



Dermatoglyphic Characteristics of Fingers of the Population in Kosovo and Metohija

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Authors' contributions

This work was carried out in collaboration between all authors. All authors read and approved the final manuscript.

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ABSTRACT

Dermatoglyphics as a separate science is being increasingly used in everyday practice. The aim of this study was to determine possible differences in dermatoglyphic characteristics digito-palmar complex (DPC) in the inhabitants of Kosovo and Metohije. Metode: The study involved 424 respondents Serbian and Montenegrin nationality and the Roms population from Kosovo and Metohija. Serbs were 230 (113 men and 117 women), 68 Montenegrins (36 men and 32 women) and 126 Roma (men 65 and 61 women). Among them were 214 or 50.47% of men and 210 or 49.53% women friendly. On within the digital work of DPK we examined six types forms on the fingertip (tendinous arch (Ta), the loop ulnaris (Lu), loop radialis (Lr), whorl (W), the accidentalis patterns (Wacc) and double loop (Ld). Results: the order of frequency of dermatoglyphic pattern is the code: Serbs:Up>W>Ta>Wacc>Rp>Ld. Montenerins: Up> W> Ta> Rp> Wacc> Ld. Roms: Up> W> Ta>Ld> Wacc>Rp. A large number of samples allowed us to obtain reference values and conclusions of our research in the field of medical dermatoglyphics. Comparative findings we have

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done have proven biological closeness of the former Yugoslavian nations. With this work, we set dermatoglyphic standards for Serbian population, which until now has not been done.

Keywords: Skin; patterns of the fingers; hand lines.

1. INTRODUCTION

Humans, as a part of nature, basically are the part of a complex system, which is growing, developing and aims to survive and maintain his species. In this context humans also changed throughout its evolution [1]. Functionally human arms and legs are "permanent executors" constantly in touch with nature, and both suffered the greatest changes [2].

The skin, which encapsulates our body, has a role of a shell, with characteristic unique patterns for each individual and are unchangeable during the life. The skin considering anatomically has an uneven thickness in different regions of the body. This "Strange ridges" and hills make a variety of configurations, which is a characteristic of every man. Traces that remain on the cases of "ripples" in our fingers are called fingerprints. They are unique for each human and belong to it's phenotype. A number of characteristics by which we recognize a single organism is actually his phenotype [3].

Dermatoglyphic is a science that studies the skin and its physiologically-figurative forms, which create a skin ridges on the fingers of the arms and legs, also on the palm and the base of the foot [4,5]. The name of the science originates from Hellenic words: derma-skin and glyph-cut.

These are some of the patterns on the fingers.



A- arch



Ta-tendinous arch

In addition, taking the fingerprints is simple, painless and quick method.

Dermatoglyphs are polygenic determined properties [6]. Their embryonic development begins as early as in the 6th and 7th week of intrauterine life, they are fully formed until 21st week of intrauterine life and do not changes during the life [1]. The gene representing n-th part of the DNA of chromosomes, is the carrier of the specific characteristics of that organism. [7,8]. Francis Galton in his book Fingerprints published in 1892 gives data about the stability of the cutaneous patterns, and cites the example of eight years old girl, from which he took the fingerprints and compared them with the fingerprints of the same person after 70 years [9]. On this example he illustrated that the fingerprints have not changed neither in qualitative nor in quantitative terms.

Galton was one of the first in the world (1892) who classified the pattern of the fingers on the three pillars into groups: Arch, loop and whorl. Cummins in the 1961.expanded the classification and sub-classification, which allowed greater precision and accuracy when reading patterns of the fingers. In our work we have used classification by Cummins. [10,11]. This allow the analysis in anthropological and medical sciences. All methods of registering dermatoglyphic pattern can be divided into standard and special methods, by Alter [12].



L –loopLu –



Loop ulnaris



Lr - Loop radialis



Ld - double loop



W –whorl

The interest of this study was to show that comparative analyzes prove the biological closeness to the people in Serbia, partly prove biological distance of Roma in relation to the Serbs and Montenegrins and to set up dermatoglyphs standards for Serbian population that has not been done up to date.

2. MATERIALS AND METHODS

In this work as material we used the prints of palmar digital dermatoglyphes from randomly selected students of medical school in Pristina as well as students of the Faculty of Medicine and of the National Academy of Fine Arts in Pristina

(age between 14 and 20 years). In total there were 424 subjects, of which 230 of Serbian (113 men and 117 women), 67 of Montenegrins (35 men and 32 women) and of 126 Roms (61 men and 65 women) nationality.

