

Dermatoglyphic Variations in Population of Three Regions of Jammu and Kashmir

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Abstract

The current study was undertaken to analyze the relationship of dermatoglyphic patterns in relation to people of three regions of J&K, i.e. Jammu, Kashmir and Ladakh regions. Study was conducted on 90 subjects, 30 each from Jammu, Kashmir and Ladakh regions of J&k State in the Postgraduate Department of Anatomy, GMC, Jammu. Enrolled subjects were young, healthy with no evidence of any disease or injury to fingertips, irrespective of age, gender, lifestyle or economic status. The qualitative parameters observed were loop, arch and whorl and quantitative parameter were the ridge counts of individual fingers of both right and left hands and total finger ridge count. The relationship of finger tip pattern of the three populations showed no significant variation with respect to arches ($p=0.95$), but radial and ulnar loops showed highly significant variations (both $p=0.0004$) due to few number of both loops in Ladakhi population, while whorls pattern showed highly significant variation ($p=0.0006$) due to more number of this pattern in Ladakhi population. In case of composite pattern, the variation was again highly significant ($p=0.0002$) because this pattern was totally absent in Ladakhi population. Significant variations were found between Jammu and Ladakh populations with respect to radial loops ($p=0.0003$), ulnar loops ($p=0.0018$) and whorls ($p=0.0033$). Significant variations were revealed on comparison of fingertip patterns between Kashmiris and Ladakhis with respect to radial loop ($p=0.0000$), ulnar loop ($p=0.0004$) and whorls ($p=0.0000$). No significant variation was detected in fingertip patterns in people of Jammu and Kashmir region, while dermatoglyphic patterns of people of Ladakh region showed statistically distinct variation from those of people of Jammu and Kashmir regions respectively.

Key Words

Dermatoglyphic, Finger tip pattern, Whorls, Radial, Ulnar, Arches

Introduction

The entire human body is clothed with skin which happens to be the largest and most important organ of the body. The skin on the ventral sides of the hands i.e. palms and plantar sides of the feet i.e. soles is exclusively designed and is corrugated with ridges and configurations. (1) The ridge pattern depends upon cornified layer of epidermis as well as dermal papillae. They are characterized by a complicated pattern of "hills and valleys". The hills are called ridges and valleys furrows. [2]All studies of the dermal ridge arrangements including Genetics, Anthropology and Egyptology are classified under term Dermatoglyphics. (3) It is the science and art of the study of surface markings/patterns of ridges on the skin of the fingers, palm, toes and soles. (4)

Widespread medical interest in epidermal ridges developed only in the last few decades, when it became apparent that many patients with chromosomal aberrations

had unusual ridge patterns. (5) Man can change, his behaviour can alter, thoughts can diversify but the dermatoglyphics pattern will remain the same till death. (6)

Dermatoglyphics have been used extensively to characterize and differentiate human populations, hence are highly suitable for studying population variations. The study of admixed populations can contribute to understanding of population genetic traits of dermatoglyphs. (7) Dermatoglyphics is a growing discipline and its ease and ready applicability render it as a useful tool to the clinician. The present prospective, observational study was conducted to analyze the relationship of dermatoglyphic patterns in relation to people of three regions of J&K, i.e. Jammu, Kashmir and Ladakh regions.

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Material and Methods

The present one-year study was conducted on 90 subjects, 30 each from Jammu, Kashmir and Ladakh regions of Jammu and Kashmir State in the Postgraduate Department of Anatomy, Government Medical College, Jammu. Enrolled subjects were all young, healthy with no evidence of any disease or injury to fingertips, irrespective of age, gender, lifestyle or economic status.

Materials used: Printer's ink, Clean glass slab, Bond paper, Roller, Magnifying lens, Acetone, Soap, Pointer, Cotton swabs, Scale.

Procedure: After taking informed consent from the patients/ subjects, they were asked to wash their hands with soap and water so as to remove any oil or dirt. Fingertip of both the hands were impregnated with ink, one by one, by placing the finger on its edge on the clean glass slab and then rolling it over gently to the other edge by applying continuous correct pressure. After the fingers

were inked, rolled impressions were taken on A4 sheet of bond paper one-by-one. Rolled fingerprints were taken because they showed the full pattern area.

The prints were then subjected to dermatoglyphic analysis with the help of magnifying hand lens, scale and ridge counting was done with the help of sharp needle. The qualitative parameters observed were: the types of patterns of individual digit or finger i.e. loop, arch, whorl. The quantitative parameter observed were: the ridge counts of individual fingers of both right and left hands, total finger ridge count. For finger ridge counting, the basic dermatoglyphic landmarks were considered i.e. triradius and core. A triradius is formed by confluence of three ridge systems and core is the approximate centre of the pattern.

