyphics in diabetes mellitus. *Journal of the Diabetes Association of India*, 21: 99-107.
- [12]. Gustavson, K.-H., Modrzewska, K. & Sjöquist, K.-E. (1994). Dermatoglyphics in Individuals with Asocial Behaviour. *Uppsala J. Med. Sci.*, 99(1): 63-67. DOI: 10.3109/03009739409179351.
- [13]. Sawant, S.U., Kolekar, S.M. & Jyothi, P. (2013). Dermatoglyphics in male patients with schizophrenia. *International Journal of Recent Trends in Science and Technology*, 6(2): 109-114.
- [14]. Ghodsi, Z., Shahri, N.M. & Ahmadi, S.K. (2012). Quantitative and Qualitative Study of Dermatoglyphic Patterns in Albinism. *Curr. Res. J. Biol. Sci.*, 4(4): 385-388.