In our research, we chose a standard Ink method. [12] This is the simplest method of taking direct fingerprinting patterns using color stain and gives us a negative of finger pattern. The team for taking the fingerprints consisted of one doctor, one nurse and one technician, and all team members were the same during the research. Firstly, subjects washed their hands with soap and dried, and than we have inflicted with black ("Aero", Celje, Slovenia) photographic roller the palmar surface of the hand and fingers. On the glass plate with two sheets of white paper format A4 for left and right palm were placed. Subjects pressed their palms to the surface of paper and get a plain print. For taking prints of distal phalanx of the fingers, the rotational taking fingerprints from the inner to the outer border as used (rotation in one movement). For statistical data processing we used the t-test of proportions. Through horizontal structure, we looked at each analyzed participation patterns on the finger specifically.

Markings on the toes are easier and better to compare, if we want to emphasize their proportional relationship [13], using numerical values, expressed as index. These index values showing the relationship between the arches and loops, arches and pulleys, pulleys and whorls. Indexes are marked according to the authors, so that we have index by Pollu, Danmajer,

Furuhata, etc. [14]. In our work we used the index by Pollu [15]. This index ratio is calculated as arcs and loops (ulnar and radial) multiplied by 100, i.e.,

$$IP = \frac{A}{P} 100 = \frac{L}{Up + Rp} 100$$

3. RESULTS

In this study, 424 respondents were Serbian, Montenegrins and Roms ethnic population from Kosovo. Among them 214 or 50.47% were males and 210 or 49.53% were females.

The gender structure of certain populations was approximately the same. Percentage ratio of men to women was in the Serbian 49:51, in Montenegrins 53:47 and in Roms 51.6:48.4. The structures by sex in total were: Serbs 54.25%, Montenegrins 16.04%, Roms 29.71%. This ratio was approximate and by gender.

Of the total number of finger patterns 50.33% were on male fingers and 49.67% in females fingers.

We concluded that the frequency of Up, W and Ld patterns were higher in men than in women, not only in the total number of all the above patterns on the fingers of both hands together, but also individually, except in Ld markings on the left and right hand of all fingers I-V. Patterns of Ta, Rp and **Wacc** were more common in women than in men.

Table 1. Examined population by sex and ethnicity

Population	Structures								
	Number of respondents			Horizontal			Vertical		
	M	F	All	M	F	All	M	F	All
Serbian	113	117	230	49,13	50,87	100,00	52,80	55,71	54,25
Montenegrins	35	32	67	52,94	47,06	100,00	16,82	15,24	16,04
Roma	65	61	126	51,59	48,41	100,00	30,38	29,05	29,71
Total	214	210	424	50,47	49,53	100,00	100,00	100,00	100,00

Table 2. Number of fingers with certain dermatoglyphic patterns by the sex of subjects (left, right) of the examined population

Population	Males			Females			Total		
	L	R	All	L	R	All	L	R	All
Serbian	564	564	1128	585	585	1170	1149	1149	2298
Montenegrin	175	175	350	160	160	320	335	335	670
Roma	325	325	650	305	305	610	630	630	1260
No.	1064	1064	2128	1050	1050	2100	2114	2114	4228
Total %	50,33			49,67			100,00		

Table 3. Frequency of deramoglyphic patterns on the fingers of Serbian population by the sex and the arms

Fingers of the arms and sex		Patterns						
		Ta	Up	Rp	W	Wacc	Ld	All
Male:								
	L	6,03	60,46	1,95	25,53	2,13	3,90	100,00
	R	4,79	53,19	2,66	33,86	2,66	2,84	100,00
I-V	L+R	5,41	56,82	2,31	29,70	2,39	3,37	100,00
Female:								
	L	15,90	46,84	5,13	23,42	4,61	4,10	100,00
	R	12,31	49,23	3,93	25,81	6,84	1,88	100,00
I-V	L+R	14,10	48,03	4,53	24,62	5,73	2,99	100,00
All:								
	L	11,05	53,52	3,57	24,46	3,39	4,00	100,00
	R	8,62	51,17	3,31	29,76	4,79	2,35	100,00
I-V	L+R	9,84	52,35	3,44	27,11	4,05	3,17	100,00

Table 4. Frequency of dermatoglyphic patterns on the fingers of Montenegrins population by the sex and the arms

