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Comparative Analysis of Qualitative Dermatoglyphic Traits of Albanian and Turkish Populations Living in the Area of Dukagjin Valley in Kosovo

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ABSTRACT

Dermatoglyphic prints were collected from 800 inhabitants of Dukagjin valley in Kosovo. The sample consisted of two ethnically different sub-populations who refer themselves as Albanians (N=400) and Turks (N=400). Qualitative analysis of prints concerned the frequency of the patterns on fingers (arch, ulnar and radial loop, whorl, accidental whorl) and on palms (Thenar and I, II, III, and IV interdigital area and the hypothenar, main line index, and the axial »t« triradius position). As was expected due to previous study of quantitative dermatoglyphic traits, in the same population the Albanians and Turks showed to be significantly different in most explored qualitative dermatoglyphic variables. Found differences indicated that the reproductive isolation between the Albanian and Turkish population in Kosovo is substantial, despite the fact that those two ethnic sub-populations live in the close vicinity through several centuries.

Key words: *qualitative dermatoglyphic traits, reproductive isolation, Kosovo, Albanian and Turkish population, population structure*

Introduction

Dermatoglyphs are stable complex phenotypes that, even today, play a very important role in human biology research. The significant genetic control of qualitative palmar dermatoglyphic traits was documented in numerous studies[1–7]. Since the intrauterine environment also has the important impact on epidermal ridge configurations, many diseases and disturbances (specially neurological) has been related to dermatoglyphic patterns with the aim to test if their etiology could be connected to the events taking place during early embryological development[8–12].

In anthropology, dermatoglyphs have been extensively used to study the genetic structure and ethno-history of human populations. It has been assumed that they can also be a useful tool for studying the mating intensity through shared history for the populations occupying the same territory. Some of the most important works include the following populations: Basque[13], Sardinians[14], inhabitants of Alberche/Tormes Valley in Spain[15], Eastern Adriatic island populations of Croatia[16,17], Moroccan Arabs[18], populations of Papua New Guinea[19], American Caucasian[20], Chorote Indians of the Gran Chaco[21], Araucarian Indians from Patagonia and other Argentinean aboriginal populations[22], South Amerindian populations[23], Andean Indians[24].

Recently, inter-population variability in qualitative palmar dermatoglyphic traits has been investigated by many researchers using new classification of the C line

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terminations[25–31]. It appears that special characters are not always good indicators of relationships between populations. Hoff et al.[32], in analyzing Native American populations, pointed out that modal types of C-line terminations give better results in inter-population studies than modal types of D-line terminations. Kamali et al.[33], on the other hand examining modal types of the C line in 13 Iranian populations, concluded that »although the modal types of the C-line do show inter population variability, they are not a good measure of the relationships of populations«. This is especially true if the two populations are separated by cultural and genetic factors. As regards the modal types of D-line terminations, Hoff et al.[32] and Kamali et al.[34] pointed out that they are not good instruments for analyzing biological relationships between populations.

Albanians are an ancient population who now lives in the southwestern part of the Balkan Peninsula. They speak Albanian language which is very distinct from the languages of surrounding populations[35]. The ancient inhabitants living in Dukagjini valley were Illyrians. There are some records from the antique period that Kosovo has been inhabited by the Illyrian tribe named Dardanet, so that the country inhabited by Dardans was called Dardania[36,37]. The Turkish population living in Dukagjini valley of Kosovo migrated into this area from Asia in the 14th and 15th century[38] as a part of the Ottoman's expansion into Balkans. Although Albanians and Turks share the same religion, they were not marrying each other. In the Turkish population living in the Dukagjini valley was found endogamy, but not between the Albanians[36].

The aim of the present study is to explore the relationship between Albanian and Turkish populations living in Dukagjini valley in south Kosovo by means of qualitative dermatoglyphic traits. Since quantitative dermatoglyphic characteristics[39] showed significant differences between those two ethnic groups we wish to test if different ethnical background would be expressed in the frequencies of qualitative patterns as well.

