

REGIONAL DIFFERENTIATION OF PALM DERMATOGLYPHS IN RURAL POPULATION IN POLAND

Adam Gašiorowski

Department of Archaeology, Maria Curie-Skłodowska University, Lublin, Poland

Gašiorowski A: Regional differentiation of palm dermatoglyphs in rural population in Poland. *Ann Agric Environ Med* 2005, **12**, 277–280.

Abstract: The study presents a comparison of the distribution of palm dermatoglyphs in the rural populations of different regions of Poland, namely, the Lublin region, the areas of Suwałki, Ostrołęka, and of the village of Giebło. A comparison of the occurrence frequency of dermatoglyphs in the above-mentioned areas reveals statistically significant differences between particular patterns. The differences result from ethnic isolation and isolation of the communities caused by geographical barriers.

Address for correspondence: Dr Adam Gašiorowski, Institute for Stone Age Archeology, Humanistics Faculty, Marie Curie-Skłodowska University, Pl. Marii Curie-Skłodowskiej 4, 20-031 Lublin, Poland. E-mail: Adam.Gasiorowski@umcs.lublin.pl

Key words: dermatoglyphs, palm, rural population, regional differentiation, isolated groups.

INTRODUCTION

Dermatoglyphs have been analysed since ancient times; Homer and Vergil described drawings on a skin [17]. According to Cummins and Midlo [8], the most striking example is a primary Hindi statue found in Nova Scotia. There are apparent lines and ridges in the shape of a human palm engraved on a stone. This statue is extremely important evidence that people have been interested in dermatoglyphs since ancient times. Also, according to Cummins and Midlo [8], studies of Grew of 1684, Bildao of 1685, and Malpighi of 1686 can be considered as the earliest scientific descriptions of dermatoglyphs. Grew presented his study on palm patterns to the Royal Society in London. He described the lines and ridges of his finger. Malpighi conducted a similar analysis.

Significant developments in studies of dermatoglyphs took place in the 50's of the past century. A new method of the topologic classification by Penrose and Loesch [25] is particularly useful in genetic research and clinical trials.

Due to specific properties of human dermatoglyphs, dactyloscopic identification is the most perfect and the most widely applied identification method. Moreover,

both the police and courts in judicial proceedings attribute evidence of the highest value to dermatoglyphic analysis.

Genetic implications of ontogenetic processes for dermatoglyphic patterns enabled, among others, a diagnosis of mono- and dizygotic twins, as well as studies on the impact of genes on the phenotype. Dermatoglyphs could also be used in the diagnosis of genetically-driven diseases, archaeology, and in authenticating artistic artefacts, testaments and other documents.

There were also analysed and compared patterns of people having various types of diseases, for instance: schizophrenia [18, 31, 40], phenylketonuria [1], Hashimoto's disease [14], chronic marrow leukaemia [2, 3, 4, 7, 16, 19, 20, 21, 28, 29, 30, 32, 33, 35, 36, 38], hereditary deafness [10], acromegaly [37], cases of thoracopagus [6], epilepsy [26], congenital heart malformations [27], cleft palate as well as mentally retarded [5].

Many studies conducted by morphologists and clinicians showed that dermatoglyphic patterns were determined by both genetical and environmental factors [22, 23, 24] during first 3 months of the foetal life of man. As a result, many other studies were undertaken, such as research into the impact of the absence of a third finger on derma-

