e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2022; 14(4); 462-470

Original Research Article

Study of Dermatoglyphics and Salivary Bacterial Culture in Dental Carries in Age group of 3-16 years

Anil Pandey[1*], Amit Kumar Singh[2], Sandeep Dabral[3], C P Bhaisora[4], Manisha Pandey[5]

[1]Associate Professor Department of Dentistry, SSJGIMSR, Almora

[2]Associate Professor Department of Pediatrics, SSJGIMSR, Almora

[3]Assistant Professor Department of Biochemistry, SSJGIMSR, Almora

[4]Professor Department of Forensic Medicine, SSJGIMSR, Almora

[5]Medical Officer: Almora

Received: 20-02-2022 / Revised: 19-03-2022 / Accepted: 10-04-2022
Corresponding author: Dr. Anil Pandey
Conflict of interest: Nil

Abstract

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.

Objective: Plamar dermtoglyphics has been and is being studied in many diseases and alterations in normal patterns have been noted. It has been an accepted fact that genetics plays an important role in determination of palmar dermatoglyphic patterns.

Conclusion: Result of our study showed that there in a significant role of genetic and environmental factors in causation of dental caries. Subjects in caries group had more number of whorls on their fingertips while subjects from control group had more number of loops on their finger tips and number of streptococcus mutans was more in caries groups which in directly proportional to the number of caries in individuals.

Keywords: Dermatoglyphics, Salivary Bacterial Culture, Dental Carries.

This is an Open Access article that uses a fund-ing model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

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]

Dermatoglyphics deals with the study of the epidermal ridges and their configurations on the fingers, palms and soles. The word “Dermatoglyphics” is derived from the

Greek word “Derma” meaning skin and “glyphic” meaning carvings. [1] Dermal ridge differentiation takes place early in foetal development. The resulting ridge configurations are genetically determined and influenced or modified by environmental forces.[2] Dermatoglyphic patterns stay constant during life and may sometimes play a significant role in the diagnosis of many disorders with genetic background. [3]

Dermatoglyphics are assumed to be genetically controlled although the exact mechanism of inheritance in still unknown. The utility of the dermatoglyphics in medicine has been demonstrated by several investigators. [2,4,5]

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 [6] 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. [7]

The dermal ridges develop in relation to the volar pads, which are formed by the 6th week of gestation and reach maximum size between 12th and 13th weeks. This means that the genetic message contained in the genome - normal or abnormal is deciphered during this period and is also reflected by dermatoglyphics. [8,9]

Aims

1. To study the association of dermatoglyphics and the caries risk in individuals.
2. To compare the level of streptococcus mutans with caries.
3. To co-relate these findings dermatoglyphics, streptococcus mutans and dental caries for possible association.

Objective:

Plamar dermtoglyphics has been and is being studied in many diseases and alterations in normal patterns have been noted. It has been an accepted fact that genetics plays an important role in determination of palmar dermatoglyphic patterns. Dermatoglyphics although is an independent field of study, it has a body of theory, method and applications. Thus in biology, anthropology, genetics and medicine, dermatoglyphics serves as a tool to describe, compare and contrast, and at times predict occurrences and risks for biomedical events studied by these major disciplinary areas.

Inclusion criteria:

1) Children between 3-16 years of age.
2) Children with good oral hygiene
3) Children with either no caries (for control group) or with more than four carious teeth (for dental caries group).
4) Children with same socio-economic background.
5) Children with same geographic and climatic zone.

Exclusion criteria:

1. Children who will be on antibiotics or have taken antibiotics for one month.
2. Children with orthodontic appliances.
3. Mentally ill patients.
4. Patients those who have systemic disease.
5. Caries less than 3 teeth.

Saliva samples and dermatoglyphic patterns were thereby taken both from the control and study group.

Armamentarium for the study:

For the caries detection:

1) Right angled probe (No. 17)
2) Shepherd's crook (No. 23)
3) Mouth mirror
4) Sterile cotton

For dermatoglyphic pattern recording:

1) Stamp pad (camlin)
2) Standard A4 size paper (75 gsm)
3) Hard board
4) Illuminating Magnifying hand lens
5) Disinfectant (Salvon)
6) Sterile cotton
7) Clean towel

For Microbial estimation:

1) Sample collection test tubes (Borosil, 5ml)
2) Sterile disposable syringes (Pricon, 3ml)
3) Culture medias-
   - Mitis Salivariu Agar (HiMedia)
   - Peptone water (HiMedia)
   - Sterilized culture petri plates (HiMedia)
   - Sucrose
   - Bacitracin
   - Potassium tellurite
   - Distill water
4) Autoclave
5) Incubator (Himedia)
6) Beakers - 500 ml capacity (Borosil)
7) Glass stirrer Glass Jar (Borosil)
8) Candle Inoculating loop (4mm internal diameter) (HiMedia)
9) Disposable scored culture plates (HiMedia)
10) Spirit lamp
11) Glass slides (GEM, Clear glass,76x25 mm,1.1 mm thick)
12) Microscope (Labomed) Gram's stain – Gram's iodine

Control group: The subjects having caries free mouths under similar conditions compared to students with increased dental caries were considered as controls (CF= caries free)

Disease group: Subjects having caries in more than 4 teeth were considered to be in the Dental Caries group (WDC = with dental 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.

- The subjects were asked to wash their hands from an antiseptic hand wash and were allowed to dry.
- The subjects were guided to wet their fingertips on the stamp pad first and later press them against a blank sheet placed on a hard board 3-4 times.
- The fingerprints taken were composed of both the right and left hands, on separate sheets.
- In this method, third recording was satisfactory and readable, so impressions were recorded 3-4 times.
- In this way finger-prints were obtained from 120 patients.
- The fingerprints taken were thereafter analyzed by an illuminating hand-lens with respect to the available standards and were classified as under Galton's classification of finger patterns (1982) which classifies them as:
  - Whorls,
  - Loops and
  - Arches.

Tabulation of data was done thereafter and comparative results between control and dental caries group were obtained.

Microbial Analysis

- Saliva was collected between 9.30 am-11.30 am during the school hours from both the control group (CF) and dental

caries group (WDC).

- The subjects were asked to refrain from eating for one hour before saliva collection. Saliva was collected in a plastic cup.
- By means of sterile disposable syringe 0.25ml aliquot of saliva was transferred from the cup to the previously labelled sterile test tube and streaked on the MS agar plates in the lab.

Laboratory procedures

Culture media plates preparation-

Culture medias are available in various form in market. Powder form was used in our study.

Procedure:

- 100ml of distilled water was taken in a cone shaped glass flask in which 9 grams of Mitis Salivarius agar media was added and mixed.
- 10% Sucrose solution was added to the solution to further promote the growth of streptococcus mutans.
- 1 mg of Bacitracin was further added to this solution.
- Thereby all contents were mixed well before placing flask in autoclave.
- Media was made sterilized by autoclaving at 121^{o} C for 15minutes at 15 Lps.
- Once it had cool down to room temperature, 1% potassium tellurite was added to increase the selectivity of media for streptococcus.
- This liquid solution was poured into sterile petri plates which were closed immediately in order to avoid any disinfection.
- On further reduction in temperature, they attain viscous consistency.
- Streaking was done from the samples using an inoculation loop having an internal diameter of 0.4 mm.
- The streaking was done by Streak plate method for isolation of pure bacterial cultures for Streptococcus mutans.
- Thereafter, the plates were incubated under aerobic conditions for the isolation of Streptococcus mutans for 48 hours at 37^{o}C.
- Following incubation, species were identified with hand lens having specific morphologic characteristics for Streptococcus mutans.
- Gram staining was also performed for the preliminary confirmation of the Streptococcus Streptococcus on Gram staining appeared as cocci arranged in short and long chains
- Colony count was done with magnifying glass and the Streptococcus mutans and Lactobacilli were expressed as colony forming units per millilitre (cfu/ml) of saliva.
- Semiquantitation was done by multiplying the actual number of colonies with 4x as 0.25 ml of saliva was taken.

Colony identification on mitis salivarius agar

Streptococcus Mutans colony identification which was used in this study was purely based on morphology of colonies.

- Streptococcus Salivarius uses the sugars to produce a gummy-like levan, producing sticky, mucoid, gum-drop colonies.
- Streptococcus Mitis colonies will be small, flat, light blue.
- Streptococcus Mutans will be undule-shaped colonies, with a granular frosted-glass appearance (making dextran from sugar)
- Enterococcus will produce dark, blue-black colonies.

Colonies were calculated by the following formula:

Number of colonies = n x 4x = ……CFU/mL of saliva

Where n = count of the morphologically identified colonies on the growth Medium

x = volume of saliva

It has to multiple by 4 because we took 0.25 ml of saliva.

The results obtained were thereafter analyzed statistically. The values were represented in Number (%) and Mean±SD.