A straight line was drawn connecting the triradius to the core and number of ridges was counted along the line using a sharp needle. For total finger ridge count, the

Table.1 Relationship of dermatoglyphic patterns in population of Jammu (Dogra), Kashmir (Kashmiri) and Ladakh (Ladakhi) regions

Pattern types	Jammu region (n=30)		Kashmir region (n=30)		Ladakh region (n=30)		Statistical inference
	No.	%	No.	%	No.	%	
Arches	1.5	5.00	2.1	7.00	1.3	4.33	0.95; Not significant
Radial loops	9.6	32.00	9.9	33.00	4.4	14.67	0.0004; Highly significant
Ulnar loops	6.1	20.33	8.7	29.00	4.3	14.33	0.0004; Highly significant
Whorls	12.3	41.00	9.1	30.33	20	66.67	0.0006; Highly significant
Composite	0.5	1.67	0.2	0.67	0	0	0.0002; Highly significant
Total	30	100.00	30	100.00	30	100.00	-

Table.2 Intergroup comparison of dermatoglyphic patterns in population of Jammu region and Kashmir region

Pattern type	Jammu versus Kashmir (Bonferroni 't' test)	Statistical inference
Arches	t=0.66; p=0.50	Not significant
Radial loops	t=1.44; p=0.85	Not significant
Ulnar loops	t=1.01; p=0.31	Not significant
Whorls	t=1.16; p=0.25	Not significant
Composite	t=0.93; p=0.35	Not significant

Table.3 Intergroup comparison of dermatoglyphic patterns in population of Jammu region and Ladakh region

Pattern type	Jammu versus Ladakh (Bonferroni 't' test)	Statistical inference
Arches	t=0.31; p=0.75	Not significant
Radial loops	t=3.07; p=0.0003	Highly significant
Ulnar loops	t=3.26; p=0.0018	Highly significant
Whorls	t=3.05; p=0.0033	Highly significant
Composite	t=1.97; p=0.05	Not significant

Table.4 Intergroup comparison of dermatoglyphic patterns in population of Kashmir region and Ladakh region

Pattern type	Kashmir versus Ladakh (Bonferroni 't' test)	Statistical inference
Arches	t=0.87; p=0.38	Not significant
Radial loops	t=4.50; p=0.0000	Highly significant
Ulnar loops	t=3.70; p=0.0004	Highly significant
Whorls	t=4.45; p=0.0000	Highly significant
Composite	t=0.68; p=0.49	Not significant

Table.5 Relationship of total finger ridge count (TFRC) in population of Jammu (Dogra), Kashmir (Kashmiri) and Ladakh

Parameter	Jammu region Mean ± SD	Kashmir region Mean ± SD	Ladakh region Mean ± SD	p-value
TFRC	104.8 ± 12.07	96.67 ± 21.63	112.97 ± 16.65	0.03

Table.6 Intergroup comparison of total finger ridge count (TFRC) in populations of Jammu, Kashmir and Ladakh regions

Comparison	Bonferroni 't' test	Statistical inference
Jammu region versus Kashmir region	t=1.798; p=0.07	Not significant
Jammu region versus Ladakh region	t=2.17; p=0.03	Significant
Kashmir region versus Ladakh region	t=3.27; p=0.0018	Highly significant

sum of all ridge counts was taken. All the dermatoglyphic prints of subjects were studied, tabulated and analyzed by applying appropriate statistical analysis.

Results

Present study includes 90 subjects, 30 each from Jammu (Dogra), Kashmir (Kashmiri) and Ladakh (Ladhaki) regions of J&K. There were 15 males and 15 females (mean age 22.9 years) from Jammu region, 11 males and 19 females (mean age 24.23 years) from Kashmir region and 11 males and 19 females (mean age 19.96 years) from Ladakh region.

Pattern type of eight fingers and two thumbs of an individual were counted in all the subjects of three regions. Among Dogra population (n=30), whorls (123; 41%) had the highest occurrence, followed by radial loops (96; 32%), ulnar loops (61; 20.33%), arches (15; 5%), while composite pattern had the least occurrence (5; 1.67%). Among Kashmiri population (n=30), radial loops (99; 33%) had the highest occurrence, followed by whorls (91; 30.33%), ulnar loops (87; 29%), arches (21; 7%), while again composite pattern had the least occurrence (2; 0.67%). Among Ladakhi population (n=30), whorls (200; 66.67%) had the highest occurrence, followed by radial loops (44; 14.67%), ulnar loops (43; 14.33%), arches (13; 4.33%), while no composite pattern found.

