

Dermatoglyphics and Dental Caries: An Assessment of Fingerprints with Dental Caries in School Children

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Abstract

Aim: The goal of this study is to associate, investigate and draw a parallel between the multifactorial dental disease (dental caries) and the configurations of finger tips.

Materials and Methods: 100 school children aged 13-16 years were clinically surveyed to determine the DMFT (Decayed, Missed, Filled Teeth) score. The fingerprint patterns of both hands of each school children were documented and examined using the magnifying glass. Statistical analysis was done to examine and compare the findings.

Results: An increased frequency of loops was seen in school children DMFT score 0 to 2 whereas increased frequency of whorls was found in those with DMFT score 3 to 5 and DMFT score ≥ 6 .

Conclusion: A conceivable relation amongst dermatoglyphics and Dental caries exists as seen in various studies. Additional research with larger sample size will produce a conclusive result to link fingerprint patterns with Dental caries.

Keywords: Dermatoglyphics, Fingerprints, Dental Caries, DMFT Index.

Introduction

Cummins and Midlo gave the term ‘Dermatoglyphics’ to the comprehensive study of dermal elevations, its computation and the study of patterns of palms and soles.¹

The dermal ridges develop in relation to and around the same time as Volar pads (6th week of intrauterine life). At about 12th week of intrauterine life, they appear enlarged, prominent and are completely formed around 24th week of gestational period. Multiple genetic and local factors affect the development of these fingerprint patterns as well as the patterns of soles.²

Whorls, Loops and Arches are the three basic types of fingerprint patterns seen in human beings. Depending upon the side (towards ulnar or radial bone) on which the loop turns, the loops are classified as Ulnar loops and Radial loops. Arches are further divided in to simple arch and tented arch.³(Figure 1).

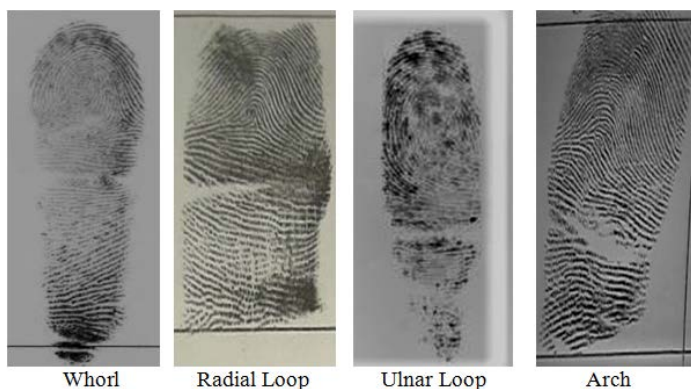


Figure 1: Basic patterns found in the distal phalanges of the digits.

Ectoderm is the primitive tissue from which tooth, nails, skin, hair etc. are formed during intrauterine life. The genetic environment at the time of development of tooth (6th week of gestational phase) also affects the type of fingerprints and hence enamel rod patterns, dentinal tubules patterns, fingerprint patterns can be correlated with each other. These fingerprint patterns serve as genetic indicator for dental diseases affecting hard tissues of teeth.⁴

Dental caries is a multifactorial disease affecting the teeth. It is also considered as a poly-microbial dental disease affecting the organic and inorganic components of the teeth leading to formation of cavity. As the development of fingerprint patterns and teeth usually happen during same time, starting around 6th week of gestational life, hereditary or genetic influences on these two parameters are similar. Also environmental and ethnic deviations also affect the structure of teeth of an individual but the inherent impact of genes is more prevailing during embryological development and hence a study equating, associating the dermatoglyphic patterns with dental caries can be a beneficial prognosticator tool for children in primary years.

Materials and Methods

The study sample included school children residing in different cities and villages of Gujarat state. School

children as well as parents were explained about the procedures of recording fingerprints as well as about oral examination. Informed consent was taken from parents. Ethical clearance was acquired from institutional ethical committee of Karnavati School of Dentistry - Uvarsad, Gandhinagar.

Inclusion Criteria

- 13-16 years of age
- Presence of all permanent teeth (fully erupted)

Exclusion Criteria

- Mixed dentition
- Permanent teeth not reaching up-to occlusion level

100 school children satisfying the sample selection criteria were examined for DMFT Index.

