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Original Article

DERMATOGLYPHIC INTERPRETATION OF DENTAL CARIES AND ITS CORELATION TO SALIVARY BACTERIAL INTERACTIONS: AN IN VIVO STUDY

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ABSTRACT

Introduction: Specific dermatoglyphic patterns have been observed in several non – chromosomal genetic disorders and other diseases whose etiology may be influenced directly or indirectly by genetic inheritance. Congenital abnormalities and is a sensitive indicator of intrauterine dental anomalies. Dental caries is an ecological disease in which the diet, the host and the microbial flora interact over a period of time in such a way as to encourage demineralisation of the tooth enamel with resultant caries formation.

Methodology: The present study was conducted in dental camp held in local schools in Kota, Rajasthan. A total of 1700 children aged 3-16 years were examined for caries.

Results Group 1a to 1c are with more than 4 dental caries (WDC) while group 2a to 2c are control groups with no caries (CG). WDC group consist of 90 subjects, out of 90 subjects, 43 were males and 47 were females. After studying 900 dermatoglyphic patterns of WDC group **(group 1a to 1c).** Out of these 900 finger prints, 462 were loops, 401 were whorls and 37 were arches.

Conclusion: Further cytogenetic studies on a larger sample should be carries out to confirm the role of dermetoglyphic and dental caries.

Keywords: Dental caries, demography.

INTRODUCTION

The entire human body is clothed with the skin which happens to be the largest and most important organ of the body. It performs many vital functions in the life of an individual, viz. it protects and safe guards the body from the vagaries of the weather, maintains the body temperature and saves the internal organs of body from the injuries. However, the skin on the ventral sides of the hands and the plantar sides of the feet is exclusively designed and is corrugated with the ridges and configurations. They are functionally useful as they help in the grasping without which the objects would easily slip away from the hands.[1]

Specific dermatoglyphic patterns have been observed in several non – chromosomal genetic disorders and other diseases whose aetiology may be influenced directly or indirectly by genetic inheritance. For example - Balgir in 2006[2] studied dermatoglyphic characteristics of 69 cases of cleft lip with or without cleft palate with controls. They concluded that patients with cleft lip and palate increased number of ulnar loops. The study of the ridged skin called dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine dental anomalies.[3]

Dental caries is an ecological disease in which the diet, the host and the microbial flora interact over a period of time in such a way as to encourage demineralisation of the tooth enamel with resultant caries formation.[4]

Streptococcus mutans, an acidogenic and aciduric microorganism colonizing the oral cavity, is considered to be the main cause of dental caries. Different studies have shown a correlation between counts of S.mutans in the oral cavity and both the prevalence and incidence of caries.[5] Among the different streptococcal species, S. mutans has shown to exhibit high cariogenic potential.[6]

The present study was done to estimate dermatoglyphic dependence of dental caries and its correlation with salivary bacteria levels, primarily Streptococcus mutans.

METHODOLOGY

This study was conducted in dental camp held in local schools in Kota, Rajasthan. A total of 1700 children aged 3-16 years were examined for caries. Of 1700 children examined only 180 subjects were selected for the present study.

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- 180 patients further divided into 6 groups 30 each.
- 30 children- primary dentition with caries in more than 4 teeth
- 30 children- mixed dentition with caries in more than 4 teeth
- 30 children- permanent dentition with caries more than 4 teeth
- 30 children- control group without caries

Collection of data: The children were examined and data was collected on a case history sheet. The 'DMFT' index was used for the permanent teeth and 'dmft' index was used for deciduous teeth. Recording was done by a single calibrated examiner using mouth mirror and probe.

Dermatoglyphic analysis of fingers: The finger prints were taken both from the control (CF) and dental caries group (WDC) was recorded using the Stamp-pad ink method.

RESULTS

Tabulation of data was done thereafter and comparative results between control and dental caries group were obtained. The results obtained were thereafter analyzed statistically. The values were represented in Number (%) and Mean±SD.