Material and Methods

The fingerprints were collected from 400 Albanian (200 females and 200 males), and 400 Turkish (200 females and 200 males) inhabitants of the Dukagjini valley in south Kosovo. Standard ink methods were used for taking fingerprints, as described by Cummins and Midlo[40]. We analyzed the following qualitative digito-palmar dermatoglyphic traits: frequency patterns on the fingers (whorl, ulnar loop, radial loop, arch, and accidental whorl), pattern frequency in individual parts of the palm (Thenar/I interdigital area, II, III, and IV interdigital area and Hypothenar), MLI (main line index), and the axial »t« triradius position. The dermatoglyphic prints were analyzed by a single observer (G. Temaj). Comparisons were performed using χ^2-test. Statistical analysis was conducted using SPSS Statistics 18.

Results

The results of qualitative analysis of the dermatoglyphic traits in fingers are presented in table 1. The results of χ^2-test revealed significant differences among Albanian and Turkish populations in females for radial loop (χ^2=6.57; p<0.01), whorl (χ^2=21.72; p<0.001) and for accidental whorl (χ^2=29.92; p<0.001). In males the results of relative frequencies of types of patterns on fingers in Albanian and Turkish populations reveal significant differences for ulnar loop (χ^2=11.19; p<0.01), whorl (χ^2=51.66; p<0.001), and accidental whorl (χ^2=19.8; p< 0.001).

In Table 2 the results for axial »t« triradius position are presented. In females statistical significance was found for position t (χ^2=9.93; p<0.01) and in males for position t" (χ^2=12.52; p<0.01).

TABLE 2
FREQUENCIES OF AXIAL »T« TRIRADIUS POSITION IN ALBANIAN AND TURKISH FEMALES AND MALES. POPULATION DIFFERENCES ARE TESTED BY χ^2-TEST

Females	t	t'	t"
Albanians	52.25	37.0	10.75
Turks	63.5*	29.0	7.5
Males	t	t'	t"
Albanians	60.75	30.0	9.25
Turks	66.5	30.5	3.0*

*p<0.01; ** p<0.001

TABLE 1
FREQUENCIES OF DERMATOGYPHICS PATTERN ON FINGERS IN ALBANIAN AND TURKISH FEMALES AND MALES. POPULATION DIFFERENCES ARE TESTED BY χ^2-TEST

Females	Arch	Ulnar loop	Radial loop	Whorl	Accidental whorl
Albanians	6.5	61.1	4.0	24.50	3.9
Turks	8.0	59.8	5.8*	18.40**	8.1**
Males	Arch	Ulnar loop	Radial loop	Whorl	Accidental whorl
Albanians	7.1	56.6	4.2	27.70	4.5
Turks	8.4	61.8*	3.8	18.1**	8.0**

*p<0.01; ** p<0.001

TABLE 3
FREQUENCIES OF MAIN LINE INDEX IN ALBANIAN AND TURKISH FEMALES AND MALES. POPULATION DIFFERENCES ARE TESTED BY χ^2-TEST