DMFT INDEX:

18	17	16	15	14	13	12	11	21	22	23	24	25	26	27	28
48	47	46	45	44	43	42	41	31	32	33	34	35	36	37	38

Cummins and Midlo’s method of using Ink-Stamp pad, was followed for recording fingerprint patterns. Both hand fingers were pressed steadfastly on white paper which was placed on even surface.

Observations and Results

SPSS software version 25 and Microsoft Excel were used to organise and evaluate the data statistically. The frequencies of all pattern types on fingertips of students with DMFT index scores 0-2, 3-5 to ≥6 were assessed. (Table 1)

Table 1: Mean and Standard deviation of pattern types seen on fingertips of school children with different groups of DMFT index score:

DMFT SCORE	Whorls	Loops	Arches
	Mean ± SD	Mean ± SD	Mean ± SD
0 TO 2	2.98 ± 0.82	3.76 ± 1.28	3.24 ± 0.77
3 TO 5	3.7 ± 1.19	3.35 ± 0.63	2.94 ± 0.86
≥ 6	3.85 ± 1.35	3.21 ± 1.08	2.93 ± 1.17

Discussion

Formed as a confluence of two Greek words - Derma denotation skin and Glyphics denotation carvings, Dermatoglyphics refers to the study of fingerprint patterns. These patterns on fingers are matchless for every individual and are frequently used by investigators around the world for identification of offenders or for identification of a discrete prey to criminals.

The change in the environment inside the mother’s womb during child development has profound impact on the development of each and every organ of the body including the skin, nails, hair, fingertips, teeth and bones.⁵ Ectoderm being the common origin of skin and teeth, and these two structures developing in intrauterine life during same time frame (approximately around 6th week), the genetic message contained in the genome is common and hence expressed similarly and simultaneously in both these tissues.⁶

In the present study, loop pattern was found to be higher in school children with DMFT score of 0 to 2 whereas whorl pattern was dominant among those with DMFT score of 3 to 5 and DMFT score ≥ 6 . The results of this study are similar to studies carried out by Bhat PK et al.⁷, and Thakkar VP et al.⁸ wherein they found that DMFT score 0 – 2 was associated with increased loops and the results of this study are also similar to studies carried out by Agravat D et al.⁹ and Khokhar V et al.¹⁰ wherein they found that, the whorl pattern was more likely to be associated with the increase in the occurrence of dental caries.

The intergroup data was analysed using Pearson Chi square test at 5% level of significance and p value was calculated. On analysis of intergroup data of right and left hand for each finger separately, with DMFT score, it was found that the patterns of both right and left ring finger had statistically significant correlation with the different

scores of DMFT index with values ranging from $p=0.004$ to $p=0.722$.

In right hand, thumb and all fingers except ring finger showed, statistically significant correlation between fingerprint patterns and DMFT scores. Similarly, in left hand, the Index finger, Middle finger and Ring finger showed statistically significant correlation between fingerprint patterns and DMFT scores (**Table 2**)

Table 2: The intergroup data analysed using Pearson Chi square test at 5% level of significance. ($p < 0.05 =$ significant)

FINGER	RIGHT HAND (p value)	LEFT HAND (p value)
Thumb	0.008	0.122
Index Finger	0.004	0.036
Middle Finger	0.009	0.024
Ring Finger	0.115	0.006
Little Finger	0.028	0.722

Conclusion

Numerous elements are accountable for incidence and persistence of caries-causing pathogens in oral cavity. The whys and wherefores for incidence and persistence of these pathogens are not fully known even after decades of research. All, that is cryptic, is eventually leading investigators to look for heritable origins of that exact disease and in such a scenario, dermatoglyphics plays an imperative role. Patient’s amenability and proficiency of investigator in recording dermatoglyphic patterns are the two main hostile circumstances that may come as interruption in endorsing dermatoglyphic analysis as a conjecturer of oral and systemic diseases. Public sentience and auxiliary research on a loftier scale in this area of fingerprint analysis will produce better and noteworthy results in future.

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