History of Medicine, 2022, 8(1): 419–430

DOI: 10.17720/2409-5834.v8.1.2022.048

Association among Dermatoglyphics and tooth decay among young children at Kanpur, Uttar Pradesh

Sarika Umrao, Rahul Srivastava, Vishal Mehrotra, Sachin Kushwah

Rama Dental College Hospital and Research Centre, Rama University, Mandhana, Kanpur, U.P India

Abstract

Background: Dental caries is a multifactorial disease, and is the most prevalent chronic disease among children worldwide irrespective of the advancements in oral healthcare.Itsetiology has been advocated to various environmental and genetic factors. Dermatoglyphics is the study of dermal ridges on the palmar and plantar surfaces of hands and feet. It is genetic in nature and is unique to each individual.This study was aimed to find a correlation between dermatoglyphic pattern and dental caries in young children.**Materials and**

Methods: A cross-sectional study was performed on 200 children (100 caries-active and 100 caries-free) between the age range of 6–13 years. The decayed, missing, and filled teeth (DMFT) score was recorded for caries-active children having a score range of 3–6 and under each score there were 25 cases. Midlo and Cummins method (1943) of recording palm prints was used using Indiana Ink (stamp pad), roller and printing papers. The prints were inspected with the help of magnifying lens and whorls and loops in each hand were recorded.

Statistical Analysis: Statistical analysis was performed using SPSS software 14.00, and Chi-square test was used for statistical analysis of collected data.

Results: The number of whorls was found to be more in caries-active children with increased number of whorls in children with a higher DMFT whereas the number of loops was more in caries-free children. There was a statistically significant difference between the groups ($P < 0.05$). The number of whorls and loops was found to be more on the right hand as compared to the left hand.

Conclusion: The results of the study indicate that there is a definite correlation between the number of whorls and loops and the presence of dental caries in children. Hence, dermatoglyphics can be used as a screening method to provide adequate preventive treatment to children showing a higher caries risk as detected by the hand ridge patterns.

Key words: Dental caries, genetics, loops, whorls

Introduction

The word "Dermatoglyphics" was coined by Cummins in 1926.[1]It originated from two Greek words "Derma" which means skin and "Glyphics" which means carving. In ancient India, ridge pattern study was called "SamudraShastra" and the whorls, loops, and arches visible on the ridges were, respectively, called as Chakra, Shankya, and Padma. The first study on dermatoglyphics was carried out by Grew in Western World in 1684 while in India the earliest study was carried out by William Herschel in 1880.[2]Dermatoglyphics includes the study of dermal ridge patterns of the hands and feet. Dermal ridges and craniofacial structures are both formed during 6th and 7th week of intrauterine life. Dermatoglyphics is considered for genetic correlation with dental caries as the epithelium of primary palate, and finger buds are both ectodermal in origin. As enamel and the fingerbuds developduring the same time, factors affecting dental caries might cause peculiarities in dermal ridge patterns. Dermatoglyphic patterns have also been used to predict

genetically related disorders, such as Down's syndrome,Alzhemier's disease, multiple sclerosis, congenital spinal cord anomalies, cleft lip, cleft palate, periodontal diseases, bruxisms, malocclusion and oral submucousfibrosis.Dental caries is the most common disease in the field of dentistry. The factors leading to dental caries are complex and primarily affect the enamel. The etiology of dental caries has been advocated to various environmental and genetic factors. The level to which each factor contributes to the development and progression of caries is variable and changes on an individual basis.Since both enamel and dermal ridge pattern are ectodermal in origin and develop during the same time of intrauterine life, a study to correlate them might be helpful for prediction of caries at an early age. Therefore, dermatoglyphics might help in early prevention of caries, thereby preventing children and adults from its deleterious effects. The study was undertaken to find a correlation between dermatoglyphics and dental caries in young children.

Materials and Methods

The aim of the study is to find a correlation between dermatoglyphic pattern and dental caries in caries-active and caries-free children. After approval from the Institutional Ethics Committee, the study was conducted on patients attending the Outpatient Department of Oral medicine and radiology,Rama Dental College Hospital and Research Centre, Kanpur, over a period of 5 months. Consent from parents/guardians was taken before the start of the study.

Study sample

The study included 200 healthy children in the age range of 6–13 years with no systemic disorders. Random sampling method was used.

Study design

Of the total cases of 200 children, 100 were caries active and 100 were caries free. In either group, there were 50 males and 50 females. In the caries-active group, the cases having caries in three or more teeth were included. They were divided into four groups in which the children with decayed, missing, and filled teeth (DMFT) index of 3, 4, 5, and 6 or more carious teeth were divided. Each group consisted of 25 children each.

