

## Original Article

# Dermatoglyphics: A Plausible Role in Dental Caries and Malocclusion?

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### ABSTRACT

**Background:** Palmistry in scientific terms is called as “dermatoglyphics” (“derma” means skin and “glyphic” means carvings). Dermatoglyphics as an independent field of study, even though it has a body of theory, methods, and applications; in many respects, it has been used as an adjunct to other disciplines, serving as a vehicle to resolve broader biomedical problems. Many studies have shown that hereditary factors play contributory role in the development of caries risk and malocclusion. This study was done to check whether dermatoglyphics plays a role in malocclusion and dental caries. **Aim:** To assess whether dermatoglyphics could help predict genetic susceptibility of children to dental caries and malocclusion. **Materials and Methods:** A total of 300 children aged 6–12 years were screened for dermatoglyphics, dental caries using decayed, missing, and filled teeth and discrete Fourier transform index and malocclusion using Angle's classification. **Statistical Analysis Used:** To show significant difference between the expected frequencies and the observed frequencies in one or more categories, a Chi-square test was applied. The observed difference was statistically significant and  $P = 0.03$  ( $<0.05$ ). **Results:** There was an increased frequency of loop in right hand digit 3 and 5 (middle and little finger) in caries positive participants. Eighty-one percent of loop pattern was observed in digit 5 (little finger) of right hand in Class II malocclusion. **Conclusion:** Specific fingerprint patterns may be used as a potential noninvasive anatomical tool for mass screening of dental caries and malocclusion and for guiding future research.

**Key words:** Dental caries, dermatoglyphics, malocclusion

### INTRODUCTION

Dermatoglyphics has gained momentum in the recent years in anthropology, genetics, and medicine, serving as a tool to describe, compare, and contrast, and at times predict occurrences and risks for biomedical events occurring in these major disciplines.

Apart from its use in Forensic Science for identification of an individual, an association between fingerprint patterns and medical ailments such as diabetes, hypertension, psychosis, and breast cancer has also been established. Recently, the field of dental dermatoglyphics has gained momentum through recognition of irregular fingerprints among individuals with periodontitis, dental caries, and certain congenital anomalies such as cleft lip and palate.<sup>[1]</sup>

Dermatoglyphics is a useful tool for preliminary investigation of conditions with a suspected genetic basis. Furthermore, modes of inheritance patterns of dermatoglyphics trait and characters are hereditary. Hereditary factors contribute to many of the caries risk/resistance factors including pit and fissure morphology, enamel structure and composition, tooth eruption time, salivary flow and composition, arch form, dental spacing, immunologic function, and dietary preference.<sup>[2,3]</sup>

Dermatoglyphic patterns are broadly classified into three major types: whorl, loops, and arches which have been further

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divided into various subtypes. These patterns are present on finger tips/buds.<sup>[4]</sup>

Dental caries is caused by host factors related to either the structure of dental enamel, immunologic response to cariogenic bacteria, or the composition of saliva. Genetic variation in host factors may contribute to increased risks for dental caries.<sup>[5]</sup>

The relative contribution of genes and the environment to the etiology of malocclusion has been a matter of controversy throughout the 20<sup>th</sup> century. Genetic mechanisms are clearly predominant during embryonic craniofacial morphogenesis, but environment is also thought to influence dentofacial morphology postnatally, particularly during facial growth.<sup>[6,7]</sup>

Dermatoglyphics is convenient, cost-effective, and could help in predicting the phenotype of possible future health conditions.

The objective of this study was to assess whether dermatoglyphics could be used as predictive tool for malocclusion and dental caries.

## MATERIALS AND METHODS

An approval was obtained from the Institutional Ethics Committee, Sumandeep Vidyapeeth before commencing the study. Prior permission was obtained from school authorities. The study was conducted among 6–12 year aged school children ( $n = 300$ ) in Vadodara City, Gujarat State. An consent was obtained from the participants before oral examination and finger print recording.

