



# Twin-city Study correlating the Dermatoglyphic Patterns with Rampant Caries and Early Childhood Caries

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## ABSTRACT

**Introduction:** Dermatoglyphics is the scientific and analytical study of fingerprints. Every individual's fingerprints are distinctive; one can determine one's ingrained potential, individuality, and choices by interpreting dermatoglyphics. This twin-city survey was undertaken to evaluate the fingerprint patterns of children with dental caries [study groups – rampant caries vs early childhood caries (ECC)] and caries-free individual (control group).

**Aim:** This study was carried out to determine the correlation between dermatoglyphic pattern and caries prevalence in young children in the twin cities of Pune and Mumbai.

**Materials and methods:** Two centers were selected in Pune and Mumbai. A total of 300 patients (150 patients in each center) were randomly selected from the age group ranging between 3 and 5 years. The samples were divided into two groups: Group I: Caries group, and group II: Caries-free group. Group I was further divided into children with ECC and children with rampant caries. Clinical examination of dental caries was done using mouth mirror and probe (only to remove debris and not probe into the fissures) in daylight or suitable light source. Fingerprints were obtained by the conventional ink method. Statistical results were obtained by one-way analysis of variance with *post hoc* Tukey's correction for multiple group comparisons using Statistical Package for the Social Sciences version 20.

**Results:** The evaluation and comparison of patterns in children with caries and caries-free children in both right and left hands showed increase in the number of whorls in children with rampant caries as compared with children with ECC. However, this was not statistically significant.

**Conclusion:** The study showed a definite variation in dermatoglyphics between the ECC, rampant caries, and caries-free group. However, the rampant caries group showed more number of whorls as compared with the ECC group, but they were statistically insignificant. Dermatoglyphics has proven to be a useful, noninvasive, and cost-efficient tool for investigating diseases with a genetic background like dental caries and cleft lip and palate, etc.

**Keywords:** Dermatoglyphics, Early childhood caries, Rampant caries.

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**Conflict of interest:** None

## INTRODUCTION

The word dermatoglyphics is derived from two Greek words (derma meaning skin, glyphic meaning to carve) and refers to the friction ridge formations that appear on the palms of the hands and soles of the feet.<sup>1</sup> Dermatoglyphics is the scientific and analytical study of fingerprints. Every individual's fingerprints are distinctive; one can determine one's ingrained potential, individuality, and choices by interpreting dermatoglyphics. Dermatoglyphic patterns vary from person to person.

A twin-city survey was conducted in Mumbai and Pune reviewing a total of 300 children. Twin cities are a special case of two cities or metropolitan centers that are found in close proximity and then expand into each other over time. Cities twinned by proximity do not necessarily match demographically, economically, or politically.

The dermatoglyphic study aspires to interpret the papillary ridges, the small markings that constitutes one's fingerprints and exist on all humanoid skin. The development of these papillary ridges occurs during a short window of development<sup>2</sup> and is affected by genetics and the environment *in utero*. Being affected by the environment during the intrauterine life suggests that the monozygotic twins would have variegated dermatoglyphic markings.<sup>3-6</sup> The ridges remain constant over postnatal life; hence; it has several forensic applications.

The twin-city survey was undertaken to evaluate the fingerprint patterns of children with dental caries [study groups – rampant caries vs early childhood caries (ECC)] and caries-free individuals (control group).

## MATERIALS AND METHODS

Two centers were selected in Pune and Mumbai. A total of 300 patients (150 patients in each center) were randomly selected from the age group ranging between 3 and 5 years.

The samples were divided into two groups; group I: Caries group, and group II: Caries-free group. Group I was

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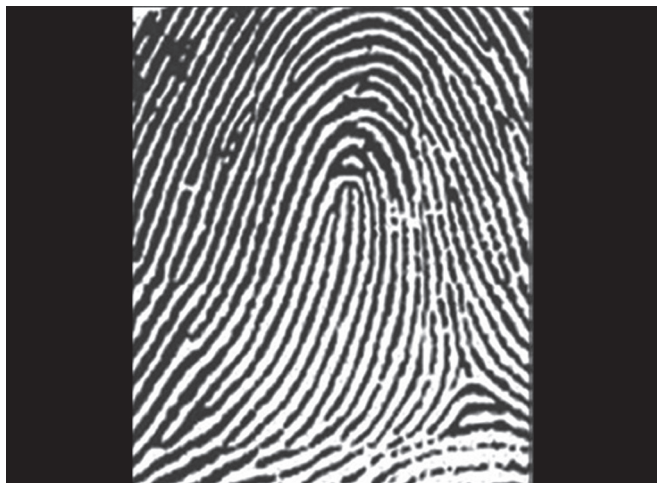