The exclusion criteria include:

• Children with other disorders, i.e. mentally or physically handicapped children

• Children with skin disorders or trauma to the fingertips

• Uncooperative children and

•Children whose parents/guardians did not give consent. Recording of handprints Midlo and Cummins method[3] of recording palm prints was used using Indiana Ink (stamp pad), roller and A4 size printing papers for collecting their prints. Mouth mirror and probe was used for detecting and recording caries in children.

First, the hands of the cases were scrubbed using soap-water and allowed to dry. After this, the hands of the cases were pressed on the stamp pad and the print was recorded on the printing paper along with pressure applied using the roller. Right-hand prints were recorded followed by left-hand prints.The entire palm print along with digits was recorded in a single impression. Later, the DMFT score was recorded for the caries-active individuals.

Analysis of handprints

A loop is documented as a series of ridges that enter the pattern area on one side of digit, recurves abruptly and leaves the pattern area on the same side. A single triradius is present, which is located laterally on the fingertip, where the loop is closed.[4]A whorl varies from the loop in the feature of concentric arrangement of ridges, with two or more triradius in the latter. A whorl may be spiral, symmetrical, double looped, central-pocketed or accidental, depending on the internal structure of the whorl pattern.[4]Whorls and loops were counted on

each digit and palm of both right and left hand for each case. They were inspected using a magnifying lens.

Data were then entered into an excel sheet. The results of the study were statistically analyzed using SPSS software 11.00 (IBM Corporation, New York, USA) and Chi-square test was used to determine the comparison between the groups. $P < 0.05$ was considered statistically significant.

Results

The numbers of loops were found to be more in caries-free cases while the numbers of whorls were found to be more in caries-active cases [Tables 1 and 2]. A highly statistically significant ($P < 0.05$) difference was found between the presence of whorls and loops in caries-active and caries-free children. It was also noted that the occurrence of whorls and loops was more in males as compared to females in both caries-free and caries-active cases. However, the difference was not statistically significant [Table 3]. The number of whorls and loops was noted to be more on right hand as compared to left hand for both the groups [Tables 4 and 5]. The difference between the groups was not statistically significant. The number of whorls was found to be more in cases having a higher DMFT score. A proportional increase in the number of whorls was seen

with an increase in DMFT [Figure 1].

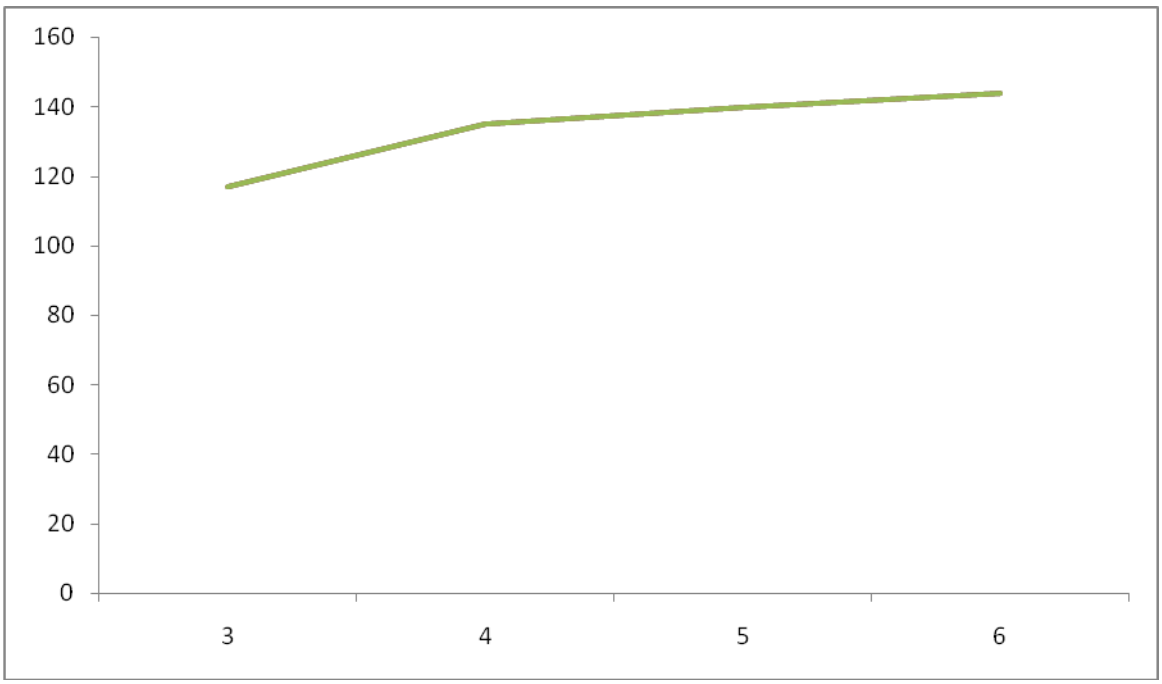

Figure 1: Correlation of whorls to decayed, missing, and filled teeth index in caries-active cases.