S. No.	Groups	Caries	Sample Size
1	**Group 1**	**<4**	**90**
2	**Group 2**	**0**	**90**

Table 1: Shows number of subjects in group 1 and group 2. Group 1 consist of 90 subjects with more than 4 dental caries (WDC), Group 2 consist of 90 subjects with no dental caries which was taken as control group (CG).

Both the groups, group 1 and group 2 are further divided into three subgroups on the basis of dentition, primary, mixed and permanent dentition. 30 patients in each group were included.

S. No.	Groups	Sample size	Dentition	Caries
1	Group 1a	30	Primary	<4
2	Group 1b	30	Mixed	<4
3	Group 1c	30	Permanent	<4
4	Group 2a	30	Primary	0
5	Group 2b	30	Mixed	0
6	Group 2c	30	Permanent	0

Table 2: Shows the division of group 1 (WDC) and group 2 (CG) based on their dentition

Group 1a to 1c are with more than 4 dental caries (WDC) while group 2a to 2c are control groups with no caries (CG). WDC

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group consist of 90 subjects, out of 90 subjects, 43 were males and 47 were females.

Males : Females was 1 : 1.1

S. No.	Groups	Sample size	Males	Females	Statistical difference
1	Group 1a	30	17	13	1.3 : 1
2	Group 1b	30	14	16	1 : 1.1
3	Group 1c	30	12	18	1 : 1.5
4	Total	90	43	47	1 : 1.1

Table 3: Shows demographic details of the patients with dental caries in WDC group

43 males were there in study which comprises 48% of total sample size while females were 47 which comprises 52% of total sample size.

After detailed case history and examination dermatoglyphic patterns were recorded on three bond papers and most visible was studied. And salivary sample from every subject was collected into a sterilized test tube with cap for the culture of streptococcus mutans colonies.

180 subjects were divided into 6 groups, 90 were carious (WDC) and 90 were controls (CG). Group 1a, 1b, 1c are WDC group with 164, 161 and 157 caries respectively. Total number of caries in WDC group was 472 while highest number of caries were in group 1a.

S. No.	Groups	No. of caries	Mean	P value
1	Group 1a	164	5.4 ± 0.12	0.79
2	Group 1b	161	5.3 ± 0.09	0.84
3	Group 1c	157	5.2 ± 0.11	0.63
	Total	472	5.24 ± 0.08	

Table 4: Number of caries in individual groups

Mean dental caries was found to be 5.24 and there is no significant difference between WDC subgroups as P value more than 0.05.

Dermatoglyphics

After studying 900 dermatoglyphic patterns of WDC group **(group 1a to 1c).** Out of these 900 finger prints, 462 were loops, 401 were whorls and 37 were arches.

1. Loops- out 462 loops, 145 were in primary dentition group, 148 were in mixed dentition group and 169 were in permanent dentition group. No

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significant statistical difference were not noted between primary, mixed and permanent dentition. Mean loops in the WDC groups are 5.1 ± .12(table 5)

2. Whorls- out of 401 whorls, 149 were in primary dentition group, 140 were in mixed dentition group and 112 were in permanent dentition group. No significant statistical difference were not noted between primary, mixed and permanent dentition. Mean whorls in WDC groups are 4.4 ± 0.02(table 5)
3. Arches- out of 37 arches, 6 were in primary dentition group, 12 were in mixed dentition group and 19 were in permanent dentition group. Statistical difference were noted between primary, mixed and permanent dentition. Mean arches in WDC groups are 0.4 ± .04(table 5)

S. No.	Pattern	Group 1a	Group 1b	Group 1c	Mean	Statistical difference
1	Loops	145	148	169	5.1± 0.12	0.0651
2	Whorls	149	140	112	4.4± 0.02	0.0527
3	Arches	6	12	19	0.4± 0.04	0.0451

Table 5: Shows dermatoglyphic pattern in group with dental caries

In **Control group** out of 900 finger prints, 789 were loops, 90 were whorls and 21 were arches.