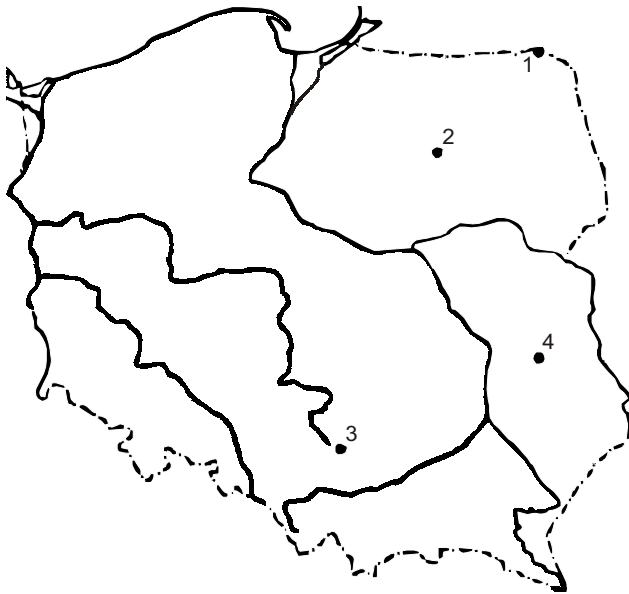


Figure 1. Map of Poland with locations of the analyzed populations having specific characteristics of isolated groups: 1 - Wizajny, the Suwałki region; 2 - Kadzidło, the Ostrołęka region; 3 - Giełło, the Małopolskie voivodship; 4 - Lublin.

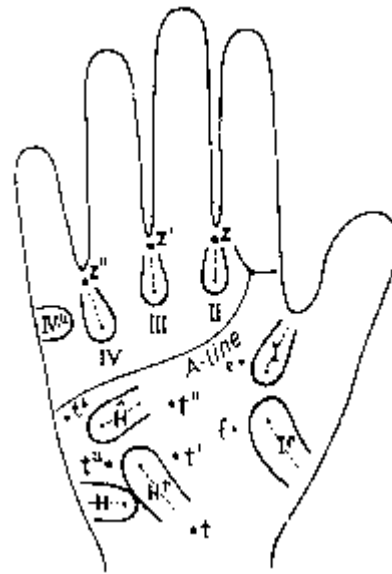


Figure 2. Dermatoglyphs elements on the palm according to the topologic method developed by Penrose and Loesch.

toglyphic patterns on the palm [15] or studies on inter-relations of dermatoglyphs patterns and blood groups [34].

MATERIALS AND METHODS

The material comprised of prints of palm dermatoglyphs was collected, as previously described prints of sole dermatoglyphs, during examinations of the rural population of the Lublin region, carried out during scientific camps organized by the Institute of Agricultural Medicine and the Medical University of Lublin [11].

The prints were taken from a total of 404 men and 404 women. The whole material was analysed by the method after Penrose and Loesch [25] which enabled a global description of the pattern of skin ridges, based on uniform principles and taking into account all topologically significant elements. For practical reasons, it is important that the method reduces the number of the possible combinations of these elements. Although it is based on principles different from the classification by Cummins and Midlo [8], it still preserves the traditional terminology. The analyses concerned 22 topological elements on the palm (Fig. 2).

Table 1. The frequencies of occurrence of dermatoglyphic patterns on palms of men and women (in %) living in the Lublin voivodeship (by Gašiorowski) and Ostrołęka and Suwałki regions (by Czyżewska).

