

## REGIONAL DIFFERENTIATION OF SOLE DERMATOGLYPHS IN RURAL POPULATION IN POLAND

Adam Gašiorowski

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

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**Abstract:** The study presents a comparison of the distribution of sole 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 population of the Lublin region and that of their occurrence in the populations of Suwałki, Ostrołęka and Giebło 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, Zakład Epoki Kamienia, Instytut Archeologii, Wydział Humanistyczny, Maria Curie-Skłodowska University, Pl. Marii Curie-Skłodowskiej 4, 20-031 Lublin, Poland.  
E-mail: Adam.Gasiorowski@umcs.lublin.pl

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### INTRODUCTION

The beginning of studies of skin ridges (dermatoglyphs) goes back to ancient times. According to Cummins and Midlo [12], the most famous ancient finger prints are probably concave sculptures on the walls of a Neolithic burial corridor on the island of Garznis in the United Kingdom. Constructed of stone slabs, the corridor leads to a lower chamber and the whole structure is surrounded by a low earth wall. Internal walls are covered with carved drawings. They present complex patterns of horse-shoe shape, more or less round figures, spirals, arching lines, whirling lines, straight lines, which occur in various combinations. Some authors, e.g., Stockis and Bridges [12], claim that the carved drawings are dermatoglyphs. In turn, in Palestine, Dr Bade [12] dug out a fragment of a clay lamp with a clear finger print. Numerous objects found at that site bear the prints of the same potter. The prints constitute signs identifying the maker of the objects; today we would call them firm logos.

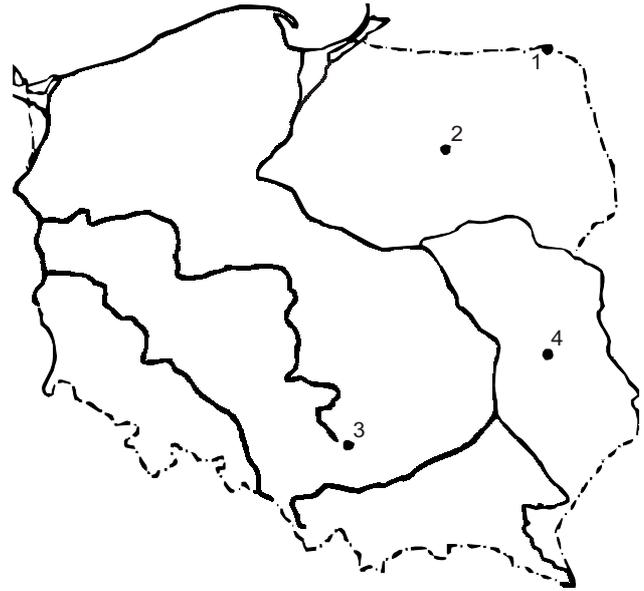
The argument concerning the deliberate impressions of fingers in clay is more convincing in the case of the Chinese seal. This is a piece of clay which was to be affixed to some document. On one side there is a name imprinted with a personal seal, and on the other – a very clear impression of a thumb. The origin of the print implies the fact that it was the sign of a given person. In his tract, published in 1563, Asia mentions a 16th-century Chinese custom of making sole and palm imprints on bills of sale concerning the sale of children; ink was used to make those prints. Yet, it does not indicate their knowledge about the uniqueness of papillary lines [12].

In 1897, Harris Wilder began studies which he then carried on for 30 years – studies on the morphology, methodology and dermatoglyphics of soles and palms. His studies on the prints of soles and palms of 1903 constitute fundamental works in the field of dactylography. He proved the phylogenetic significance of print patterns and developed methods which are still applied today [43]. In 1905, Schlaginkaufen analysed skin ridges on the feet of Europeans, West African Negroes, inhabitants of Papua,