The following Statistical formulas were used:

1. **Mean**: To obtain the mean, the individual observations were first added together and then divided by the number of observations. The operation of adding together or summation is denoted by the sign Σ.
   The individual observation is denoted by the sign X, number of observations denoted by n, and the mean by $\overline{X}$.

$$\overline{X} = \frac{\Sigma X}{\text{No. of observations (n)}}$$

2. Standard Deviation: It is denoted by the Greek letter σ. If a sample is more than 30 then.

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n}}$$

When sample in less than 30 then.

$$\sigma = \sqrt{\frac{\Sigma (X - \overline{X})^2}{n-1}}$$

3. **Chi square test:**

$$\chi^2 = \frac{\Sigma (O - E)^2}{E}$$

Where O = Observed frequency
E = Expected frequency

4. **Student 't' test**: To test the significance of two means the student 't' test was used

$$t = \frac{\overline{X}_1 - \overline{X}_2}{S\sqrt{\frac{1}{n_1} + \frac{1}{n_2}}}$$

where $S^2 = \frac{(N_1 - 1)SD_1^2 + (N_2 - 1)SD_2^2}{N_1 + N_2 - 2}$

where $\overline{X}_1$, $\overline{X}_2$ are means of group 1 and group 2

N_1, N_2 are number of observation group1 and group 2

SD_I, SD_2 are standard deviation in group1 and group 2.

5. **ROC Curve**

6. Level of significance: "p" is level of significance

p > 0.05	Not significant
p <0.05	Significant
p <0.01	Highly significant
p <0.001	Very highly significant

The present study was conducted into Department of Dentistry. The study sample consists of 180 subjects in total and divided into 2 groups on the basis of caries

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).

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

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.

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

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

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. Males : Females was 1 : 1.1

Table 3: Shows dermatoglyphic pattern in group with dental caries

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

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 significant statistical difference were not noted between primary, mixed and permanent dentition. Mean loops in the WDC groups are 5.1 $\pm$ .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 $\pm$ 0.02(table 5)

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

3. difference were noted between primary, mixed and permanent dentition. Mean arches in WDC groups are 0.4 $\pm$ .04(table 5)

Table 4: **Shows dermatoglyphic pattern in group with dental caries**

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

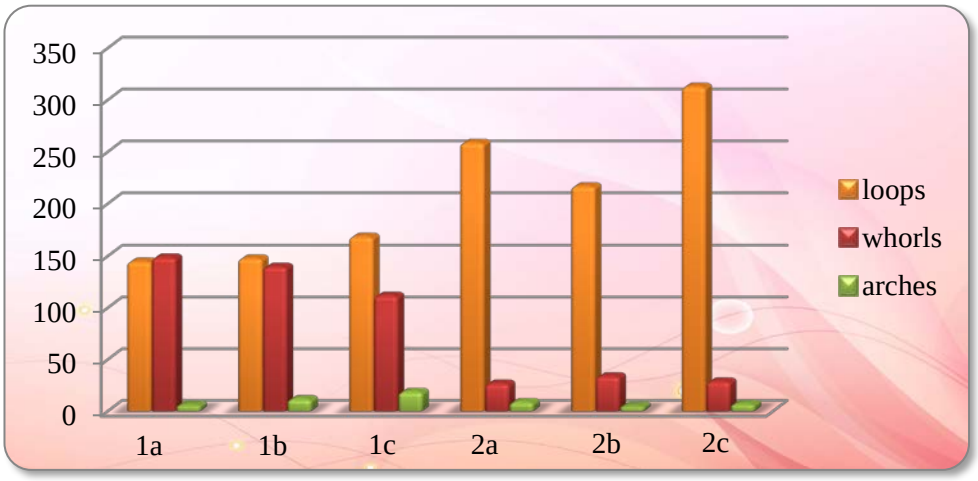
In **Control group** out of 900 finger prints, 789 were loops, 90 were whorls and 21 were arches.