After explaining the purpose of the study, the demographic details, decayed, missing, and filled teeth (DMFT) index, and Angle's malocclusion were recorded in a pro forma. The hands of the participants were cleaned and dried, duplicating ink was applied to the distal phalanges of all the fingers and the fingerprint impressions were obtained on a white pro forma sheet with blocks for each finger. Prints were dried and studied using a magnifying lens to identify the finger patterns. The fingertip patterns were analyzed according to the classical method and configurational types.<sup>[8,9]</sup>

1. Arch pattern
  - a. Simple
  - b. Tented
2. Whorl pattern
  - a. Spiral
  - b. Symmetrical
  - c. Double loop
3. Loop pattern
  - a. Ulnar
  - b. Radial.

The data obtained were entered in a Microsoft Excel SpreadSheet (MS Office 2007) and then subjected to statistical analysis.

## RESULTS

Two independent quantitative variables were measured in this study. The dermatoglyphic pattern and the DMFT score and malocclusion were analyzed [Figure 1].

This study showed an increase in the loop pattern in both the hands. A significant correlation was seen between the ulnar loop pattern and malocclusion, with a higher occurrence of ulnar loop pattern in individuals with malocclusion [Table 1].

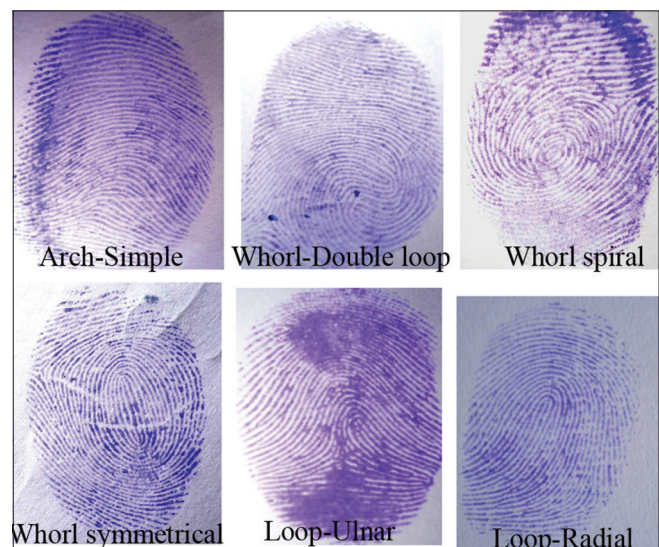
There was increased loop pattern seen in the 3<sup>rd</sup> and 5<sup>th</sup> digits of both the hands in Angle's Class I malocclusion group [Figure 2a and b].

In case of Angle's Class II malocclusion, the loop pattern in the 5<sup>th</sup> digit of both the hands was predominant [Figure 3a and b].

There was total absence of arch pattern in both the hands among the Angle's Class III malocclusion group, right hand digits 1, 3, and 4 showed an equal distribution of whorl and loop pattern, whereas the left hand digits 1, 2, and 4 showed an increase in the whorl pattern [Figure 4a and b].

**Table 1: Correlation between angles' malocclusion and dermatoglyphic pattern**

Dermatoglyphic pattern		Angle's malocclusion			P value
Type	Subtype	Class I	Class II	Class III	
Arch	Simple	49	5	0	0.03
	Tented	173	14	1	
Loop	Ulnar	1328	163	44	0.03
	Radial	49	12	2	
Whorls	Symmetrical	121	19	4	0.03
	Spiral	699	76	34	
	Double loop	158	16	4	



**Figure 1: Different dermatoglyphics patterns observed in study**

This study shows an increased loop pattern among the study group followed by the whorl pattern; however, an increased ulnar loop pattern was seen in both caries positive and caries negative subjects. Similarly, spiral whorl pattern was predominant among both caries positive and caries negative subjects [Table 2].

Loop pattern was increased in the right hand digits 3 and 5 among the caries positive subjects; similarly an increased loop pattern was present in the left hand digits 1, 3, and 5; the 4<sup>th</sup> digit of both the hands showed an increase in the whorl pattern [Figure 5a and b].