India, Ceylon, as well as a large number of apes. The problems of the occurrence of ridges and patterns on soles were examined by many scholars, including, among others, Łasiński [35], Wojtowicz-Lebioda [74, 75], and Geipol [21]; the latter described skin ridges in Negroes from Madagascar and Arabs from Africa. The identification, symmetry and heritability of sole dermatoglyphs was studied by Gąsiorowski [18, 19]. In his 1988 study he proved the existence of high symmetry between the left and right soles and the heritability of patterns from both the father and the mother. Great advancements in the studies on dermatoglyphs occurred in the twentieth century. The application of dermatoglyphs in individual and inter-population variability was taken up by many scholars [6, 8, 9, 11, 13, 14, 19, 20, 24, 25, 26, 27, 28, 29, 35, 37, 38, 39, 41, 45, 47, 48, 49, 57, 58, 59, 60, 61, 65, 66, 69, 70, 74, 75]; the classification developed by Cummins and Midlo [12] played a very important role in comparative studies of features of dermatoglyphs.

Clinical researchers of various specializations have devoted much attention to examinations of dermatoglyphic patterns. Already Cummins and Midlo [12] observed the effect of mental deficiency on some patterns. Relationships between chromosomes and dermatoglyphs were described by many authors [1, 2, 10, 18, 34, 43, 51, 70]. General and partial triploidy, leading to an increased number of chromosomes, revealed causes of many characteristic clinical syndromes and developmental disorders with their typical dermatoglyphic patterns. In cases of Down's syndrome such examinations were carried out by numerous researchers [17, 21, 22, 54, 61, 70, 76]. Down's syndrome was the first disease in which chromosomal etiology was confirmed. Disorders in dermatoglyphic patterns were also stated in Klinefelter's syndrome [5, 15, 16, 46, 67], Turner's syndrome [7, 10, 23, 29, 65], Edward's syndrome [71] and in other chromosomal dysfunctions [3, 4, 30, 31, 32, 33, 36, 40, 42, 44, 53, 56, 62, 63, 66, 72, 73].

Sole dermatoglyphs among the Czech population were described by Pospíšil and Pospíšilová [58], and among the Slovak population by Pospíšil [59, 60]. The interdependence between skin ridge patterns in the subdigital fields of



**Figure 2.** Map of Poland with marked sites of examinations of rural populations characterized by ethnic distinctiveness and relatively isolated character; 1 - Wizajny, Suwałki district, Podlaskie voivodeship; 2 - Kadzidło, Ostrołęka district, Mazowieckie voivodeship; 3 - Giebło, Ogrodzieniec community, Zawiercie district, Silesian voivodeship; 4 - Lublin.

soles was described by Buchwald [6]; Czyżewska [13] in turn studied the changeability of skin ridge patterns on soles and palms, proving their territorial differentiation.

The present paper aims at showing a high territorial changeability in the occurrence of papillary patterns on soles.

## MATERIALS AND METHODS

The material comprised prints of sole dermatoglyphs collected 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.

The prints were taken from the total of 404 men and 404 women. The whole material was analysed by the method after Penrose and Loesch [52] which enabled a



**Figure 1.** Sole patterns covered by topological classification after L. S. Penrose and D. Loesch [50, 52]. The added pattern I<sup>t</sup>, not included in the classification after L. S. Penrose and D. Loesch, and a print of that pattern.

**Table 1.** Sole patterns of the rural population of Lublin voivodeship compared to the patterns noted in the population of Ostrołęka and Suwałki.