| Pattern | Lublin voivodeship | | | | Ostrołęka | | | | Suwałki | | | |
|------------------|--------------------|------|------|------|-----------|-------|---------|-------|---------|-------|---------|-------|
| | ♂ | | ♀ | | ♂ | | ♀ | | ♂ | | ♀ | |
| | L | R | L | R | L | R | L | R | L | R | L | R |
| N | 404 | 404 | 404 | 404 | 698 | 684 | 784 | 788 | 434 | 448 | 414 | 417 |
| I | 9.2 | 2.7 | 7.7 | 2.7 | 12.5 | 3.6 | 9.6 | 5.2* | 10.1 | 2.9 | 9.2 | 4.3 |
| I' | 8.9 | 3.5 | 10.1 | 3.7 | 11.7 | 6.4* | 9.3 | 5.4 | 11.8 | 5.1 | 8.9 | 6.0 |
| II | 2.2 | 7.4 | 1.0 | 4.5 | 1.4 | 5.9 | 0.9 | 2.7 | 2.8 | 7.6 | 0.5 | 3.1 |
| III | 35.1 | 59.4 | 37.6 | 57.7 | 30.9 | 59.8 | 30.0** | 53.7 | 34.8 | 63.0 | 28.7** | 54.4 |
| III ^T | 3.2 | 3.2 | 4.2 | 1.2 | 6.0* | 3.4 | 5.4 | 1.5* | 7.1* | 2.5 | 7.3 | 2.9 |
| IV | 62.3 | 45.7 | 54.9 | 44.5 | 72.1*** | 43.1 | 68.6*** | 49.0 | 68.2 | 41.1 | 63.5 | 46.0 |
| H | 16.1 | 17.8 | 16.8 | 15.1 | 11.7* | 14.3 | 14.9 | 14.2 | 15.0 | 15.2 | 14.5 | 13.4 |
| Ĥ | 26.5 | 23.5 | 31.7 | 29.0 | 19.6** | 20.2 | 28.3 | 27.9 | 25.8 | 27.9 | 26.3* | 26.4 |
| H ^T | 1.2 | 4.0 | 2.4 | 5.4 | 1.0 | 3.1 | 1.9 | 4.4 | 1.4 | 3.8 | 1.0 | 4.1* |
| t | 77.2 | 76.0 | 67.4 | 68.6 | 80.5 | 75.6 | 74.6** | 73.1 | 80.4 | 75.7 | 71.7 | 66.7 |
| t'+t'' | 28.4 | 27.2 | 35.2 | 31.4 | 24.2 | 30.0 | 32.5 | 32.2 | 27.9 | 32.8 | 36.5 | 36.2 |
| t'' | 11.6 | 13.1 | 12.6 | 12.8 | 7.2* | 8.2** | 7.7** | 7.5** | 5.5** | 6.5** | 5.6*** | 8.4** |
| z+z'+z'' | 2.4 | 1.6 | 2.6 | 2.2 | 4.3 | 4.1* | 6.4** | 6.2** | 5.1* | 4.9* | 10.4*** | 7.4** |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

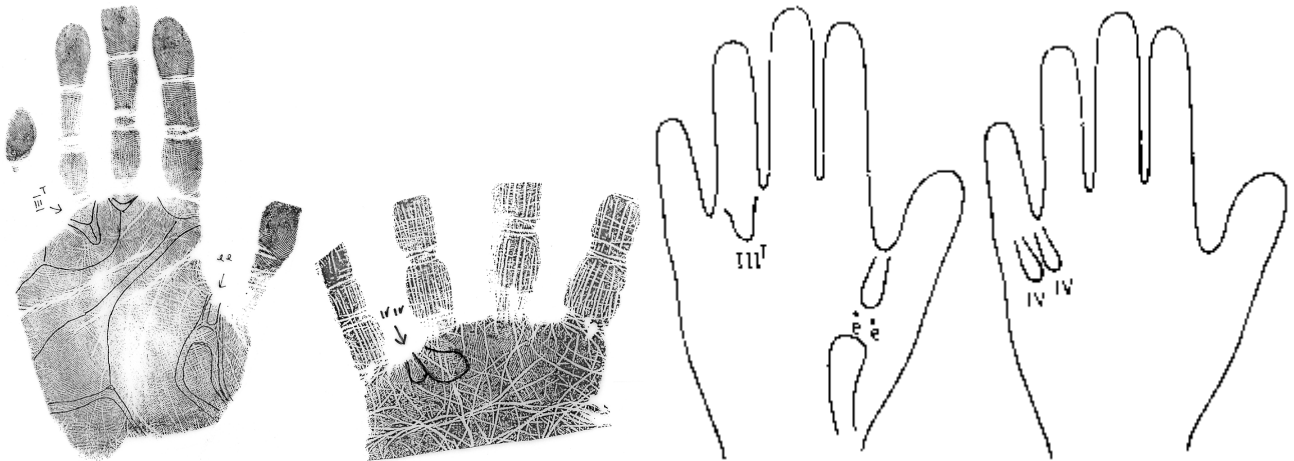


Figure 3. Additional patterns identified on the palm.