Main line index	Position	Palms female		Palms male	
		Turks	Albanians	Turks	Albanians
	1	0.00	0.00	3.00	0.00*
	2	3.00	7.00*	4.00	7.50*
	3	7.50	2.50*	7.00	4.75
A	4	31.50	31.50	26.00	38.00*
	5’	56.00	58.50	48.00	45.75
	5”	2.00	0.50*	11.50	4.00*
	7	0.00	0.00	0.50	0.00
		100	100	100	100
	5’	1.50	9.00	7.00	10.00
	5”	28.00	36.75	24.00	40.25**
	6	22.50	23.00*	9.50	19.25*
B	7	35.00	26.25*	48.50	26.00**
	8	11.50	4.75	8.00	4.00*
	9	1.50	0.25	3.00	0.50*
		100	100	100	100
	5’	0.00	0.00	0.00	0.00
	5”	11.00	3.25*	9.50	4.75*
	6	12.00	16.25	4.00	14.75**
	7	22.00	21.50	18.00	16.50
	9	25.50	41.00*	36.50	32.25
C	11	0.50	0.00	3.00	0.25*
	X	13.50	11.75	13.00	21.50*
	x	0.00	0.00	0.00	0.00
	10	16.00	6.25*	16.00	10.00*
	0	0.00	0.00	0.00	0.00
		100	100	100	100
	7	7.50	12.75*	14.50	8.50
	8	12.00	12.25	10.50	12.00
	9	20.00	11.25*	12.00	11.50**
D	10	26.00	42.00**	16.00	32.50*
	11	33.50	42.00*	42.50	34.00*
	13’	1.00	0.50	5.00	1.50
		100	100	100	100
	11	1.00	3.75*	1.50	2.00
	12	17.00	7.25**	19.50	9.00*
T	13’	64.00	53.00*	58.50	68.00*
	13”	18.00	36.00**	20.50	21.00
		100	100	100	100

The relative frequencies of main line index for both hands are presented in Table 3. χ^2-test for line A in females revealed significant difference between two populations for position 2 (χ^2=5.92; p<0.01), position 3 (χ^2=5.86; p<0.01), and position 5” (χ^2=4.15; p<0.01). For line B statistical difference was found for position 6 (χ^2=6.80; p<0.01) and position 7 (χ^2=11.32; p<0.01). The inter population differences for line C was also statistically significant between females for position 5” (χ^2= 17.0; p<0.01), position 9 (χ^2=20.96; p<0.01), and posi-

tion 10 (χ^2=18.26; p<0.01). χ^2-test revealed significant differences between Albanian and Turkish females for line D in position 7 (χ^2=5.49; p<0.01), position 9 (χ^2= 10.96; p<0.01) position 10 (χ^2=22.11; p<0.001) and position 11 (χ^2=13.23; p<0.01). The inter-population difference in females for line T was also statistically significant for position 11 (χ^2=5.39; p<0.01) position 12 (χ^2=16.94; p<0.001) position 13' (χ^2=9.25; p<0.01) and position 13" (χ^2=31.97; p<0.001).

In males, χ^2-test revealed significant difference between two populations for frequencies of line A in position 1 (χ^2=10.24; p<0.01), position 2 (χ^2=3.9; p<0.01), position 4 (χ^2=12.69; p<0.01) position 5" (χ^2=14.7; p< 0.01). The differences for line B were statistically significant for position 5" (χ^2=23.48; p<0.001), position 6 (χ^2=14.66; p<0.01), position 7 (χ^2=42.36; p<0.001), position 8 (χ^2=4.99; p<0.01) and position 9 (χ^2=5.89; p< 0.01). The chi-square test revealed statistically significant difference for line C in position 5", (χ^2=6.12; p< 0.01), position 6 (χ^2=25.95; p<0.001), position 11 (χ^2= 5.9; p<0.01), position X, (χ^2=9.54; p<0.01) and position 10, (χ^2=5.85; p<0.01). The difference for line D was statistically significant for position 9, (χ^2=28.75; p<0.001), position 10, (χ^2=5.10; p<0.01), and position 11, (χ^2= 6.72; p<0.01). For line T, significant differences were found for position 12, (χ^2=17.20; p<0.01) and position 13', (χ^2=7.36; p<0.01).

Table 4 shows the relative frequencies of patterns in palmar areas in females and males. In the palmar area, in females, there is a statistically significant difference for Thenar and I interdigital area (χ^2=19.99; p<0.01), II interdigital area (χ^2=19.99; p<0.01), III interdigital area (χ^2=57.80; p<0.0001), and IV interdigital area (χ^2=3.97; p<0.01). In males, the statistically significant difference is found for Thenar and I interdigital area (χ^2=18.34; p< 0.01), II interdigital area (χ^2=13.14; p<0.01), III interdigital area (χ^2=17.92; p<0.01), and for the hypothenar (χ^2=6.67; p<0.01).