Pattern	Lublin voivodeship					Ostrołęka					Suwałki	
	L ♂ R		L ♀ R		N=345	L ♂ R		L ♀ R		L ♂ R		L ♀ R
	N=404	N=404	N=404	N=404		N=329	N=328	N=333	N=261	N=285	N=222	
I	84.0	83.0	84.9	84.4	83.2	86.0	83.5	85.0	81.2	83.9	84.7	86.6
Î	35.1	30.2	33.2	31.4	30.7	24.9	25.3 <sup>1</sup>	23.71	49.0 <sup>3</sup>	39.0 <sup>1</sup>	36.0	35.4
I <sup>f</sup>	1.2	0.7	2.2	0.7	0.9	0.9	0.6	0.3	3.1	1.1	2.3	2.4
II	8.9	11.6	11.6	11.6	6.7	11.3	8.2	12.9	11.1	11.9	16.2	12.2
ÎÎ	27.7	26.5	24.5	25.0	26.1	21.3	21.7	20.7	31.8	30.9	25.2	28.0
III	65.8	69.8	53.7	62.9	58.6 <sup>1</sup>	59.0 <sup>2</sup>	50.6	54.1 <sup>1</sup>	61.3	65.3	45.1 <sup>1</sup>	49.6 <sup>3</sup>
ÎÎÎ	16.8	16.6	16.6	15.8	18.8	20.4	18.3	20.4	23.0 <sup>1</sup>	22.8 <sup>1</sup>	23.4 <sup>1</sup>	21.7
IV	19.1	22.5	10.9	13.6	15.4	20.4	8.8	12.9	13.0 <sup>1</sup>	19.3	9.0	13.0
ÎV	2.2	3.2	3.2	3.0	3.5	2.7	1.2	2.4	3.8	3.9	5.9	5.9
V	0.5	0.7	0.7	0.7	0.0	0.9	0.9	1.2	0.4	0.4	0.5	0.4
∇	40.3	39.6	37.1	34.4	38.0	42.9	46.7 <sup>2</sup>	47.2 <sup>3</sup>	46.0	41.8	53.6 <sup>3</sup>	45.7 <sup>2</sup>
p	53.2	60.3	45.1	57.2	33.9 <sup>3</sup>	48.3 <sup>2</sup>	26.8 <sup>3</sup>	42.3 <sup>3</sup>	33.7 <sup>3</sup>	55.4	27.0 <sup>3</sup>	42.5 <sup>3</sup>
p'	21.7	20.8	18.8	14.8	28.4 <sup>1</sup>	25.2	26.5 <sup>1</sup>	25.2 <sup>3</sup>	34.9 <sup>3</sup>	23.5	28.4 <sup>2</sup>	18.1
p''	12.6	15.6	7.2	9.9	11.3	11.3	7.9	6.6	9.2	10.2 <sup>1</sup>	5.9	9.1
z+z'+z'	54.7	54.9	53.0	50.5	74.2 <sup>3</sup>	66.6 <sup>2</sup>	64.3 <sup>2</sup>	63.4 <sup>3</sup>	74.3 <sup>3</sup>	71.2 <sup>3</sup>	80.2 <sup>3</sup>	75.2 <sup>3</sup>

<sup>1</sup>p<0.05; <sup>2</sup>p<0.01; <sup>3</sup>p<0.001

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 [12], it still preserves the traditional terminology. The analyses concerned 22 topological elements on the sole (Fig. 1); the descriptions also included pattern I<sup>f</sup>, which was separated from pattern Î, because it clearly differs from that loop (Fig. 2). Pattern I<sup>f</sup> was earlier ignored in statistical analyses of the dermatoglyphs by the topological method. The obtained quantitative data were then subjected to the statistical analysis. The occurrence frequency of particular patterns on soles, taking into account the left and right sides of the body, was expressed in 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≤0.01 were assumed as highly significant, and those at p≤0.05 – as significant; p denotes the probability of random occurrence of such differences.

The results of examinations of papillary patterns on soles in the examined material were compared with those obtained by Czyżewska [13] who examined villages in the regions of Suwałki and Ostrołęka, and with the results of Grall [27] who examined the village of Giebło.

The region of Suwałki covers the villages of Grzybinia, Wizajny, 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.

## RESULTS AND DISCUSSION

The results are presented in Tables 1-2. On the whole, differences between sole patterning in the examined material and that of the population of Ostrołęka and Suwałki concern patterns Î, III, ÎÎ, IV, ∇, and triradii p, p', and p'', as well as the sum of zygodactylic patterns (z + z' + z'') (Tab. 1).

In the examined material, pattern Î occurred more often in women from Ostrołęka on both soles, than in men from Suwałki. The difference was significant, particularly in the case of the left sole. Pattern III was most frequent in the material in both sexes and on both soles. Statistically significant differences occurred in men on both soles in comparison with men from Ostrołęka, and in women on both soles in comparison with women from Suwałki, and on the right sole compared to women from Ostrołęka. Although pattern ÎÎ occurred more frequently in the populations from Suwałki and Ostrołęka in both sexes, statistically significant differences concerned only the inhabitants from Suwałki, namely, both soles in men and the left sole in women.