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). Table 5: Shows dermatoglyphic pattern in control group

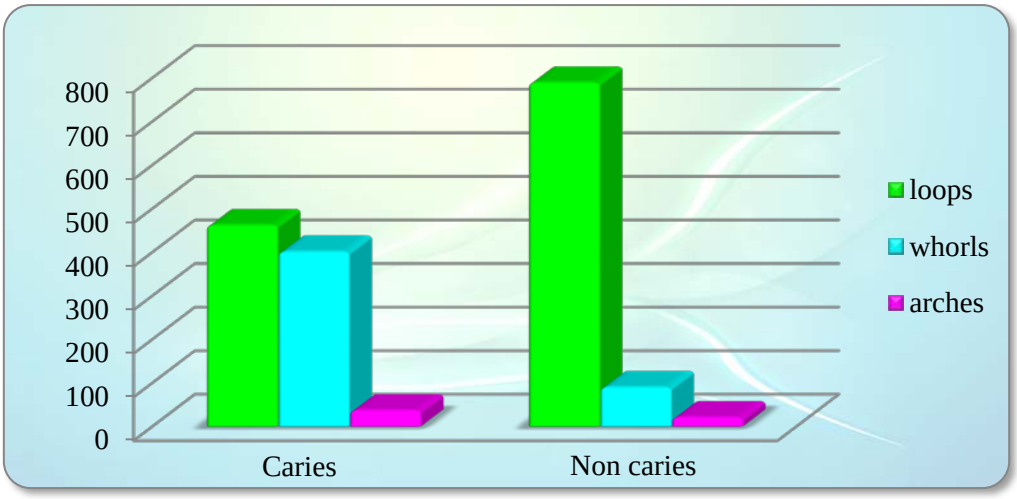
Table 5: Shows dermatoglyphic patterns in WDC and CG groups

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

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.



Graph 1: Dermatoglyphic pattern distribution in WDC and CG groups



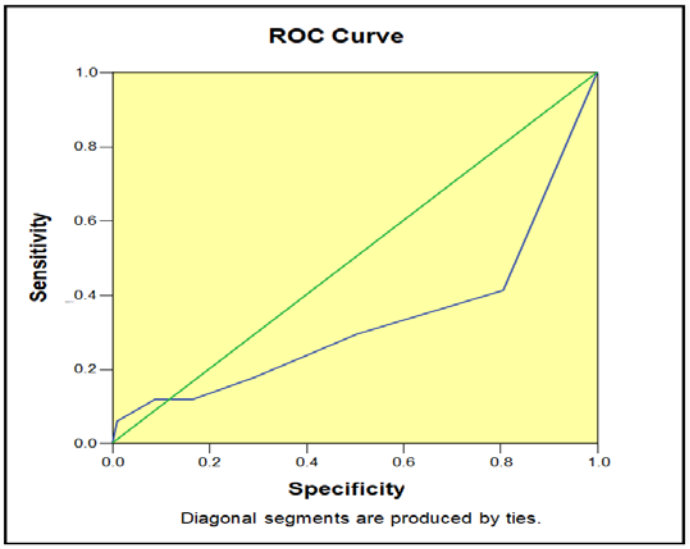
Graph 2: **Mean dermatoglyphic pattern in WDC and CG group.**

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.

Table 6: **Shows total number of streptococcus mutans colonies count in salivary samples. Highest number of colonies was found in group 1c while least colony count was found in group 2b.**

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



Graph 3: ROC curve between whorls and caries

Result of our study showed that there in a significant role of genetic and environmental factors in causation of dental caries. Subjects in caries group had more number of whorls on their finger tips while subjects from control group had more number of loops on their finger tips and number of streptococcus mutans was more in caries groups which in directly proportional to the number of caries in individuals.

Bibliography:

1. Kumbnani HK. Dermatoglyphics : A Review. J Anthropol 1982:32-74.
2. Schaumann B, Alter M. Dermatoglyphics in Medical Disorders. J Newyork Heal 1976:439-46.
3. Jordan B, Will JC. Alter Dermatoglyphic analysis as a diagnostic tool. Medicine 1967;46:35-6.
4. Balgir RS. Dermatoglyphic studies in affective disorders : an appraisal. Biol. Psychiatry 1982;17:69-82.
5. Polat MH. The use of dermatoglyphics in medicine and significance in the diagnosis of diseases. Karadeniz Tip Degil 1998;83- 86.
6. Balgir RS. Dermatoglyphics in cleft lip and cleft palate anomalies. PMID 1959;7:112-229.
7. Atasu M, Akyuz S. Congenital hypodontia : A pedigree & dermatoglyphic study. J Clin Pediatr Dent 1995;6:47-79.
8. Mathew L, Hegde AM, Rai K. Dermatoglyphic peculiarities in children with oral clefts. J Indian Soc Pedod Prev Dent 2005;23:179-82.
9. Gopinath VK, Arzreanne AR. Saliva as a Diagnostic Tool for Assessment of Dental Caries. Arch Orofacial Sci 2006;1:57-59.