Fig. 1: Dermatoglyphic pattern – a loop



Fig. 2: Dermatoglyphic pattern – a whorl

further divided into children with ECC and children with rampant caries. Clinical examination of dental caries was done using a mouth mirror and a probe (only to remove debris and not probe into the fissures)<sup>7</sup> in daylight or suitable light source. Fingerprints were recorded using the ink method. The hands of the children included in this study were washed with water to improve the quality of the prints.

Statistical results were obtained by one-way analysis of variance (ANOVA) with *post hoc* Tukey’s correction for multiple group comparisons using Statistical Package for the Social Sciences version 20.

**Recording and Interpretation of Dermatoglyphic Patterns: Fingerprints**

The fingerprints of all subjects were recorded using black duplicating ink. The fingers were uniformly pressed on the ink pad after which the digits were pressed firmly against the white paper by the operator to avoid bias. A magnifying glass (×2) was used to assess the fingerprints.

**INTERPRETATION OF HANDPRINTS**

The handprints were assessed under a magnifying glass with ×2 power sequentially in both the hands. This study included qualitative analysis, i.e., the fingertip patterns (loops, whorls, arches).

The frequency or manifestation of true patterns of loops, whorls, and arches was counted on the fingertips of all the 10 digits of children in all the groups. They were assessed for increase or decrease in mean frequencies.

**QUALITATIVE DERMATOGLYPHIC ANALYSIS**

**Type of Dermatoglyphic Pattern**

Different types of dermal patterns were identified.<sup>8</sup>

A loop is identified as an array of ridges that intrudes the paradigm area on one side of digit, convolutes

abruptly, and leaves the paradigm area on the same side. Where the loop is closed, a single triradius is formed; this is located laterally on the fingertip. It is termed as ulnar loop if the ridge opens on ulnar side and is called as the radial loop if it opens toward the radial side (Fig. 1).

A whorl consists of concentric arrangement of ridges. Based upon the internal structure of the whorl pattern, it can be presented as spiral, symmetrical, double looped, central-pocketed, or accidental (Fig. 2).

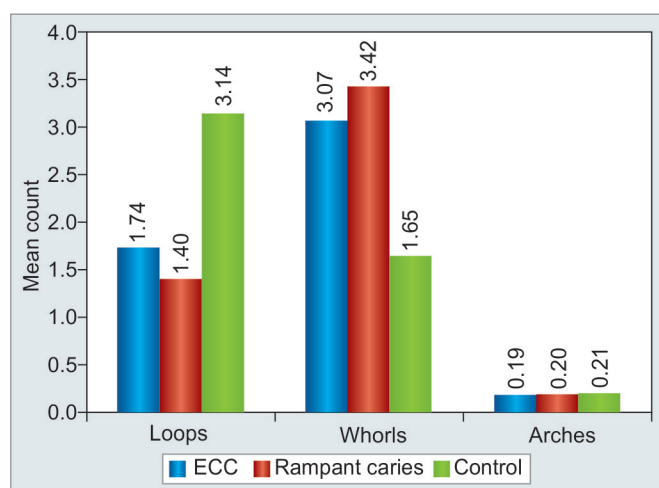
Of all the dermatoglyphic patterns seen, arches depict the simplest ridge pattern, which is formed by the succession of one or more parallel ridges, which traverse the finger from one side to the other without convoluting (Fig. 3).

**RESULTS**

Statistical results were obtained by ANOVA with *post hoc* Tukey’s correction for multiple group comparisons. The average number of loops did not differ significantly between ECC and rampant caries group (p-value > 0.05). The average number of loops is significantly higher in



Fig. 3: Dermatoglyphic pattern – an arch



**Graph 1:** The intergroup distribution of fingerprint pattern (right + left)

control group compared with ECC and rampant caries group ( $p$ -value  $< 0.001$  for both). The average number of whorls did not differ significantly between ECC and rampant caries group (Graph 1) ( $p$ -value  $> 0.05$ ). The average number of whorls is significantly higher in ECC and rampant caries group compared with control group ( $p$ -value  $< 0.001$  for both). The average number of arches did not differ significantly across three study groups ( $p$ -value  $> 0.05$  for all). The statistical results obtained from Pune and Mumbai were not significant (Table 1).