A comparison of the occurrence of pattern IV showed random dependences, with the exception of the left sole in men from Suwałki.

**Table 2.** Sole patterns of the rural population of Lublin voivodeship compared to the patterns noted in the population of Giebło.

Pattern	Lublin voivodeship						Giebło	
	L ♂ R		L ♀ R		L ♂ R		L ♀ R	
	N=404	N=404	N=404	N=404	N=95	N=95	N=101	N=101
I	84.0	83.0	84.9	84.4	75.8	74.8	88.0	92.0 <sup>1</sup>
Î	35.1	30.2	33.2	31.4	45.2	39.0	36.6	24.7
I <sup>f</sup>	1.2	0.7	2.2	0.7	3.1	3.1	0.0	0.0
II	8.9	11.6	11.6	11.6	7.3	8.4	9.9	7.0
ÎÎ	27.7	26.5	24.5	25.0	22.1	24.1	24.8	20.8
III	65.8	69.8	53.7	62.9	52.8 <sup>1</sup>	48.9 <sup>2</sup>	43.5	52.5 <sup>1</sup>
ÎÎÎ	16.8	16.6	16.6	15.8	20.0	15.8	16.8	17.8
IV	19.1	22.5	10.9	13.6	17.9	21.1	9.9	8.9
ÎV	2.2	3.2	3.2	3.0	2.2	1.1	2.0	3.0
V	0.5	0.7	0.7	0.7	0.0	0.0	0.0	0.0
ÎV	40.3	39.6	37.1	34.4	29.41	30.5	27.7	31.7

<sup>1</sup>p<0.05; <sup>2</sup>p<0.001

Statistically significant differentiation of pattern Î concerned only women and both soles. In populations from Ostrołęka and Suwałki this pattern occurred clearly more frequently (p<0.001) than in the Lublin population.

The occurrence of the triradii p and p' did not differ significantly only on the right sole in men and p' on the right sole in women; all the other results differed significantly at the level p<0.001.

Zygodactylic triradii occurred more frequently by 13 – 27% in the populations of Ostrołęka and Suwałki and the differences were statistically significant for both sexes and on both soles.

Table 2 shows the frequency of occurrence of patterns on soles in the population of the Lublin region in comparison to the inhabitants of the Giebło village.

The results indicate that the greatest differences between both populations occurred only when comparing pattern III. In my material this pattern was more frequent in men and women on both soles, and statistically significant differences occurred on both soles in men and on the right sole in women.

Apart from that, significant differences occurred only in women on the right sole in relation to pattern I, more frequently encountered in the inhabitants of the Giebło village, and in relation to pattern V on the left sole in men, which occurred more frequently in the population of the Lublin region.

The population of the Suwałki and Ostrołęka region were separated in the past by natural geographic barriers. Today they are characterized by a low level of industrialization. These factors caused limitations of immigration processes. The regions are also characterized by ethnic distinctiveness. For these reasons both examined groups of population have an isolated character.

The village Giebło, Ogrodzieniec district in the Małopolskie voivodeship, is today inhabited by about 740

people. It may also be regarded as a specific isolated area in which some features are shaped differently than in other populations in consequence of intermixing lasting for many centuries.

