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Association Between Toe Dermatoglyphics & Caries And Its Correlation To Body Mass Index In Children

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Abstract

AIM: The Aim & Objective of the study was to find an association between toe dermatoglyphic pattern and dental caries & its relation to Body Mass Index.

Method: The study was conducted among 85 children aged 11–14 years screened for Dermatoglyphics at CDSRC. Dental caries was recorded using DMFT index & Body Mass Index was calculated for each child. Right Toe print was taken using Indiana Ink and printing paper and was inspected with the help of magnifying lens.

Results: Toe Dermatoglyphics was not significant compared to DMFT & BMI. 37.3% children with right loop pattern had higher DMFT. 62.9% children with higher DMFT had low BMI.

Conclusion: Specific toe print patterns may be used as a potential non-invasive anatomical tool for screening of dental caries.

Keywords: Body Mass Index, Dental Caries, Toe Dermatoglyphics.

Introduction: Dermatoglyphics" is refers to as the study of the dermal Ridge configuration on the palmar and plantar surfaces of the hands and feet.1Apart from its use in Forensic Science for identification of an individual, an association between fingerprint patterns and medical ailments such as diabetes, hypertension, psychosis, and breast cancer has also been established. Recently, the field of dental dermatoglyphics has gained momentum through recognition of irregular fingerprints among individuals with periodontitis, dental caries, and certain congenital anomalies such as cleft lip and palate. The epidermal ridges first appear in the form of localized cell proliferations around the 10th to 11th week of gestation. (William J Babler, 1976). These proliferations form shallow corrugations that project into the superficial layer of the dermis. The number of ridges continue to increase, being formed either between or adjacent to existing ridges. It is during this period of primary ridge formation, that the characteristic patterns are formed. At about 14 weeks, the primary ridge formation ceases and secondary ridges begin to form as sweat gland, and develop along the apices of the primary ridges at uniform intervals .At this time, the epidermal ridges first begin to appear on the volar surfaces. The dermal papillae are developing on the deep surface of the epidermis around the 24th week. Till then, the morphology of primary and secondary ridges appears as a smooth ridge of tissue and thereafter peg like

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structures, the dermal papillae, characteristic of the definitive dermal ridges progressively formed. Therefore, the genetic message present in the genome- "normal or abnormal" is transmitted during this period and is also reflected by dermatoglyphics.2In 1892, Sir Francis Galton classified the basic characteristic pattern of fingerprint. He classified mainly into three types: Arches, loops, and whorls. This was mainly based on the degree of curvature of the ridges. Arches may be simple or tented, loops may be described as radial or ulnar, and whorls may be spirals or double loop.An aim of a study was to find an association between Toe Dermatoglyphic pattern & Dental caries and its correlation to Body Mass Index. The objective was early prevention of dental caries in Pediatric cases, thereby limiting the disease from progressing to an advanced stage and preventing further tooth loss.

II. MATERIALS & METHODS

the study was conducted in the Dept. of Pedodontics & Preventive Dentistry, at the College of Dental Sciences and Research Centre (CDSRC), Ahmedabad, Gujarat in the month of June and July 2017. Consent from parents/guardians was taken before the start of the study. **Study sample**: The study included 85 healthy children in the age range of 11-14 years with no sex differences. Random sampling method was used.

Exclusion criteria:

- 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.

Method of collection of data: Clinical examination of 85 children was done, and DMFT index was recorded. Firstly, Feet were thoroughly cleaned and allowed to dry. After this, right toe was guided by the researcher to the

ink stamp pad and pressed firmly against the A4 size paper. The paper was stabilized on a hard smooth surface board. In this method, impression was recorded 3-4 times, but third recording was satisfactory and readable. These dermatoglyphic patterns (fig.1) were analysed with the help of a magnifying glass (6 xs).



Figure-1: Dermatoglyphic patterns.

Data Analysis: Collected data were studied by coding the variables in Excel format and Chi-Square test was used to compare the association between Dermatoglyphics pattern and caries & its relation to BMI. P-values less than 0.05 were considered statistically significant.

Results: Figure 2 shows overall percentage distribution of dental caries among different right toe patterns in children. Table 1 shows numerical data regarding relation between individual dermatoglyphic patterns to that of dental caries status. 37.3% children had right loop pattern who were at high caries risk followed by Arch with loop(17.6%), Plain arch (15.7%), Plain whorl (15.7%), Arch with whorl (5.9%), Accidental (5.9%) and Tented arch (2%). 41.2% children had right loop pattern who were at low caries risk followed by Arch with loop

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(23.5%), Plain arch (17.6%), Accidental (8.8%), Plain whorl (5.9%) & Arch with whorl (2.9%).