Twenty-three topologic elements were analysed on the palm (Fig. 2). Additionally, the following originally described patterns were examined: III^T , 2 triradii e (ee) and 2 patterns IV ($IVIV$) (Fig. 3). So far, the above patterns have not been included in statistical examinations using the topologic method.

The data obtained was further analysed statistically. The differences in frequencies of specific patterns on a palm were displayed using percentages.

The significance of the differences between percentages of particular categories of the tested features was checked by the chi-square test. The threshold of the inference error risk was assumed to be 5%. The differences for which $p \leq 0.01$ were assumed as highly significant, and those at $p \leq 0.05$ - as significant; p denotes the probability of random occurrence of such differences.

The results of examinations of papillary patterns on palms in the examined material were compared with those obtained by Czyżewska [9] who examined villages in the regions of Suwałki and Ostrołęka, and with the results of Gralla [13] who examined the village of Giebło.

The region of Suwałki covers the villages of Grzybinia, Wiżajny, Manutkinia and Makowszczyzna; the villages

constitute a cluster stretching for about 10 km on the border with Lithuania. The Ostrołęka region is represented by the villages of Brzozówka, Kadzidło and Jeglijowiec, located on an area of about 6 km in the Kurpiowska Forest (Fig. 1)

RESULTS AND DISCUSSION

The results of the study indicated statistically significant regional differences in frequencies of occurrence of dermatoglyphs patterns. There were found statistically significant regional differences in frequencies of the occurrence of patterns III on the left hand in the female series. The differences occurred in 38% of the Lublin region series, in 30% of the Ostrołęka region series and in 29% of the Suwałki region series.

Pattern IV on the left palm was the most rare in both men and women of the Ostrołęka region series.

Significant differences were also discovered in frequencies of patterns and triradius t on the left palm in both men and women of all series.

The study also showed particularly significant differences in frequencies of occurrence of triradius t' on the left

Table 2. The frequencies of occurrence of dermatoglyphic patterns on palms of men and women (in %) living in the Lublin voivodeship (by Gąsiorowski) and Giebło village (by Gralla).

| Pattern | Lublin voivodeship | | | | Giebło | | | |
|----------------|--------------------|------|------|------|---------|---------|---------|---------|
| | ♂ | | ♀ | | ♂ | | ♀ | |
| | L | R | L | R | L | R | L | R |
| N | 404 | 404 | 404 | 404 | 99 | 99 | 103 | 103 |
| I | 9.2 | 2.7 | 7.7 | 2.7 | 12.2 | 3.1 | 2.0* | 3.0 |
| I' | 8.9 | 3.5 | 10.1 | 3.7 | 17.3* | 4.1 | 1.0** | 2.0 |
| II | 2.2 | 7.4 | 1.0 | 4.5 | 4.1 | 11.2 | 2.0 | 3.9 |
| III | 35.1 | 59.4 | 37.6 | 57.7 | 4.1*** | 32.7*** | 8.8*** | 31.4*** |
| IV | 62.3 | 45.7 | 54.9 | 44.5 | 24.4*** | 23.5*** | 27.4*** | 26.5*** |
| H | 16.1 | 17.8 | 16.8 | 15.1 | 8.2* | 8.1* | 9.8 | 8.7 |
| H' | 26.5 | 23.5 | 31.7 | 29.0 | 25.5 | 18.4 | 27.5 | 25.5 |
| H ^T | 1.2 | 4.0 | 2.4 | 5.4 | 4.1 | 2.0 | 2.0 | 2.0 |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

and right palm in both men and women. The pattern was more frequent in the Lublin region series than in the Ostrołęka and the Suwałki region series. Unlike triradius t'' , the so called zygodactylic patterns (z, z', z'') were found more frequently on both right and left palms of men and women living in the Ostrołęka and Suwałki regions.