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

## REFERENCES

1. Abel W: Über Störungen der Papillarmuster. I. Gestörte Papillarmuster in Verbindung mit einigen körperlichen und geistigen Anomalien. *Z Morphol Anthropol* 1936, **36**, 1-38.
2. Alter M: Is hyperploidy of sex chromosomes associated with reduced total finger ridge count? *Am J Hum Genet* 1965, **17**, 473-475.
3. Alter M, Shulenberg R: Dermatoglyphics in the rubella syndrome. *JAMA* 1966, **197**, 685-687.
4. Alter, M: Dermatoglyphics in phenylketonuria. *Humangenetik* 1967, **4**, 23-28.
5. Alter M, Gorlin R, Yunis, J, Peagler F, Bruhl H: Dermatoglyphics in XYY Klinefelter's syndrome. *Am J Hum Genetics* 1966, **18(6)**, 507-513.
6. Buchwald W: Współzależność między wzorami listewek skórnych w polach podpalcowych stóp. *Zmienność biologiczna człowieka* 1995, **2**, 17-21.
7. Ciovirnache M, Stanescu V, Ionescu V, Florea I, Grigerescu A: Les dermatoglyphes dans le syndrome de Turner. *Rev Roum Endocrinol* 1968, **5**, 287-290.
8. Chai CK: Analysis of palm dermatoglyphics in Taiwan Indigenous Populations. *Am Physic Anthropol* 1971, **34**, 3-11.
9. Chakraborti MR, Mukherjee DP: Dermatoglyphic affinities of the tribes and castes of Nilgiri Hills (India). *Z Morphol Anthropol* 1964, **55**, 335-356.
10. Cheah IS, Tan BY: Turner's syndrome (gonadal dysgenesis): clinical, dermatoglyphic and chromosomal features. *Med J Malaya* 1969, **23**, 181-185.
11. Crhák L: Geografické trendy dermatoglyfických kategorií na Moravě. *Act Univ Palackianae Olomuncensis Fac Rerum Nat* 1968, **28**, 75-88.
12. Cummins H, Midlo Ch: *Finger Prints, Palms and Soles*. New York 1961.