Discussion and Conclusion

We conducted a comparative study of the Albanian and Turkish sub-populations of the Dukagjin valley in Kosovo using polygenetically determined qualitative dermatoglyphic traits. Based on earlier findings of quantitative dermatoglyphic traits, we expected that we will find the differences between two ethnic groups using qualitative dermatoglyphic traits as well[33].

The Albanian population is linguistically distinctive from surrounding, mainly Slavic, populations. Preserving the language is an important factor in maintaining cultural, social as well as genetic identity[41]. Human evolution is full of fragmentations of populations into smaller groups. Local populations could be differentiated genetically from neighbors because of early genetic drift (founder effect) or for other reasons. Three conditions are important for genetic differentiation to take place: 1) small size of population, 2) isolation, and 3) length of time[40]. According to Cavalli-Sforza[41], »should the fragments of single populations become utterly isolated from one another, for example, they will differentiate even in the absence of mutations and natural selection. Chance alone causes their respective gene frequencies to change, in a process called drift«. Genetic and linguistic evolution correspond closely[42].

Dermatoglyphic divergence observed between Albanian and Turkish populations can be interpreted in terms of micro-evolutionary processes, such as genetic drift. In our opinion, genetic drift is the most logical interpretation of the results obtained in this study because there are no solid evidences to confirm that natural selection may have a direct impact on the formation of dermatoglyphic traits[43].

The current comparison showed significant differences between the Albanian and Turkish populations for several qualitative digital patterns (ulnar loop in males, radial loop in females, and whorl and accidental whorl in both sexes). The statistical differences that we found in the termination of the C line between Albanian and Turkish population does not support the observation of Kamali et al.[34], that the termination of the C line is not a good indicator of relationships and differences among populations. According to the results of Kamali et al.[33] Jantz and Chopra[44], Reddy et al.[45,46] and Demarchi et al.[47], Karmakar and Kobyliynsky[48,49] Karmakar et al.[50] palmar traits are better indicators of distances among populations than finger traits. This result was also supported by our observations. Our comparisons showed significant differences for the greater number of palmar traits.

In conclusion we can state that the Albanian and Turkish sub-populations of the Dukagjin valley in Ko-

TABLE 4
FREQUENCIES OF DERMATOGLYPHIC PATTERN ON IN ALBANIAN AND TURKISH FEMALES AND MALES. POPULATION DIFFERENCES ARE TESTED BY χ^2-TEST

Females	I/Th	II	III	IV	HY
Albanians	4.00	2.75	47.50	51.75	39.00
Turks	11.00*	11.00*	74.00**	59.00*	35.00
Males	I/Th	II	III	IV	HY
Albanians	4.25	4.00	51.00	49.50	43.75
Turks	13.00*	11.00*	66.00*	46.00	37.00*

*p<0.01; ** p<0.001

sovo, show numerous differences in frequencies of qualitative dermatoglyphic patterns. Since dermatoglyphic traits are not very sensitive to the influences of evolutionary forces and they are changing very slowly[19,51–55], the presented findings imply that those two populations living in close vicinity maintained substantial reproductive isolation throughout centuries.

