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Praiseworthiness of Dermatoglyphics in Determining Dental Caries Vulnerability among Gujarati Children: A Cross-Sectional Study

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ABSTRACT

Introduction: Dermatoglyphics is the study of finger prints from toes, fingers palms, and soles of animals and humans. Dermatoglyphic examination is opening up as an exceptionally tool for initial investigations into circumstances with an alleged genetic basis. The current study was conducted to determine worthiness of dermatoglyphics in prophesying genetic vulnerability of children to dental caries via cost-effective means.

Materials and Methods: Cross-sectional study was undertaken on 100 children of age group between 4–14 years divided equally into two groups namely: Caries-free group (def/DMF score "0") and Caries group (def/DMF score more than or equal to "5"). Both were subdivided into 25 males and 25 females. Each child's handprints were taken and observed for dermatoglyphic pattern; total finger ridge count TFRc and atd angle.

Results: Whorls were found more in caries group whereas ulnar loops were more common in caries free group. Total finger ridge count was significantly higher in caries group. The atd angles did not show any significant differences among caries and caries free group.

Conclusion: Dermatoglyphic pattern variation may be an important tool in identification of people at risk of developing dental caries, which will enable an early detection and prevention of the disease.

Key Words: genetic, fingerprints, caries

INTRODUCTION

Dermatoglyphics is the study of finger prints from toes, fingers palms, and soles of animals and humans.[1] Ridge formation is epidermal in origin and develops on the volar surfaces. Two types of ridges are formed which are primary and secondary ridges. From the adjacent ones there is an increase number of ridges and primary ridge development is accountable for dermatoglyphic pattern. Secondary ridges are modified as sebaceous glands which is at the apex of primary ridges at fixed intervals. Ridges are the parts which decompose lastly when a person dies. Even in monozygotic twins fingerprints are perpetual and not identical. [2] Dermatoglyphics, considered as a window of congenital abnormalities is a sensitive pointer of intrauterine anomalies. Dermatoglyphics is known to be one of the paramount existing diagnostic tools in abnormalities which is genetic in origin.[3]

In the past 15 decade dermatoglyphics has been a beneficial tool in indulging basic questions in evolution, genetics, medicine and biology in adding to being the paramount and most broadly used technique for personal identification. Several studies have been done to know the dermatoglyphic indi-

cators of various systemic diseases like congenital heart disease, leukemia, intestinal disorders, rubella, embryopathy and various forms of mental illnesses like schizophrenia. Dermatoglyphic analysis is now initiating to prove itself as an extremely valuable implement for primary investigations into conditions with a suspected genomic basis. On the other hand, modes of the inheritance patterns of dermatoglyphics traits and characters are hereditary. So this study was carried out to assess the dermatoglyphic patterns in children with no dental caries and in those children with dental caries to determine the utility of dermatoglyphics in envisaging genetic susceptibility of dental caries in children through cost effective resources.

MATERIALS AND METHODS

A cross-sectional study was undertaken on 100 children of age group between 4–14 years who attended the outpatient Department of Pediatrics. Prior to the research protocol was approved by the institutional ethical committee board. The children were included after getting approval from their parents. Each child was allotted sample number and the same was also written on child's handprint recording form. His/her def / DMF score was written on a separate form against their respective sample number, where d=decayed primary tooth, e=exfoliated/extracted primary tooth due to caries, f=filled primary tooth due to caries. D=decayed permanent tooth, M=Missing permanent tooth due to caries, F= filled permanent tooth due to caries. 100 subjects were equally divided into two groups namely:

Caries-free group: was further divided into 25 females and 25 males and children with def/DMF score "0", that is with no caries.

Caries group: was also subdivided into 25 males and 25 females and children with def/DMF score more than or equal to "5".

Exclusion criteria

Those children with special health care needs (i.e. medically compromised and physically disabled) were excluded since the literature suggests them to show a characteristic pattern, and oral hygiene maintenance is not consistent in them as compared to normal healthy children.

All the children were examined for dental caries in natural light and the caries status was recorded using the def/DMF index. The method of taking handprints was described to the children and they were advised not to spill the dye on their apparel or body. The hands of the patient were washed thoroughly and dried.

Using gauze pack a pea-sized amount of duplicating ink was spread to the entire area of palm and fingers of the hand where it was essential that a very slight amount of dye was taken as this aided in getting clear handprints. If the amount of dye was more, darker were the prints and thus indecipherable.

Several dyes were tried before settling for duplicating printing ink. Once uniform range of the dye was confirmed, the child was asked to put his/her hand with all digits apart on a sheet of paper. If the child quivered his/her hand during the procedure, the handprint got filthy. To make sure that recording of prints is proper light pressure was applied over all the fingers. The handprints obtained were checked for their lucidity through a magnifying glass (2 ×) and were preserved with caution. A single-blinded investigator studied all the handprints. Frequently, it was observed that the thumb did not provide appropriate prints, which may be owing to its spatial placement as matched to the rest of the fingers. Hence, pressure was applied to get proper thumb print.

The handprints were evaluated in a serial manner. The handprints were studied from the left hand 4th digit till the thumb then from the thumb of right hand till the 4th digit under a magnifying glass with 2× power. Only the type of pattern on the fingertips of ten digits was distinguished for each digit. The total finger ridge count (TFRc) was done. Finally atd angles were measured in both hands.

1. Type of dermatoglyphic pattern: The frequency of true patterns of loops, whorls and arches was calculated on the fingertips of all the digits.