13. Czyżewska J: Badania nad zmiennością układów listewek skórnych opuszek palców dłoni i stóp u wybranych grup ludności z terenu Polski. I. Topologiczne istotne elementy: piętlce i trójpromienie. *Mat i Prace Antropologiczne* 1980, **98**, 53-72.
14. Ducros J: Intérêt anthropologique du nombre de crêtes des dessins digitaux: Application a des Basques Français. *L'Anthropologie* 1970, **74**, 57-69.
15. Dzik A, Kosowicz J: Zmiany dermatogliczne w zespole Klinefeltera. *Endokrynologia Polska* 1969, **20**, 295-302.
16. Forbes A P: Fingerprints and palm prints (dermatoglyphics) and palmar flexion creases in gonadal dysgenesis, pseudohypoparathyroidism and Klinefelter's syndrome. *N Eng J Med* 1964, **270**, 1268-1277.
17. Fujita H: A comparative study on finger patterns of patients with Down's syndrome in Japan. *Jap J Hum Genet* 1969, **14**, 198-209.
18. Gąsiorowski A: *Identification, Symmetry and Heritability of Dermatoglyphs on Human Sole*. UMCS, Lublin 1988.
19. Gąsiorowski A: Zmienność listewek skórnych stopy. *Ann UMCS* 1965, **20**, 269-298.
20. Geipel G: Die Tastleisten der Fußsohlen von Negern Madagaskars, Afrikas und Arabern Nordafrikas. *Z Morphol Anthropol* 1958, **49**, 232-239.
21. Gębala A, Jakliński A, Dobrzańska A, Grzeszyk C, Iwazkiewicz A: Dermatoglify stóp u dzieci w zespole Downa. *Ped Pol* 1968, **43**, 3-5.
22. Gębala A, Jakliński A, Dobrzańska A, Iwazkiewicz A, Grzeszyk C: Dermatoglify dłoni i palców w zespole Downa z częściową trisomią chromosomu 21. *Pol Tyg Lek* 1969, **24**, 2-10.
23. Gębala A, Dobrzańska A, Grzeszyk C: Badania dermatoglifyków dłoni i stóp w zespole Turnera. *Ped Pol* 1970, **45**, 275-284.
24. Glanville EV, Poelking J: Palmar dermatoglyphics in White, Negro and mixed groups. *Am J Physic Anthropol* 1964, **22**, 407-412.
25. Grace HJ, Ally FE: Dermatoglyphic features of South African Coloureds. *Hum Heredity* 1972, **22**, 351-355.
26. Grace HJ, Ally FE: Dermatoglyphs of the South African Negro. *Hum Heredity* 1973, **23**, 53-58.
27. Gralla G: Listewki skórne dłoni i stóp ludności wsi Giełbo w powiecie zawierciańskim. *Przegl Antrop* 1975, **41**, 47-57.
28. Gyenis G: *Hautleistensystemuntersuchungen bei drei ungarischen populationen*. Humanbiologia Budapestinenses, Budapest 1974.
29. Kosowicz J, Dzik A: Zmiany daktyloskopowe w zespole Turnera. *Endokrynol Pol* 1967, **18**, 529-536.
30. Loesch D, Czyżewska J: Dermatoglyphic patterns in 9 p prismsyndrom. *J Ment Defic Res* 1978, **22**, 49-68.
31. Loesch D: Dermatoglyphic distances and position of 21 trisomy mozaic. *J Ment Defic Res* 1979, **23**, 253-263.
32. Loesch D: Dermatoglyphic studies in the parents of trisomy 21 children. *Hum Hered* 1981, **31**, 201-207.
33. Loesch D: Dermatoglyphic sole patterns in 21 trisomics. *J Ment Defic Res* 1983, **27**, 5-9.
34. Loesch D: *Quantitative Dermatoglyphics Classification, Genetics, and Pathology*. Oxford Monographs on Medical Genetics, No 10. Oxford University Press, Oxford - New York - Toronto 1983.
35. Łasiński W: Układ listewek skórnych na stopach Polaków. *Folia Morph TIN* 1950, **3/4**, 417-457.
36. Mastroiacoro P, Curro V, Calabro A, Dallapiccola B: Hand dermatoglyphics in trisomy 4 p. *Hum Genet* 1976, **34**, 271-276.
37. Matzretter Th: Das Hautleistensystem der Mischlinge auf den Karperdischen Inseln. *Z Morphol Anthropol* 1962, **52(1)**, 52-67.
38. Matzretter T: Hautleistensystemuntersuchung an sechs afrikanischen Negerstämmen. *Z Morphol Anthropol* 1964, **55**, 315-334.
39. Matzretter T: Untersuchungen über das Papillarsystem südwest-angolanischer Negerstämme. *Mitteilungen der Anthropologischen Gesellschaft in Wien* 1967, **96/97**, 21-56.
40. Mavalwala J, Wilson MG, Parker CE: The dermatoglyphics of the 18q-syndrome. *Am J Phys Anthropol* 1970, **32**, 443-449.
41. Mavalwala J: The dermatoglyphics of the Parsis of India. *Z Morphol Anthropol* 1963, **54**, 173-189.
42. Mavalwala J, Thompson H, Parker C, Wilson G: Sole dermatoglyphics of XYY patients. *Am J Phys Anthropol* 1970, **32**, 145-146.
43. Martin R: Pipallarsystem. *Lehrbuch der Anthropologie* 1962, **3**, 1810-1935.
44. Mikułowski W, Dobosz-Syklis R, Knaus A: Przyczynek do zastosowania daktyloskopii w zespole Ehlersa i Daulosa. *Wiad Lek* 1968, **17**, 1589-1592.