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REFERENCES

1. PONS J, Trab Inst B de Sahagun Antropol Etnol, 14 (1954) 35. — 2. GLANVILLE EV, Am J Hum Genet, 17 (1965) 420. — 3. VRYDAGH-LAOUREUX S, Bull Mem Soc Anthropol Paris, 7 ser, 12 (1975) 281. — 4. KLOEPFER HW, A genetic model for the inheritance of a dermatoglyphic trait: Absence of the palmar c-triradius. In: MAVALWALA J (Ed) Dermatoglyphics. An International Perspective (The Hague, Netherlands: Mouton, 1978). — 5. LOESCH D, J Hum Evol, 7 (1978) 669. — 6. MORGAN LY, JUBERG RC, FAUST CC, Am J Phys Anthropol, 49 (1978) 441. — 7. KAREV GB, Am J Phys Anthropol, 84 (1991) 479. — 8. BABLER WJ, Am J Phys Anthropol, 48 (1978) 21. — 9. BABLER WJ, Coll Antropol, 11 (1987) 297. — 10. BABLER WJ, Prenatal communalities in epidermal ridge. In: DURHAM NM, PLATO CC (Eds) Trends in Dermatoglyphic Research (Dordrecht, Netherlands: Kluwer, 1990). — 11. SORENSON JAMISON C, Dermatoglyphics and the Geschwind hypothesis. I. Theoretical background and palmar results of dyslexia. In: DURHAM NM, PLATO CC (Eds) Trends in Dermatoglyphic Research (Dordrecht, Netherlands: Kluwer, 1990). — 12. HAUSER G, Dermatoglyphic pointers to embryonic development. In: REDDY BM, ROY SB, AND SARKAR BN (Eds) Dermatoglyphics Today (Calcutta, India: Indian Institute of Biosocial Research and Development, 1991). — 13. ARRIETA I, MARTINEZ B, CRIADO B, TELEZ M, ORTEGA B, PENAGARIKANO O, LOSTAO CM, Hum Biol, 75 (2003) 265. — 14. SANNA, E., FLORIS G, Hum Biol, 67 (1995) 265. — 15. MARTIN J, MESA SM, FUSTER V, MORAL P, Am J Hum Biol, 8 (1996) 305. — 16. MILIČIĆ J, Dermatoglyphics in the eastern Adriatic: Possibilities and dilemmas in the study of population structure. In: DURHAM NM, PLATO CC (Eds) Trends in Dermatoglyphic Research (Kluwer Academic Publishers, Boston, 1990). — 17. RUDAN I, RUDAN P, CHAVENTRE A, JANIĆIJEVIĆ B, MILIČIĆ J, SMOLEJ-NARANČIĆ N, SUJOLDŽIĆ A, Homo, 49 (1998) 201. — 18. KANDIL M, LUNA F, CHAFIK A, ZAOUI D, MORAL P, Ann Hum Biol, 25 (1998) 319. — 19. FROEHLICH JW, GILES E, Am J Phys Anthropol, 54 (1981) 93. — 20. PLATO CC, CEREGHINO JJ, STEINBERG FS, Am J Phys Anthropol, 42 (1975) 195. — 21. DEMARCHI DA, SEISDCDOS L, Ann Hum Biol, 23 (1996) 363. — 22. DEMARCHI DA, GIORDANO AR, MARCELLINO AJ, Hum Biol, 69 (1997) 227. — 23. DEMARCHI DA, MARCHELLINO AJ, Hum Biol, 70 (1998) 579. — 24. DITTMAR M, Am J Phys Anthropol, 105 (1998) 377. — 25. PONS J, Trab Inst B de Sahagun Antropol Etnol, 13 (1952) 87. — 26. PLATO CC, Am J Phys Anthropol, 33 (1970) 413. — 27. CHAMLA MC, SAHLY A, Libyca Alger, 20 (1972) 11. — 28. PLATO CC, WERTELECKI W, Am J Phys Anthropol, 37 (1972) 97. — 29. VRYDAGH-LAOUREUX S, Hum Biol, 51 (1979) 537. — 30. FOX KM, GARRUTO RM, GAJDUSEK DC, Coll Antropol, 11 (1978) 355. — 31. FRANCIS J, A comparative study of palmar C-line polymorphism among the two communities of Kerala. In: REDDY BM, ROY SB, AND SARKAR BN (Eds) Dermatoglyphics Today (Calcutta, India: Indian Institute of Biosocial Research and Development, 1991). — 32. HOFF C, PLATO CC, GARRUTO RM, DUTT J, Am J Phys Anthropol, 55 (1981) 455. — 33. KAMALI MS, MAVALWALA J, KHANEQAH AA, BHANU BV, Am J Phys Anthropol, 85 (1991) 429. — 34. KAMALI MS, MAVALWALA J, BHANU BV, Am J Phys Anthropol, 81 (1990) 527. — 35. CERABREGU M, Gjeo dhe hartolinguistika (hartografia) II (Prishtine, 1990). — 36. MIRDITA Z, Studime Dardane (Prishtine, 1979). — 37. STIPCEVIC A, Iliret-historia, Jeta, kultura, (Prishtine, 1980). — 38. HADRI A, Historia e popullit Shqiptar, (Prishtine, 1973). — 39. TEMAJ G, MILIČIĆ J, ŠKARIĆ JURIĆ T, BEHLULI I, SMOLEJ NARANČIĆ N, HADŽISELIMOVIĆ R, NEFIĆ H, Coll Antropol, 33 (2009) 1001. — 40. CUMMINS H, MIDLO C, Fingerprints, Palms, and Soles. (New York: Dover, 1961). — 41. CAVALLI-SFORZA LL, Sci Am, Nov (1991) 72. — 42. BERTRANPETIT J, CAVALLI-SFORZA LL, Ann Hum Genet, 55 (1991) 51. — 43. CHAI CK, Biological distances between indigenous populations of Taiwan. In: MAN J, WEINER S, HUIZINGA J (Eds) The Assessment of Population Affinities (Oxford, England: Clarendon Press, 1972) 182. — 44. JANTZ R, CHOPRA VP, Am J Phys Anthropol, 60 (1983) 61. — 45. REDDY BM, PFEFFER A, CRAWFORD MH, LANGSTIETH BT, Hum Biol, 73 (2001) 291. 46. REDDY, BM, CHOPRA VP, KARMAKAR B, MALHOTRA CC, MUELLER H, Am J Hum Biol, 12 (2000) 315. — 47. DEMARCHI DA, GIORDANO AR, MARCELLINO AJ, Hum Biol, 69 (1997) 227–239. — 48 KARMAKAR B, KOBYLIANSKY E, Coll Antropol, 33 (2009) 1007. — 49. KARMAKAR B, KOBYLIANSKY E, Anthropol Anz, 67 (2009) 253. — 50. KARMAKAR B, YAKOVENKO K, KOBYLIANSKY E, Coll Antropol, 32 (2008) 467. — 51. ROTTHAMMER F, CHAKRABORTY R, LLOP E, Am J Phys Anthropol, 46 (1977) 51. — 52. DITTMAR M, Homo, 44 (1993) 229. — 53. REED T, VIKEN RJ, RINEHART SA, Am J Med Gen, 140A (2006) 263. — 54. CHEN YF, ZHANG HG, LAI CH, LU ZY, WANG ZG, Life Sciences, 50 (1) (2007) 135. — 55. SABIR B, CHERKAOUI M, BAALI A, LEMAIRE O, DUGOUJON JM, BOËTSCH G, Int J Anthropol, 20 (3–4) (2005) 277.

KOMPARATIVNA ANALIZA KVALITATIVNIH SVOJSTAVA DERMATOGLIFA ALBANSKIH I TURSKIH POPULACIJA KOJI ŽIVE U DOLINI DUKAGJIN NA KOSOVU

S A Ž E T A K

Otisci dermatoglifa su prikupljeni u uzorku od 800 stanovnika Dukagjin doline (od 400 Albanaca i 400 Turaka). Provedena je kvalitativna analiza otisaka određujući frekvencije crteža na prstima te učestalost crteža na dlanovima u području tenara i I interdigitalnog prostora, u II, III, i IV interdigitalnom prostoru i na hipotenaru, Indeks glavnih linija i poziciju aksijalnog »t« triradijusa. Kao što se s obzirom na prethodna istraživanja i očekivalo, Albanci i Turci značajno se razlikuju u većini varijabli. Pronađene razlike pokazuju da je miješanje između albanske i turske populacije malo, unatoč činjenici da žive zajedno kroz nekoliko stoljeća.