1. Loops- out 789 loops, 259 were in primary dentition group, 217 were in mixed dentition group and 213 were in permanent dentition group. Statistical difference were not noted between primary, mixed and permanent dentition. Mean loops in control group are 8.2 ±0 .30. Number of loops were increased in permanent dentition (table 6)
2. Whorls- out of 90 whorls, 27 were in primary dentition group, 34 were in mixed dentition group and 29 were in permanent dentition group. No significant statistical difference were not noted between primary, mixed and permanent dentition. Mean whorls in control group is 1 (table 6)
3. Arches- out of 21 arches, 9 were in primary dentition group, 5 were in mixed dentition group and 7 were in permanent dentition group. No statistical difference were noted between primary, mixed and permanent dentition. Mean arches in control group are 0.23±0.21. (table 6)

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S. No.	Pattern	Group 2a	Group 2b	Group 2c	Mean	Statistical Difference
1	Loops	259	217	313	8.2±0.30	0.0329
2	Whorls	27	34	29	1	0.0589
3	Arches	9	5	7	0.23±0.21	0.0754

Table 6: Shows dermatoglyphic pattern in control group

S. No.	Pattern	Caries group	Non caries group	Mean	Statistical difference
1	Loops	462	789	6.95±0.31	<0.0001
2	Whorls	401	90	2.72±0.47	<0.0001
3	Arches	37	21	0.32±0.02	0.0360

Table 7: Shows dermatoglyphic patterns in WDC and CG groups

Total number of loops in both groups was 1251 with mean of 6.95 and total number of whorls in both groups was 491 with mean of 2.72 while total number of arches in both groups was 58 with mean of 0.32.

Salivary streptococcus mutans

After recording dermatoglyphic patterns salivary samples was collected into sterilized test tubes and microbiological culture was done for each patient to know streptococcus mutans colony count in both the groups WDC and CG.

S. No.	Groups	Total no. of st. mutans colonies	Mean
1	Group 1a	307	10.23
2	Group 1b	309	10.30
3	Group 1c	361	12.03
4	Group 2a	105	3.5
5	Group 2b	93	3.1
6	Group 2c	117	3.9

Table 8: Shows total number of streptococcus mutans colonies count in salivary samples. Highest number of colonies were found in group 1c while least colony count was found in group 2b.

S. No.	Mean of WDC group	Mean of CG group	P value
1	10.85	3.5	0.039

Table 9: Shows mean values of WDC & CG groups and their statistical difference

Mean value of WDC group is 10.85 while mean value of CG group is 3.5. Significant statistical difference was found in total number of streptococcus mutans count in both the groups.

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S. No.	Group	Total no. of st. mutans colonies
1	Caries	977
2	Control	315

Table 10: Total number of colony count in caries and control group, 977 colonies were obtained from 90 patients of caries group(WDC) while 315 colonies were obtained from 90 patients of control group (CG).

ROC Curve Analysis

For Whorls

Cut off value is **4**

S. No.	Groups	Subjects who have more than 4 whorls	Subjects who have less than 4 whorls
1	Group 1a	21	9
2	Group1b	19	11
3	Group1c	17	13
4	Group 2a	1	29
5	Group2b	1	29
6	Group 2c	0	30

Table 11: Shows number of subjects who have more than 4 whorls and subjects those who have less than 4 whorls

Positive	Negative
TP	FP
FN	TN

TP = 57
TN = 33
FP = 2
FN = 88

57	2	59
88	33	121
145	35	

Sensitivity = 57/125 = 0.456

Specificity = 33/55 = 0.69

PPV = 57/79 = 0.72

NPV = 33/101 = 0.32

ROC Curve Analysis

For Loops

Cut off value is **6**

S. No.	Groups	Subjects those who have more than 6 loops	Subjects who have less than 6 loops
1	Group 1a	9	21
2	Group 1b	11	19
3	Group 1c	13	17
4	Group 2a	19	11
5	Group 2b	23	7
6	Group 2c	22	8