## DISCUSSION

Widespread and expansive interest in epidermal ridges has developed only in the last several decades when it became obvious that many patients with chromosomal defects had abnormal ridge formations.<sup>9,10</sup> Dermatoglyphic patterns make good material for genetic studies, because unlike stature, intelligence, and body weight,

they are not significantly influenced by age or by post-natal environmental factors.<sup>11</sup> Dermatoglyphics have the advantage of remaining stable throughout life and, therefore, can be compared among individuals of different ages.

Both the enamel and the epithelium of the finger buds have an ectodermal origin and both develop concomitantly during intrauterine life.<sup>12,13</sup> This develops the basis of considering dermatoglyphic patterns as genetic markers for dental caries.

In this study, the assessment and comparison of patterns in children with ECC and rampant caries and caries-free children in both hands showed increase in the number of whorls in children with rampant caries as compared with children with ECC. However, this was not statistically significant. The statistical results obtained from Pune and Mumbai were not significant, indicating no specific correlation between dermatoglyphic pattern and geographic/demographic location.

These results were substantiated by Atasu<sup>14</sup> who found an increased occurrence of ulnar loops in caries-free children and an increased occurrence of whorls in children with dental caries. The majority of whorl patterns in the control group were spiral, while the caries group showed spiral, central pocket, and double loop. Arches were the least common patterns in both the groups.<sup>15,16</sup>

A definite correlation in the dermatoglyphic patterns between children with caries and caries-free children can be seen in this study.<sup>13,17</sup> Thus, during their first dental visit, recording the dermatoglyphic patterns of children will prove to be an adept predicting tool to determine whether the child belongs to the high-risk group or the low-risk group, and, thereby, can aid in planning and coordinating a definitive preventive and treatment approach.

**Table 1:** The intergroup comparison of fingerprint pattern

Parameters	Group 1 (n = 95) ECC	Group 2 (n = 123) Rampant Caries	Group 3 (n = 81) Control	Inter group comparisons (p-values)		
				Group 1 vs Group 2	Group 1 vs Group 3	Group 2 vs Group 3
<b>Right</b>						
Loops	1.73 ± 0.87	1.45 ± 0.56	3.10 ± 0.77	0.129 (NS)	0.001 (S)	0.001 (S)
Whorls	3.05 ± 0.83	3.39 ± 0.62	1.72 ± 0.73	0.108 (NS)	0.001 (S)	0.001 (S)
Arches	0.22 ± 0.11	0.17 ± 0.12	0.17 ± 0.12	0.379 (NS)	0.381 (NS)	0.902 (NS)
<b>Left</b>						
Loops	1.75 ± 0.74	1.35 ± 0.56	3.17 ± 0.69	0.322 (NS)	0.001 (S)	0.001 (S)
Whorls	3.09 ± 0.76	3.45 ± 0.58	1.59 ± 0.69	0.110 (NS)	0.001 (S)	0.001 (S)
Arches	0.16 ± 0.11	0.23 ± 0.10	0.25 ± 0.11	0.213 (NS)	0.255 (NS)	0.785 (NS)
<b>Right + Left</b>						
Loops	1.74 ± 0.81	1.40 ± 0.56	3.14 ± 0.73	0.421 (NS)	0.001 (S)	0.001 (S)
Whorls	3.07 ± 0.79	3.42 ± 0.60	1.65 ± 0.71	0.121 (NS)	0.001 (S)	0.001 (S)
Arches	0.19 ± 0.11	0.20 ± 0.12	0.21 ± 0.12	0.588 (NS)	0.469 (NS)	0.799 (NS)

Values are mean ± standard deviation; p-values by ANOVA with *post hoc* Tukey's correction for multiple group comparisons; p-value  $< 0.05$  is considered to be statistically significant. S: Significant; NS: Non-significant

## CONCLUSION

The dermatoglyphic patterns may be employed effectively to study the genetic root of dental caries. In a developing country like India, it might prove to be a noninvasive, economical, and effective tool for screening. These patterns may represent the genetic makeup of an individual and, therefore, it suggests an individual's predisposition to certain diseases.

Since dermatoglyphics is still a counterfactual and imprecise science at present, it requires further extensive research to ascertain the significance of these variations in the dermatoglyphic features of children with dental caries.

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