DISCUSSION

Fingers, palm, and sole impressions are expressions of the environmental changes taking place and are inherited in

nature. It has been proved scientifically that no two individuals, even monozygotic twins contain the same finger prints and thus make them a unique characteristic of every individual.

Table 2: Correlation between dental caries and dermatoglyphic pattern

Dermatoglyphic pattern		Dental caries status		P value
Type	Subtype	Caries absent	Caries present	
Arch	Simple	31	28	0.03
	Tented	109	103	
Loop	Ulnar	807	728	0.03
	Radial	36	27	
Whorl	Symmetrical	82	62	0.03
	Spiral	391	418	
	Double loop	107	71	

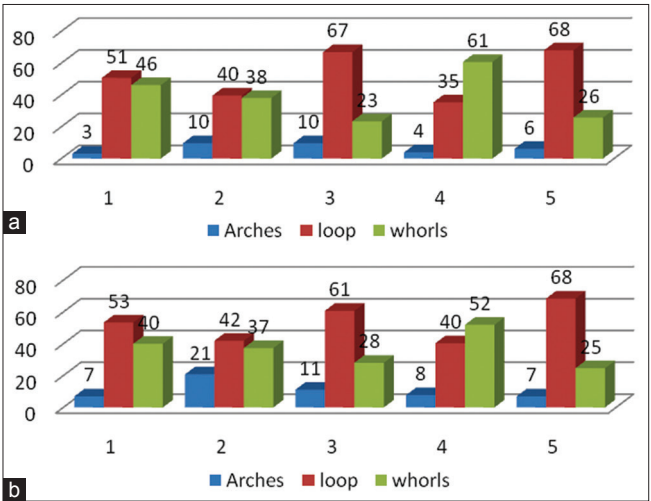


Figure 2: (a) Graphical distribution of fingerprinting pattern in Angle's Class I malocclusion on right hand. (b) Graphical distribution of fingerprinting pattern in Angle's Class I malocclusion on Left hand

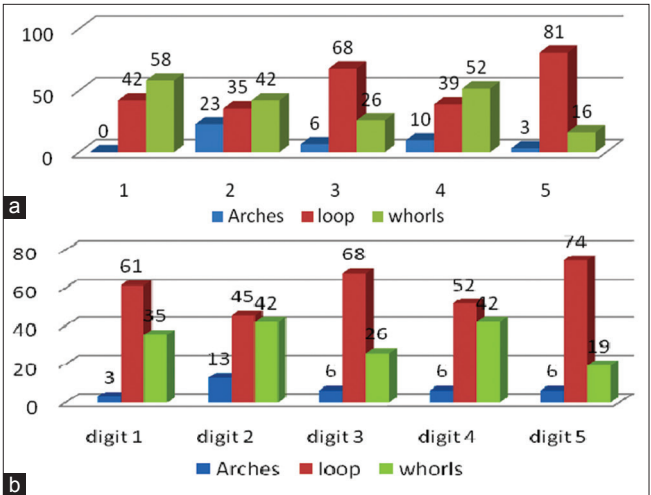


Figure 3: (a) Graphical distribution of right hand digits in Angle's Class II malocclusion. (b) Graphical distribution of left hand digits in Angle's Class II malocclusion

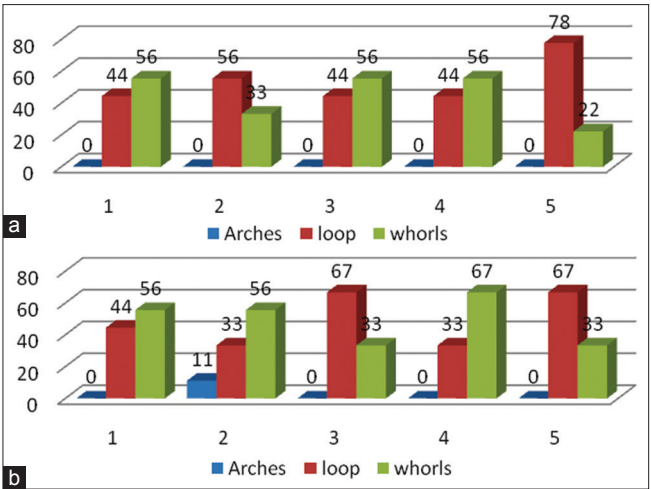


Figure 4: (a) Graphical distribution of right hand digits in Angle's Class III malocclusion. (b) Graphical distribution of right hand digits in Angle's Class III malocclusion