Relationship of dermatoglyphic patterns in population of three regions is given in Table 1, while intergroup comparisons are given in Tables 2, 3 and 4. Relationship of total finger ridge count in population of three regions is given in Table 5, while intergroup comparison is given in Table 6.

Discussion

Dermatoglyphic traits are those that are inherited as individual specific traits. They play an important role in human biological research. (8) Dermatoglyphic features due to the permanency, genetic influence as well as number of easily observable and measurable characters may be considered one of the most suitable parameters for population variability. (9) Since topological and climatic conditions vary, the population might also have underlying genetic variations in different genetic traits including dermatoglyphic patterns pertaining to their distinct ethnic background. (10)

The present study was carried out to understand the genetic relationship, if any, among different populations of Jammu, Kashmir and Ladakh regions using classical dermatoglyphic markers like fingertip patterns and total finger ridge count. The study was done as there is a distinct signature of ethnicity, geographical conditions, culture and language in Jammu and Kashmir.

As per the results found in our study, the mean total finger ridge count was maximum in Ladakhi population (112.97), followed by Jammu population (104.8) and Kashmiri population (96.67). Total ridge count is one of the parameters used to understand ethno-geographic variation among different groups. (8)

On comparison of the three populations no significant variation was found with respect to arches (p=0.95), but radial and ulnar loops showed highly significant variations (both p=0.0004) due to few number of both loops in Ladakhi population. Whorls pattern also showed highly significant variation (p=0.0006) due to more number of

this pattern in Ladakhi population. In case of composite pattern, the variation was again highly significant ($p=0.0002$) because this pattern was totally absent in Ladakhi population.

When we compared two populations of Jammu and Ladakh, significant variations were found with respect to radial loops ($p=0.0003$), ulnar loops ($p=0.0018$) and whorls ($p=0.0033$). Significant variations were revealed on comparison of fingertip patterns between Kashmiris and Ladakhis with respect to radial loop ($p=0.0000$), ulnar loop ($p=0.0004$) and whorls ($p=0.0000$).

Mean total finger ridge count also showed significant variations ($p=0.03$) among the populations of Jammu, Kashmir and Ladakh regions due to more number of mean total finger ridge count in Ladakhi population as compared to other two regions. On intergroup comparison, our observations revealed significant variations in total finger ridge count in Kashmiris and Ladakhis ($p=0.0018$).

Singh (11) studied dermatoglyphic variations in four castes of Uttar Pradesh, India i.e., in Brahmins, Kurmis, Pasi and Chamars. He found that according to pattern and caste considerations, loops dominated in Brahmins, whorls in Kurmis, while whorls and arches dominated in Chamars. Balgir and Sharma (12) carried out dermatoglyphic studies among two breeding isolates of Gujjars (200 individuals of each population) and the distribution of phenotypic frequency of dermatoglyphic features among Hindu and Muslim Gujjars provided strong evidence that these populations have become distinct in course of history due to inflow of genes from Muslim invaders or from effects of inbreeding and biosocial geographical isolates of Muslim Gujjars from their counterparts Hindu Gujjars. A study by Arrieta *et al.* (13) analyzed the digital patterns in the Basque valleys of Debe and Spanish populations also revealed the importance of whorls in separation of populations like Uribe, Gernika, Aeratia and Durango, which is in agreement with the present study observations. Another study was done by Sharma *et al.* (8) on dermatoglyphic variations in five ethno geographical cohorts of Indian population. Dermatoglyphic patterns of 250 students were studied and it was found that the participants of Western cohort (Rajasthan and Gujarat) exhibited high percentage of arch as compared to other cohorts; loops were more frequent in participants of North cohort being 3.7% and the whorls showed uniform distribution with an average of 40%. Unlike this study, in the present study few number of arches pattern were observed in all three studied populations, while whorls pattern varied from 30 to 67% in our study. Biswas (9) studied the dermatoglyphic markers of 202 Dhimals of

North Bengal, India and found that they exhibited more whorls (52.65%), followed by loops (42.65%). The mean total finger ridge count was 162.18. Observations of our study are in agreement with this study as we also found that whorls dominated (46%), followed by loops (23.94%). However, mean total finger ridge count in our studied population of three regions was 107.22 which are much less than what the above study has reported.

Conclusion

No significant variation was detected in fingertip patterns in people of Jammu region and Kashmir region which indicate some genetic association between them. The dermatoglyphic patterns of people of Ladakh region showed statistically distinct variation from the people of Jammu and Kashmir regions which indicate that they are genetically different from people of Jammu and Kashmir regions and there is no migration drift of the people of Ladakh.

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