Fingers of the hand and sex		Patterns						
		Ta	Up	Rp	W	Wacc	Ld	All
Male:								
	L	7,43	52,57	1,72	28,00	1,14	9,14	100,00
	R	5,71	45,72	2,29	41,71	0,00	4,57	100,00
I-V	L+R	6,57	49,14	2,00	34,80	0,57	6,86	100,00
Female:								
	L	13,75	46,88	2,50	33,75	0,62	2,50	100,00
	R	6,25	56,22	0,00	35,00	1,88	0,62	100,00
I-V	L+R	10,00	51,56	1,25	34,38	1,25	1,56	100,00
All:								
	L	10,45	49,85	2,08	30,75	0,90	5,97	100,00
	R	5,97	50,75	1,19	38,51	0,90	2,68	100,00
I-V	L+R	8,20	50,30	1,64	34,62	0,90	4,33	100,00

Table 5. Frequency of deramoglyphic patterns on the fingers of Roma population by the sex and the arms

Fingers of the arms and sex		Patterns						
		Ta	Up	Rp	W	Wacc	Ld	All
Male:								
	L	8,00	51,08	2,15	23,38	0,62	14,72	100,00
	R	7,08	49,84	1,85	28,31	0,31	12,61	100,00
I-V	L+R	7,54	50,46	2,00	25,85	0,46	13,69	100,00
Female:								
	L	8,85	38,36	1,31	33,77	3,94	13,77	100,00
	R	5,90	43,60	2,30	28,85	5,25	14,10	100,00
I-V	L+R	7,38	40,98	1,80	31,32	4,59	13,93	100,00
All:								
	L	8,41	44,92	1,75	28,41	2,22	14,29	100,00
	R	6,51	46,83	2,06	28,57	2,70	13,33	100,00
I-V	L+R	7,46	45,87	1,91	28,49	2,46	13,81	100,00

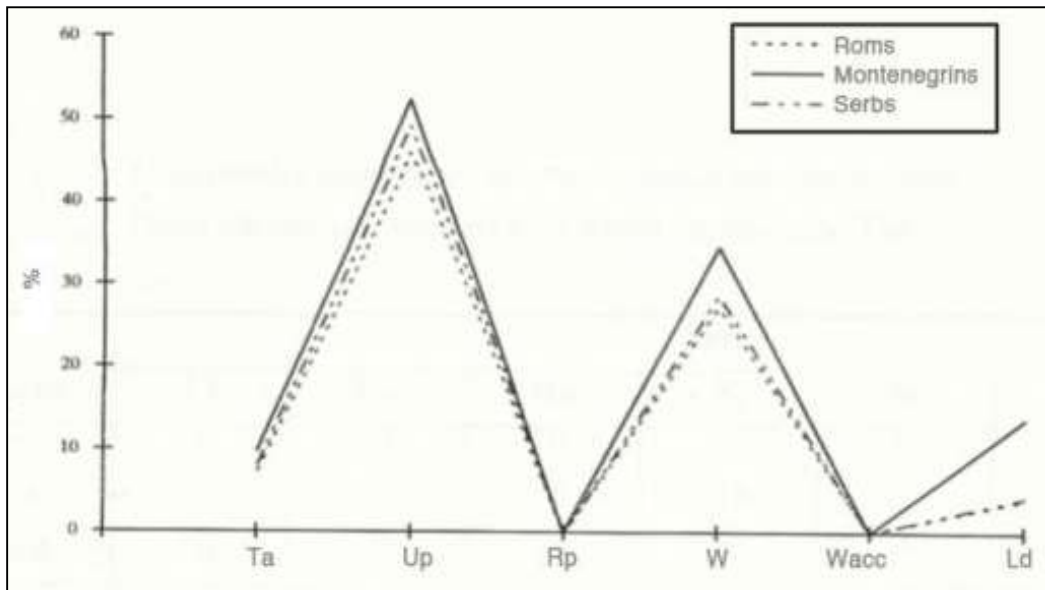
The most common pattern is Up. Represented on all fingers with 50.30%, it is only for 2.05% less than in Serbian population, what is statistically insignificant ($t = 0.934$, $p > 0.05$). There is no differences in the frequency of Up pattern between left and right hands in

Montenegrins of both sexes which was 49.85% (left): 50.75% (right).

In Roms population most common pattern was Up. Its participation was 45.87% of all fingers of both sexes. Its participation in the Serbian population was 6.48% lower, which is statistically very significant ($t = 3.706, p < 0.001$). In relation to the Montenegrins population to 4.43%, which is statistically insignificant ($t = 1.854, p > 0.05$). More frequent Up patterns in men than in women, 9.48% of all fingers (IV) was statistically highly significant ($t = 3.390, p < 0.001$).