Table 12: Shows number of subjects who have more than 6 loops and subjects those who have less than 6 loops

TP = 33, TN = 57, FP = 22, FN = 26

33	22	55
26	57	83
59	79	

Sensitivity = 33/59 = 0.62, Specificity = 57/79 = 0.72, PPV = 33/55 = 0.6, NPV = 57/83 = 0.68

DISCUSSION

Dental caries is an irreversible microbiological disease of the calcified tissue of the teeth, characterized by

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demineralization of the inorganic portion and destruction of the organic substance of the tooth, which often leads to the cavitation. It is a complex and dynamic process where a multitude of factors influence and initiate the progression of disease. There are practically no geographic areas in the world whose inhabitants do not exhibit some evidence of dental caries. It affects persons of both genders in all races, all socioeconomic strata and every age group.[7]

Dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine anomalies. Dermatoglyphics is known to be one of the best available diagnostic tools in genetic disorders. Dermatoglyphics refers to the friction ridge formations which appear on the palms of the hands and soles of the feet. The ridge formations of the skin of an individual begin to appear during the third and fourth month of foetal development. Dermal palmar and plantar ridges are highly useful in biological studies. Their variable characteristics are not duplicated in other people, even in monozygotic twins or even in the same person, from location to location. Thus, dermatoglyphics may be in a position to become the primary means of assessing complex genetic traits, and also useful for the evaluation of children with suspected genetic disorders.[1]

Dermatoglyphic studies was conducted on various other medical diseases and positive correlation were observed in those studies on diabetes mellitus,[8] down's syndrome,[9] breast cancer,[10] mental retardations,[11] tuberculosis,[12] cleft lip and palate,[13] prostate cancer[14] and etc.

Inherited disorders of tooth development with altered enamel structure increase the incidence of dental caries. Specific genetic linkage has not been determined for all of the syndromes of altered tooth development. Consequently genetic screens of large populations for genes or mutations associated with increased caries susceptibility have not been done.[15]

REFERENCES

1. Kumbnani HK. Dermatoglyphics : A Review. J Anthropol 1982:32-74.
2. Balgir RS. Dermatoglyphics in cleft lip and cleft palate anomalies. PMID 1959;7:112-229.
3. Atasu M, Akyuz S. Congenital hypodontia : A pedigree &

DOI: 10.46376/IJMR/2.3.2021.

dermatoglyphic study. J Clin Pediatr Dent 1995;6:47-79.

4. Gopinath VK, Arzreanne AR. Saliva as a Diagnostic Tool for Assessment of Dental Caries. Arch Orofacial Sci 2006;1:57-59.
5. Gamboa F, Estupinan M, Galindo A. Presence of Streptococcus Mutans in saliva and its relationship dental caries : antimicrobial susceptibility of the isolates. Universitas Scientiarum 2004;9:23-27.
6. Leal SC, Mickenautsch S. Salivary streptococcus mutans count and caries outcome : a systematic review. J Min Inter Dent 2010;3:137-147.
7. Shafer WG, Hine MK, Levy BM, Shafer's Textbook of Oral Pathology, 6th Edition. Elsevier Reprinted 2010.
8. Bets LV, Dzhanibekova IV, Lebedev NB, Kuraeva TL. Constitutional and dermatoglyphic characteristics of children with diabetes mellitus. Probl Endokrinol 1994;40:6-9.
9. Preus M. Dermatoglyphics and Syndromes. Amer J Dis Child Dec 1972;124: 933-943.
10. www.odc.co.in- History of Dermatoglyphics. (29/11/12).
11. Uchida A and Soltan J. Evaluation of Dermatoglyphics in Medical Genetics. Pedia Clin North Amer 1963:409-421.
12. Sidhu LS, Bhatnagar DP, Malhotra R, Sodhi HS. Association of finger ball dermatoglyphics with pulmo nary tuberculosis. Anthropol Anz 1977;36:36 - 42.