Table 1: Distribution of whorls and loops in caries-free cases according to gender

	Caries free						Z	P
	Male			female				
	Sum	mean	SD	Sum	Mean	SD		
WHORLS	201	3.94	1.07	1.90	3.87	1.18	0.042	0.84
LOOPS	2.83	5.54	1.14	2.58	5.26	1.20		

SD Standard deviation

Table 2: Distribution of whorls and loops in caries-active cases according to gender

Variables			Caries active				Z	P
		MALE			FEMALE			
	SUM	MEAN	SD	SUM	MEAN	SD		
WHORLS	273	5.46	1.28	259	5.18	1.25	0.21	O.64
LOOPS	219	438	1.07	194	3.88	1.25		

SD Standard deviation

Table 3: Comparison of number of whorls and loops in caries-free and caries-active cases

	CARIES FREE			CARIES ACTIVE	P
		MALE		FEMALE	
	SUM	MEAN	SUM	MEAN	
WHORLS	391	5.15	532	532	<0.001
LOOPS	541	4.55	413	413	

Table 4: Distribution of whorls and loops in caries-free cases in relation to hand

			CARIES FREE				Z	P
		RIGHT			LEFT			
	SUM	MEAN	SD	SUM	MEAN	SD		
WHORLS	205	2.05	0.79	186	1.86	0.73	0.92	0.33
LOOPS	302	3.02	0.87	239	2.39	0.69		

SD standard deviation

Table 5: Distribution of whorls and loops in caries-active cases in relation to hand

			CARIES ACTIVE				Z	P
		RIGHT				LEFT		
	SUM	MEAN	SD	SUM	MEAN	SD		
WHORLS	308	3.08	0.92	224	2.24	0.69	0.22	0.64
LOOPS	232	2.32	0.77	181	1.81	0.57		

SD standard deviation

Discussion

Dental caries is achronic, complex, multifactorial disease, the occurrence of which is influenced by a variety of factors including host and environmental interplay.Numerous host factors for dental caries have been proven to be genetically determined. The etiology of dental caries is complex and the restoration of a tooth affected by caries to its original form is intractable. There are many methods for detection of dental caries-like tactile perception, lasers, and various other methods. Dermatoglyphics is one such method which helps us in the early detection of caries. Dermatoglyphics can help us predict the development of caries in children by analysis of fingerprints at an early age and, therefore, can help us in its prevention saving the child from its direct consequences.

Palm prints serve as a long-term record. They are unique to each individual. Hence, they serve as an accurate record for a particular individual. Palm print reading is quite fascinating and has inspired a lot of people in Palmistry. They also serve as genetic markers for detecting genetic diseases, diabetes,[5] malocclusions, cleft lip and palate,[6]and arch forms[7] of an individual. They are a

boon to the field of dentistry and medical disorders as they help in early prevention and detection of the disease.

In dentistry, dental caries detection can be done at an early age by the use of dermatoglyphics. The epithelium of the finger develops during the same intrauterine period as the development of enamel; hence, both genetic and environmental factors affecting one can affect the other. Enamel is usually the first structure which gets affected by caries and, therefore, preventing its occurrence is quite necessary. Hence, palm prints can be used for detecting and preventing caries at an early age. Therefore, dermatoglyphics was used for evaluating the prevalence of caries in the present study.

Dermatoglyphic patterns visible on the finger tips are whorls, loops, and arches and on the palm are atd-angle, H–loop, IV loop, and t-triradius.[8] Various studies have shown no correlation of arches with the presence of dental caries. [9-11] Hence, they were not included in the present study.