Average indexes by Poll-in were greater in the left than the right hand, also were higher in

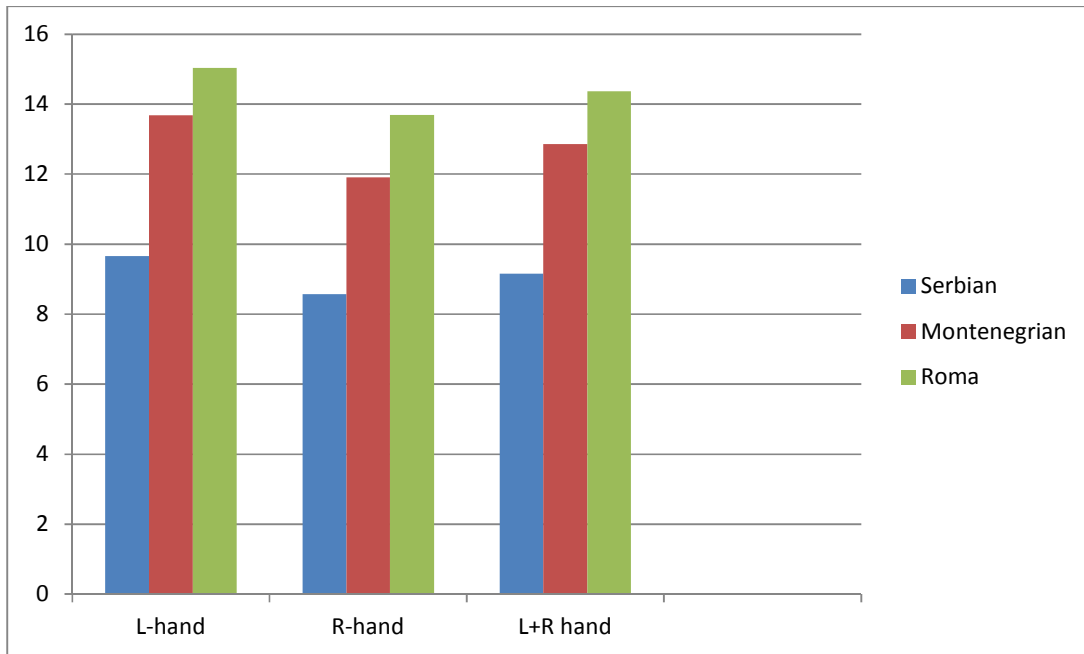
women than in men in all three populations [15]. Left hand in men population ranged from 8.57% (Serbs) to 13.69% (Roma), and right hand from 9.66% to 15.03% for the same population. Among the women listed, the right hand index ranged from 12.86% (Roms) to 23.92% (Serbs). The left hand listed Poll index was significantly higher than the right hand. Women from Roma population was 22.31%, 27.85% Montenegrins, while the Serbians 30.59% so that the differences is very significant. All of the above indexes were significantly higher than the Montenegrins and Albanians in similar surveys of Prof. N. Boljevic in Montenegro where the indexes ranged from 5.66% to 12.56% [16].



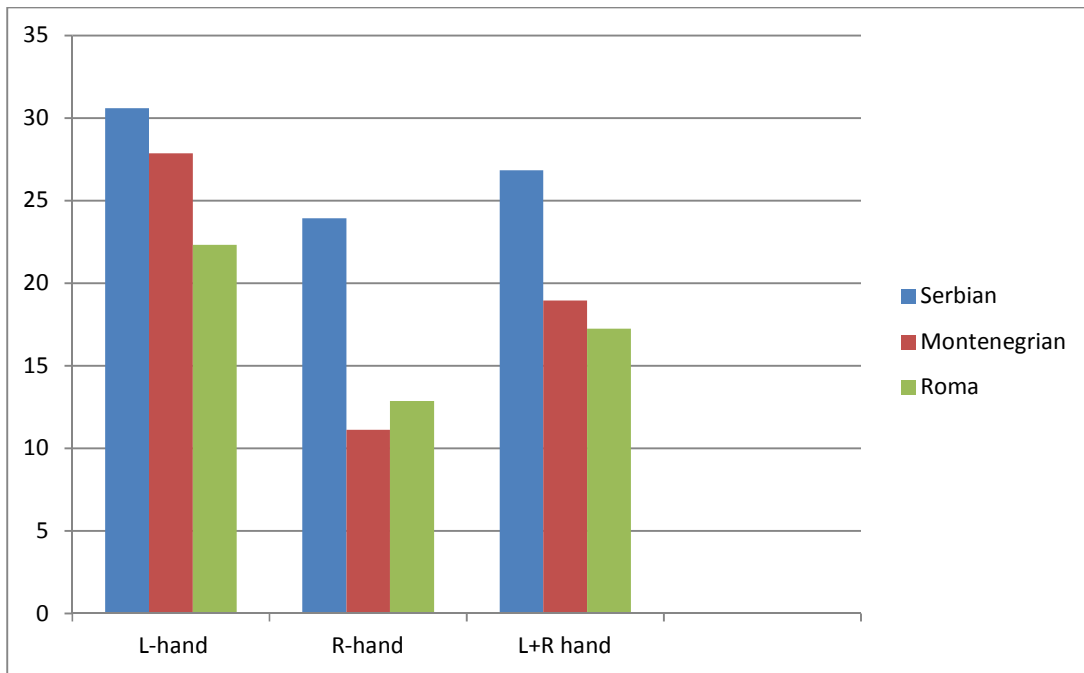
Graph 1. Comparative percentage ratio of participation dermatoglyphic pattern of fingerprints for population of Serbs, Montenegrins and Roma