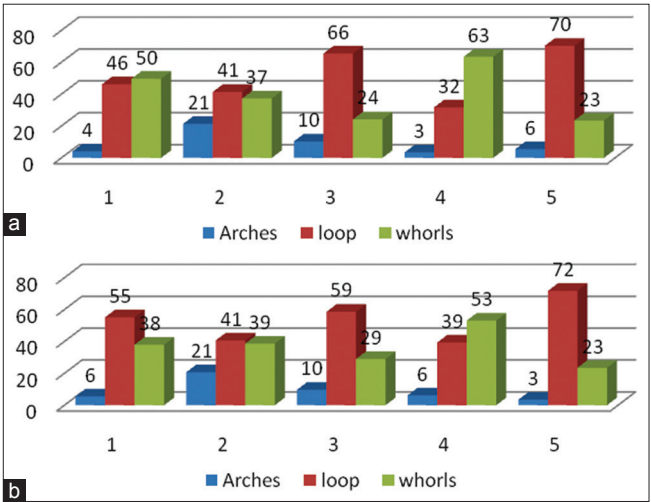


Figure 5: (a) Graphical distribution of fingerprint patterns of right hand digits with caries positive participants. (b) Graphical distribution of fingerprint patterns of right hand digits with caries positive participants

Once formed, they remain constant and do not alter in the lifetime due to disease process, aging, or any other reason.<sup>[1]</sup>

The dermal ridges take their origin from the fetal volar pads that appear in the 6–7<sup>th</sup> week of embryonic life, i.e., at the same time as that of tooth formation in intraembryonic life. This means that the genetic message contained in the genome (normal or abnormal) is deciphered during this period and is also reflected by dermatoglyphics.<sup>[1]</sup>

In this study, loop and whorl pattern of finger print were equally distributed in all individuals with malocclusion. These results are contrary to those of Tikare *et al.*<sup>[1]</sup> who found whorl pattern to be equally distributed in all the three classes of malocclusion.

Eighty-one percent loop pattern was observed in digit 5 (little finger) of the right hand in Class II malocclusion, as consistent with the study results of Reddy *et al.*<sup>[10]</sup>

The participants in this study of Class II malocclusion showed decrease in number of arch pattern in all digits of right and left hand. These results are contrary to those of Trehan *et al.*,<sup>[11]</sup> who found an increase in whorl pattern in Class I and III and an increase in loop and arch pattern in Class II.

In this study, we found no significant difference in the frequency distribution of loop pattern in all digits when compared with caries free and caries positive participants. However, we found increase frequency of loop in right hand digit 3 and 5 (middle and little finger) in caries positive participants in this study, whereas caries-free participants showed an increase in frequency of loop in all digits of left hand as compared to whorls. These results are in contrast to those of Abhilash *et al.*<sup>[12]</sup> who found an increase in whorl pattern in caries positive and decrease in loop pattern in caries-free group.

Dermatoglyphic patterns may be utilized effectively to study genetic basis of dental caries and malocclusion. The results of this study provide some insight into specific fingerprint patterns for dental caries and malocclusion. These could be used as potential noninvasive anatomical tools for screening of dental caries and guiding future research, with respect to early diagnosis, instituting preventive strategies, and more

effective treatment modalities in individuals with dental caries and malocclusion. More studies with large sample size may validate the use of dermatoglyphics in oral and dental pathologies.

## CONCLUSION

Dermatoglyphics can be used as a non invasive mass screening tool to examine population at risk for dental caries and malocclusion.

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## Conflicts of interest

There are no conflicts of interest.

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