45. Minier J: Les dermatoglyphes dans la race Basque. *L'Anthropologie* 1956, **60**, 67-70.
46. Muller JM, Jalbert P, Cordonnier D: Syndrom de Klinefelter Caryotype XXYY. Étude des dermatoglyphies. *Ann Biol Clin (Paris)* 1967, **25**, 207-210.
47. Olivier G: Les dermatoglyphes des Françaises. *Bulletins et Mémoires de la Société d'Anthropologie de Paris* 1964, **7**, 49-56.
48. Olivier G: Note sur les dermatoglyphes palmaires des Tamouls du sud de l'Inde. *Bulletins et Mémoires de la Société d'Anthropologie de Paris* 1966, **9**, 275-279.
49. Olivier G: Les dermatoglyphes des Franco-Vietnamiens. *Bulletins et Mémoires de la Société d'Anthropologie de Paris* 1967, **1(12)**, 94-114.
50. Penrose LS, Loesch D: Topological classification of palmar dermatoglyphics. *J Ment Defic Res* 1970, **14**, 111-128.
51. Penrose LS: Finger-print pattern and the sex chromosomes. *Lancet* 1967, **1**, 298-300.
52. Penrose LS, Loesch D: Dermatoglyphic sole patterns. A new attempt at classification. *Hum Biol* 1969, **41**, 427-448.
53. Penrose LS: Dermatoglyphics in trisomy 17 or 18. *J Ment Defic Res* 1969, **13**, 44-49.
54. Penrose LS, Delhanty Joy DA: Familial Langdon Down anomaly with chromosomal fusion. *Ann Hum Genet* 1961, **25**, 243-252.
55. Penrose LS: Comparative study of sole patterns in chromosomal abnormalities. *J Ment Defic Res* 1970, **14**, 2-9.
56. Plato CC, Wertelecki W, Gerald PS, Niswander JD: Dermatoglyphics in the 18q-syndrome. *Ped Res* 1971, **5**, 64-69.
57. Plato CC, Niswander JD: Dermatoglyphics of the Turkeese of Micronesia. *Hum Biol* 1967, **39**, 176-181.
58. Pospišil MF, Pospišilova V: Dermatoglyfy planty a prstov nôh obyvatelov Horehronia. *Acta FRN Univ Com* 1965, **10**, 149-172.
59. Pospišil MF: Die Dermatoglyphik der Slowakei. I. Die Dermatoglyphen der Fingerbeeren. *Acta FRN Univ Comen Anthropol* 1970, **15**, 153-179.
60. Pospišil MF: Die Dermatoglyphik der Slowakei. III. Dermatoglyphen der Sohle und Zehen. *Acta FRN Univ Comen Anthropol* 1971, **16**, 129-169.
61. Priest JH, Verhulst C, Sirkin S: Parental dermatoglyphics in Down's syndrome. A ten-year study. *J Med Gen* 1973, **10**, 328-332.
62. Purvis-Smith SG, Menser MA: Dermatoglyphics in adults with congenital rubella. *Lancet* 1968, **2**, 141-145.
63. Ross LJ: Dermatoglyphic observations in a patient with trisomy 18. *J Pediatr* 1968, **72**, 862-864.
64. Rothhammer F, Dixon M: Microevolution in human Chilean populations. VI Dermatoglyphics in Araucarian Indians. *Z Morphol Anthropol* 1969, **61**, 217-223.
65. Saksena PN, Kumar N: Dermatoglyphics in Turner's syndrome. Analysis of patterns in 4 cases and their families. *Indian J Pediatr* 1968, **35**, 429-444.
66. Shiono H, Minami R, Shinada M, Nakao T: Dermatoglyphics in Rubinstein-Taybi syndrome in Japan. *Tohoku J Exp Med* 1971, **104**, 19-21.
67. Shiono H: Dermatoglyphics of XXYY Klinefelter's syndrome. *Tohoku J Exp Med* 1969, **98**, 1-3.
68. Tegako LI: *Dermatoglyfika Nasielenija Belorusii. Populacjonnyje Aspekty Izmenczivosti*. Nauka i Technika, Minsk 1989.
69. Tiwari SC, Chattopadhyay PK: Palmar dermatoglyphics of Tibetans. *Z Morphol Anthropol* 1967, **59**, 146-157.
70. Trębicka-Kwiatkowska B, Rączkiewicz B, Galińska I, Gąsiorowski A: Badania kariologiczne i dermatologiczne w zespole Downa z translokacją G/G. *Pol Tyg Lek* 1973, **32**, 1220-1222.
71. Trębicka-Kwiatkowska B, Rączkiewicz B, Gąsiorowski A: Przypadek zespołu Edwardsa z trisomią E. *Wiad Lek* 1974, **27**, 565-570.
72. Tunckbilek E, Atasu M, Say B: Dermatoglyphics in trisomy 8. *Lancet* 1972, **2**, 821-823.
73. Uchida JA, Miller JR, Soltan HC: Dermatoglyphics associated with XYY chromosome complement. *Am J Hum Genet* 1964, **16**, 284-289.
74. Wojtowicz-Lebioda H: Dalsze badania nad zróżnicowaniem wzorów listewek skórnych w strefie podpalcowej stopy. *MPA* 1967, **74**, 155-172.
75. Wojtowicz-Lebioda H: Zróżnicowanie wzorów listewek skórnych w strefie podpalcowej stopy. *MPA* 1964, **70**, 163-176.
76. Zajączkowska K: Badania dermatoglifyków dłoni u pacjentów z zespołem Downa i ich rodziców. *Neur Neurochir Pol* 1969, **3**, 267-272.