Table 6. Index values dermatoglyphic pattern by Poll-in

Respondents	Poll index			
	Gender	L-arm	R-arm	L+R-arms
Serbs	M	9,66	8,57	9,15
	W	30,59	23,92	26,83
	M+W	19,36	15,81	17,63
Montenegrins	M	13,68	11,91	12,85
	W	27,85	11,11	18,93
	M+W	20,11	11,49	15,80
Roms	M	15,03	13,69	14,37
	W	22,31	12,86	17,24
	M+W	18,03	13,31	15,61



Graph 2. Relation of index values from dermatoglyphic pattern by Poll in males



Graph 3. Relation of index values from dermatoglyphic pattern by Poll in women

4. DISCUSSION

The large sample allows us to obtain reference values and conclusions of our research in the field of medical dermatoglyphics.

Based on statistical indicators that we used in our study, through analyzing six variables of qualitative markers of digit palmar complex we found:

The frequency order of digitopalmary pattern is in:

Serbs: Up> W> Ta> Wacc>Rp>Ld
Montenegrins: Up> W> Ta>Rp> Wacc>Ld
Roma: Up> W> Ta>Ld> Wacc>Rp,

It can be concluded that the most common pattern is UP in all three groups of subjects.

At I finger of both hands of the Serbs most frequent pattern is a pattern Up to II finger pattern W, the finger III is the most frequent pattern Up, as well as on IV and V finger.

At I finger of both hands in Montenegrins is the most frequent pattern W. On the finger II most frequent pattern is a pattern W. On finger III pattern was up, while the finger IV pattern W, and on the finger V pattern up.

At I finger of both hands with the Roma is the most frequent pattern DI to the fingers II is more frequent pattern W, the finger III pattern Up to finger IV pattern W, while the finger V most frequent pattern was Up.

From these results it is concluded that on the finger II in all three groups of respondents the most frequent pattern is W.

Index values dermatoglyphic pattern by Poll-in for Serbs were 17.63, for Montenegrins 15.80, and for Roms 15, 61. So, the index value by Poll-in is the largest in the Serbs, and the lowest in Roms.

Using comparative findings, we have partly proven also biological closeness of the Yugoslavian people. With this work we set dermatoglyph standards for Serbian population, which until now, has not been done, comparing with the famous dermatoglyphic standards of other nations.

Dermatoglyphics, as a separate science is being increasingly used in daily practice, but in medicine slightly less, although the dermatoglyphics is very important in medicine and reliable [17]. Today, by using clinical dermatoglyphics over 150 diseases could be identified with 80% to 99.9% of probability. Clinical dermatoglyphics is most often used in diagnosing mental retardation [18,19], autism [20,21], schizophrenia [22], Alzheimer' diseases [23], or even in predicting appearances of addiction diseases such as alcoholism [24].

Besides mentioned above, dermatoglyphs can be used to determine genetic predispositions for dyslexia [25], or hyperactivity [20], and also as clinical markers for various types of trisomy [27,28].

5. CONCLUSION

By studying the phenotypic characteristics of the mentioned nations, who carry correlative features and heritage this study demonstrated certain difference of the Rom in relation to the Serbian and Montenegrin populations.

Our research is first among Kosovo population, and this is a first attempt to further research the biological-genetic population structure.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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