2. Total finger ridge counting: Two landmarks "core" and "triradii" of the pattern were marked. Joining these two landmarks a line was drawn (this line was almost as possible at right angles to the ridge area). All ridges which cross this line were counted, whereas ridges ending before touching the line were not counted.

3. atd angle: Their mean was taken and the observations obtained were tabulated taking both hands separately.

RESULTS

A total of 100 Gujarati children were taken in our study out of which 50 were study samples and 50 were control samples. The population was distributed uniformly according to gender and presence of caries or not thus dividing into caries group and caries free group consisting of 25 males and 25 females in each group respectively.

Table 1: Dermatoglyphic Patterns on Finger Tip In Caries Group

	Sample	Whorls	Ulnar Loops	Radial Loops	Arches
Male	25	37.20%	59.60%	0%	3.20%
Female	25	40.80%	52.80%	0.80%	5.60%
Overall	50	39	56.2	0.4	4.40%

Table 2: Dermatoglyphic Patterns on Finger Tip In Caries Free Group

	Sample	Whorls	Ulnar Loops	Radial Loops	Arches
Male	25	32.8%	60.8%	2%	4%
Female	25	35.2%	60%	1.2%	3%
Overall	50	34%	60.4%	1.8%	3.8%

Table 3: Pooled data of both sexes in caries and control group

	Whorls	Ulnar Loops	Radial Loops	Arches
Caries Group (def/DMF score "0")	39	56.2	0.4	4.4
Caries Free Group (def/DMF score >="5")	34	60.4	1.8	3.8

On whorls study: From the above [Tables 1-3] it is observed that in both males and female caries sample shows decrease in the percentage of whorls compared to caries free subjects but it is statistically not significant ($P > 0.05$) .

On ulnar loops: Both in males and females caries sample group, ulnar loops were more than the controls but not statistically significant (P > 0.05).

On radial loops: In male study group, the radial loops are absent but were present in the control group but was not statistically significant, whereas in female study group, the radial loops were present in both the groups.

Table 4: Depicts comparison of mean TFRc in caries and caries-free group

Group	Mean TFRC
Caries Group	137.44 +/- 6.52
Caries-free Group	134.54 +/-7.73

{TFRc = Total finger ridge count}

Table 5: Depicts comparison of mean TFRc in males and females of both the groups

Group	Gender	Mean TFRC
Caries Group	Female	140.68 +/- 4.81
	Male	134.20+/-6.46
Caries-free Group	Female	138.12+/-6.28
	Male	130.96+/-7.96

{TFRc = Total finger ridge count}

On arches value: In males the percentage of arches is 3.2 % where as in the control group it is 4% which is not statistically significant. But in females, there is more frequency of arches 5.6% in the study. The TFRc values of studied carious group was significantly higher than caries free group (p=0.0453, P < 0.005).

In males of control group, the TFRc value was significantly lower than of carious group value (P =0.0002, t = 4.02) and also in females the value of carious group was significantly higher than caries free group (P < 0.0009, t = 3.530). [Tables 4-5]. Mean atd angles in caries and caries free group were 44.66+/-8.38 and 43.34+/-3.54. The atd angles did not show any significant differences among caries and caries free group. ($P > 0.05$).

DISCUSSION

The findings of this study reveal statistically significant differences between the dermatoglyphic patterns of the controls and the study population. The foundation of considering dermatoglyphic pattern as genomic marker for dental caries is that epithelium of finger tips and also of the enamel which is the most vulnerable dental tissue for dental caries have ectodermal origin and both develops at similar time of intrauterine life. Studies have shown that dermatoglyphic patterns are determined genetically. [4,5,6] Any disturbances at this particular period can affect both enamel as well as the dermatoglyphic patterns. [7] Research has established a strong correlation between dermatoglyphics and dental caries. [8, 9, 10]

Dermatoglyphic readings of patterns in the digits of both caries and caries-free children in this study demonstrated maximum loop pattern followed by whorls and arches, whereas the frequency of whorl pattern was more among caries group subjects.

Our results correlate with the findings of Metin Atasu [11] , where caries free persons had more ulnar loops on finger tips whereas the person with caries on ten or more teeth had increased frequency of whorls on finger tips. Furthermore, the means of TFRc of study subjects was higher than that of control group comparable to the results found by PR

Abhilash [12]. Dental caries exhibits the graded continuous variation pattern, where severe distinction between the average and higher afflictions are not possible. Only two extreme differences such as "no caries" and caries on "five or more teeth" may be likely to demonstrate obvious variations.

Although conclusions could be drawn based on this study, digital dermatoglyphics may have an upcoming role in recognizing people either with or at increased risk for dental caries so that either risk reduction actions or earlier treatment may be incorporated. This study also suggests that the specific fingerprint patterns may be utilized as possible noninvasive anatomical tool for screening of dental caries and also for throwing light into further research. This relatively noninvasive technique can reasonably be practised in selective nonsymptomatic patients as a part of definite risk assessment approach with an ability to identify the earliest changes associated with caries process, many years before the embarkment of clinical lesion. This may be helpful in the introduction of more preventive, early diagnosis and effective treatment strategies in patients with dental caries.

CONCLUSION

Scientific literatures from different parts of the world on prevention of dental caries have borne variety of results. No investigators have yet conducted a study on an associatiom based on dermatoglyphic patterns and dental caries in children of Gujarat. Hence, the study will provide the data on dermatoglyphic pattern variations and its relation to dental caries in an individual. Dermatoglyphic pattern variation may be an important tool in identification of people at risk of developing dental caries, which will enable an early detection and prevention of the disease.

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