In the present study, the numbers of whorls were found more in caries-active case while the numbers of loops were found more in the caries-free cases. The results of the study are similar to studies done by Bhat et a.[1]andAnitha et al.[9]It is also in line with the studies done by Atasu.[12] and Sharma and Somani.[8] in which the caries-free persons had more loops and the patients with dental caries had an increased frequency of whorls. The results are in contrast to the studies conducted by Navit et al.[11] and Sharma and Somani,[8]in which they found the number of loops to be more in the caries-active group as compared to the caries-free group. According, to Navit S et al.[11] there is a significant association of the dermal ridge patterns and caries-free children rather than caries-active children.

The frequency of whorls and loops was found to be more in right hand as compared to the left hand in both the caries-active cases and caries-free cases. This observation can be attributed to the fact that most of the patients included in the study were right-handed and the results are also in line with the study by Bhatet al.[1]

In the present study, it was noted that the increase in number of whorls pattern was observed with an increase in the DMFT score. The results are in accordance with studies done by Anithaet al.[9] and Singh et al.[13] In a study by Abhilash et al.[14] they found 83% correlation between dental caries susceptibility and the incidence of whorl pattern of an individual.

In our study, the incidence of whorls and loops was found more in males as compared to females in both caries-free and caries-active groups. The results differ from the study conducted by Madanet al.[15]in which loops were found to be more in the females as compared to the males.The recording of fingerprint pattern in the initial visit can be useful in predicting the caries risk of the child. Thus,dermatoglyphics can be used as an important tool in the field of dentistry for early detection and prevention of caries in children, thereby saving the children from undergoing invasive or restorative treatment at an early age.

Conclusion

The results of the study indicate that there is a definite correlation between the dermal ridge pattern and dental caries in children. The use of dermatoglyphicscan be used as a screening method to provide adequate preventive treatment to children showing a higher caries risk as detected by the hand ridge patterns.

References

1. Bhat PK, Badiyani BK, ArunaCN.Dermatoglyphics – A new diagnostic tool in detection of dental caries in children. J Indian SocPedodPrev Dent 2012;19:67-73.

2. Mukherjee DP. How scientists read palms. Science Today 1980;1:15-21.

3. Cummins H, Midlo C. Finger Prints, Palm and Soles: An Introduction to Dermatoglyphics. New York: The Blakistan Co. Inc.; 1961.

4. Ramani P, Abhilash PR, Sherlin HJ, Anuja N, Premkumar P, Chandrasekar T. Conventional dermatoglyphics – Revived concept: A review. Int J Pharma Bio Sci 2011;3:446-58.

5. Sharma MK, Sharma H. Dermatoglyphics: A diagnostic tool to predict diabetes. J ClinDiagn Res 2012;6:327-32.

6. Mathew L, Hegde AM, Rai K. Dermatoglyphic peculiarities in children with oral clefts. J Indian SocPedodPrev Dent 2005;23:179-82.

7. Sachdeva S, Tripathi A, Kapoor P. Dermatoglyphic assessment in subjects with different dental arch forms: An appraisal. J Indian ProsthodontSoc 2014;14:281-8.

8. Sharma A, Somani R. Dermatoglyphic interpretation of dental caries and its correlation to salivary bacteria interactions: An in vivo study. J Indian SocPedodPrev Dent 2009;27:17-21.

9. Anitha C, Konde S, Raj NS, Kumar NC, Peethamber P. Dermatoglyphics: A genetic marker of early childhood caries. J Indian SocPedodPrev Dent 2014;32:220-4.

10. Sengupta AB, Bazmi BA, Sarkar S, Kar S, Ghosh C, Mubtasum H. A cross sectional study of dermatoglyphics and dental caries in Bengalee children. J Indian SocPedodPrev Dent 2013;31:245-8.

11. Navit S, Chadha D, Khan SA, Singh RK, Johri N, Navit P. The mystery of handprints: Assesment and correlation of dermatoglyphics with early childhood caries a case-control study. J ClinDiagn Res 2015;9:ZC44-8.

12. Atasu M. Dermatoglyphic findings in dental caries: A preliminary report. J ClinPediatr Dent 1998;22:147-9.

13. Singh E, Saha S, Jagannath GV, Singh S, Saha S, Garg N. Association of dermatoglyphic peculiarities with dental caries in preschool children of Lucknow, India. Int J ClinPediatr Dent 2016;9:39-44.

14. Abhilash PR, Divyashree R, Patil SG, Gupta M, Chandrasekar T, Karthikeyan R. Dermatoglyphics in patients with dental caries: A study on 1250 individuals. J Contemp Dent Pract 2012;13:266-74.

15. Madan N, Rathnam A, Bajaj N. Palmistry: A tool for dental caries prediction! Indian J Dent Res 2011;22:213-8.