Furthermore, pattern III^I on the left palm in men and on the right palm in women was found significantly more frequently in the Ostrołęka series than in the Lublin series. Also, it has been discovered that pattern Ir was significantly more frequent only in men living in the Ostrołęka region.

It is important to indicate that in the past natural barriers limited the analyzed Suwałki and Ostrołęka regions. They have also not been heavily industrialized for the last several decades. These factors determined a limited immigration processes. As a result, both analyzed groups of the Suwałki and Ostrołęka regions possess the characteristics of isolated groups [9].

The most significant differences were discovered in the frequencies of patterns III and IV on palms in both men and women - they were more frequent in the Lublin region series than in Giełbo village series. The above differences were significant ($p < 0.001$), and on the left palm in men amounted even up to 30%.

Also, significant differences ($p < 0.01$) were discovered in the frequencies of pattern Ir on the left palm in women.

Significant differences ($p < 0.05$) were also found in the frequencies of the following patterns: pattern I on the left palm in women was more frequent in the Lublin region series, pattern Ir on the left palm in men was more frequent in the Giełbo series, and pattern H on both, left and right palms in men was twice as frequent as in Giełbo than in the Lublin region.

Presently, Giełbo village has 741 inhabitants and constitutes a part of province Ogródzieniec in the Małopolskie voivodeship. This group can be considered as a specific isolation population and due to multi-crossing possesses some characteristics different from those of the rest of the Polish population.

In conclusion, the study shows the differences among the occurrence frequency of particular palm patterns in different rural populations of Poland. This variability should be considered when analysing palm patterns in relation to diseases of chromosomal etiology.