			Right Toe Patterns							Total
			1	2	3	4	5	6	7	
DMFT CODE	1	Count %	19	9	8	3	8	1	3	51
			37.3%	17.6%	15.7%	5.9%	15.7%	2.0%	5.9%	100.0%
	2	Count %	14	8	2	1	6	0	3	34
			41.2%	23.5%	5.9%	2.9%	17.6%	0.0%	8.8%	100.0%
TOTAL		Count %	33	17	10	4	14	1	6	85
			38.8%	20.0%	11.8%	4.7%	16.5%	1.2%	7.1%	100.0%

Table 1:- Distribution of dental caries in the various Right

 toe patterns.



Figure 2:- Overall percentage distribution of various Right toe patterns to Dental caries status.Table 2 summarize relation between body mass index and different dermatoglyphic patterns. 43.5% children had Right loop pattern who were underweight followed by Arch with loop (17.7%), Plain arch (17.7%), Plain whorl (9.7%), Arch with whorl (4.8%), Accidental (4.8%) & Tented arch (1.6%).26.1% children had Right loop & Arch with loop respectively who had normal body mass index followed by Plain whorl (17.4%), Plain arch (13%), Accidental (13%) & Arch with whorl (4.3%).

			Right Toe Patterns							Total
			1	2	3	4	5	6	7	
BMI	1	Count %	27	11	6	3	11	1	3	62
			43.5%	17.7%	9.7%	4.8%	17.7%	1.6%	4.8%	100.0%
	2	Count %	6	6	4	1	3	0	3	23
			26.1%	26.1%	17.4%	4.3%	13.0%	0.0%	13.0%	100.0%
TOTAL		Count %	33	17	10	4	14	1	6	85
			38.8%	20.0%	11.8%	4.7%	16.5%	1.2%	7.1%	100.0%

 Table 2:- Percentage distribution of Body mass index in various Right toe patterns.

Figure 3 shows graphical distribution of various dermatoglyphic patterns in children with normal BMI & underweight children.



Figure 3:- Distribution of various Right toe patterns presented in normal & underweight children.

Figure 4 & Table 3 shows relation between dental caries status and body mass index of children. 62.9% children presented with higher DMFT who had low BMI, while 37.1% children presented with lower DMFT who had low BMI.

52.2% children presented with higher DMFT who had normal BMI, while 47.8% children presented with lower DMFT who had normal BMI.(Table 3).

			DMFT Coo	Total	
			1	2	
BMI	1	Count %	39	23	62
			62.9%	37.1%	100.0%
	2	Count %	12	11	23
			52.2%	47.8%	100.0%
TOTAL		Count %	51	34	85
			60.0%	40.0%	100.0%

Table 3:- Relation between Dental Caries status & BodyMass Index.



Figure 4:- No. of patients presented with high & low DMFT score in normal and underweight children.

Discussion

Fingers, palm, and sole impressions are expressions of the environmental changes taking place and are inherited in nature. It has been proved scientifically that no two individuals, even monozygotic twins contain the same finger prints and thus make them a unique characteristic of every individual. Once formed, they remain constant and do not alter in the lifetime due to disease process, aging, or any other reason.³

In ancient India, ridge pattern study was called "Samudra Shastra" 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 1880.⁴

In the present study, DMFT Score had *p-value* 0.752 (>0.05) which shows that there was no statistical difference between DMFT & Right Toe patterns. The number of loops was found to be more in cases having a higher DMFT score. A proportional increase in the number of loop was seen with an increase in DMFT.

The results are in similar to the studies conducted by Navit *et al.*⁵ and Sharma and Somani,⁶ 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.*, there is a significant association of the dermal ridge patterns and caries-free children rather than caries-active children.⁵

The results of the study are contrast to studies done by Bhat *et al.*⁷ and Anitha *et al.*⁸ It is also in line with the studies done by Atasu⁹ and Sharma and Somani,⁶ in which the caries-free persons had more loops and the patients with dental caries had an increased frequency of whorls.

In our study, Body Mass Index (BMI) Score had a p-value of 0.55 (>0.05), which shows that there was no statistical significance present between BMI & Right Toe patterns.

Creske *et al.*¹⁰ examined the association between body mass index and caries in children and came up with results that overweight children showed higher DMFT, which is similar with the study done by Werner *et al.*¹¹. Edalat *et al.*¹² concluded that there was no linear correlation between severe early childhood caries and BMI, Height & weight deficiency, whereas Hilgers *et al.* investigated BMI & dental caries and concluded that elevated BMI is associated with an increased incidence of permanent molar inter-proximal caries., which is similar with the study done by Bhoomika *et al.*¹³.

Conclusion

Specific Toe print patterns may be used as a potential non-invasive anatomical tool for mass screening of dental caries and malocclusion and for guiding future research.

However, though dental caries based on dermatoglyphics can be predicted with a fair degree of accuracy, it cannot be relied upon as the sole factor. This is due to the fact that numerous other factors such as ethnic and racial variations, congenital, environmental and other local factors can also influence the development of caries. Extensive studies of toe pattern has to be undertaken with several groups according to their racial and ethnic backgrounds.¹

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