REFERENCES

- Alter M: Dermatoglyphics in phenylketonuria. *Humangenetik* 1967, **4**, 23-28.
- Aleksandrowicz J, Dębski T, Schiffer Z: Wzory linii papilarnych (dermatoglyfika) u ludzi chorych na białaczkę. *Pol Arch Med Wewn* 1969, **43**, 999-993.
- Aleksandrowicz J, Schiffer Z, Dębski T: Dermatoglyphs in leukemia. *Lancet* 1966, **2**, 1364.
- Berka L, McClure PD, Sonley MJ, Thompson MW: Dermatoglyphs in childhood leukemia. *Can Med Assoc J* 1971, **105**, 476-478.
- Bindsell W, Grimm H: Über Papilarmuster bei einem Fall von erblicher Spaltbildung an Händen und Füßen. *Z Mensch Vererb Konstitutionsl* 1942, **26**, 365-375.
- Brehme H: Über die Hautleistenbefunde bei einem Fall von Thoracopagus. *Humangenetik* 1967, **3**, 331-335.
- Colombo A, Gasparoni MC, Biscatti G, Severi F: Dermatoglyphi e leukemia linfatica acuta nell'infanzia. *Minerva Pediatr* 1973, **25**, 335-336.
- Cummins H, Midlo M: *Finger prints, palms and soles: an introduction to dermatoglyphics*. Dover Publications, Inc., New York 1961.
- Czyżewska J: Badania nad zmiennością układów listewek skórnych opuszek palców, dłoni i stop w wybranych grupach ludności z terenu Polski, I. Topologicznej istotne elementy: pętlice i trójpromienie. *Mat i Prac Antrop* 1980, **98**, 53-72.
- Dar H, Winter ST: A study of dermatoglyphics and the simian crease in familial deafness. *Hum Hered* 1970, **20**, 493-506.
- Gašiorowski A: Regional differentiation of sole dermatoglyphs in rural population in Poland. *Ann Agric Environ Med* 2005, **12**, 61-65.
- Gašiorowski A, Gałkowska E, Kimak A: Dermatoglyphy dłoni w przypadku rozszczepu podniebienia. *Arch Med Sąd i Krym* 1981, **31**, 13-19.
- Gralla G: Listewki skórne dłoni i stóp ludności Giełba w powiecie zawierciańskim. *Przeł Antrop* 1975, **41**, 47-57.
- Hajn V: Dermatoglyphs in Hashimoto's Disease. *Zprawy Cs spol antropologicke pri CSAV (Mitteilungen der Tschechoslowakischen Gesellschaft fur Anthropologie)* 1978, **31-32**, 47-51.
- Holt SB: The effect of absence of thumb on palmar dermatoglyphs. *J Med Genet* 1972, **9**, 448-450.
- Loesch D, Mdzewski: Dermatoglyphy w przewlekłej białaczce szpikowej. *Pol Tyg Lek* 1971, **26**, 1150-1152.
- Martin R: *Papillarsystem. Lehrbuch der Anthropologie*, Bd. III. Gustav Fischer Verlag, Stuttgart 1962.
- Mellor CS: Finger-prints in schizophrenia. *Nature* 1967, **213**, 939-940.
- Menser MA, Purvis-Smith SG: Dermatoglyphic defects in children with leukaemia. *Lancet* 1969, **1**, 1076-1077.
- Menser MA, Purvis-Smith SG: Dermatoglyphs in leukaemia. *Lancet* 1972, **1**, 956.
- Nora AH, Nora YY, Fernbach DJ: Dermatoglyphs and leukaemia. *Lancet* 1969, **2**, 905-906.
- Penrose LS: Finger-prints, palms and chromosomes. *Nature* 1963, **197**, 933-935.
- Penrose LS: Fingerprint patterns and the sex chromosomes. *Lancet* 1967, **1**, 298-299.
- Penrose LS, Loesch D: The effect of sex chromosomes characteristics of dermal ridges on palms and fingerprints. *Genet Pol* 1969, **10**, 328-332.
- Penrose LS, Loesch D: Topological classification of palmar dermatoglyphs. *J Ment Defic Res* 1970, **14**, 111-128.
- Pospisil MF, Kacejova A, Kocvarov A: Dermatoglyphic formation in epileptics. *Acta Fac Rerum Nat Univ Com Anthr* 1971, **16**, 143-152.
- Preus M, Fraser FC, Lery EP: Dermatoglyphs in congenital heart malformations. *Hum Hered* 1970, **20**, 388-402.
- Purvis Schmith SG, Menser MA: Dermatoglyphs in children with acute leukaemia. *Br Med J* 1973, **4**, 646-648.
- Rosner F: Dermatoglyphs of leukaemic children. *Lancet* 1969, **2**, 272.
- Rosner F: Dermatoglyphs in leukaemia. *Lancet* 1970, **2**, 882-883.
- Rothhammer F, Pereira G, Camousseight A, Benado M: Dermatoglyphics in schizophrenic patients. *Hum Hered* 1971, **21(2)**, 198-202.
- Verbov JL: Dermatoglyphs and leukaemia. *Lancet* 1969, **2**, 323-324.
- Verbov JL: Dermatoglyphs in leukaemia. *J Med Genet* 1970, **7**, 125-131.
- Weniger M: Statistische Untersuchungen über die Beziehungen zwischen den klassischen Blutgruppen (ABO-System) und den quantitativen Werten der Fingerbeerenmuster. *Z Mensch Vererb Konstitutionsl* 1953, **32**, 32-55.
- Wertelecki W, Plato CC, Fraumeni JF Jr: Dermatoglyphs in leukaemia. *Lancet* 1969, **2**, 806-807.
- Wertelecki W, Plato CC, Fraumeni JF, Niswander JD: Dermatoglyphs in leukaemia. *Pediatr Res* 1973, **7**, 602-604.
- Zienkiewicz H, Wasilkowski A, Kosowicz J: Badania daktyloskopowe w akromegalii. *Endokryn Pol* 1960, **11**, 153-156.
- Zahalkova M, Belusa M: Dermatoglyphs in children with leukaemia. *Lancet* 1970, **1**, 1236-1237.
- Zavala C, Nunez C: Dermatoglyphics in schizophrenia. *J Genet Hum* 1970, **18(4)**, 407-420.