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Association Between Palmar Dermatoglyphic Pattern And Dental Caries Among 12 Year Old School Going Children In Chennai City – A Cross Sectional Study.

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Abstract

Introduction: The basis of considering Dermatoglyphic patterns as genetic marker for dental caries is that the epithelium of finger buds as well as enamel has ectodermic origin, and both develop at almost the same time of intrauterine life.

Aim: To find the association between palmer Dermatoglyphic pattern and dental caries among 12 year old school going children in Chennai city.

Materials and Method: A convenient sample of200, 12 year old school going children from two schools in Chennai city were included in the study. The data collection comprised of clinical examination of dental caries using DMFT index, 1938and recording the palmer Dermatoglyphic patterns of the children as proposed by Cummins and Midlo.

Results: The median number of loops and whorls for subjects with very low caries experience differed significantly when compared to subjects having low, moderate and high caries experience. There was no difference in the median number of arch patterns between subjects with varying level of dental caries

Conclusion: Subjects with very low dental caries had the least number of whorls and highest number of loops as their Dermatoglyphic patterns when compared to subjects with low, moderate and high dental caries.

Keywords: Dermatoglyphics, Dental caries, risk prediction, school children

Introduction

The word Dermatoglyphic was derived from two Greek words ‘derma’ meaning skin and ‘glyphe’ meaning carve. Dermatoglyphics, as coined by Cummins and Midlo, refers to study of the intricate dermal ridge configurations on the skin covering the palmer and plantar surfaces of hand and feet. It is an established scientific fact that no two individuals have the same fingerprints and other details of dermal ridges.[1] Thus, fingerprints are unique to each person. Dermatoglyphics has been a useful tool in understanding basic questions in biology, medicine, genetics and evolution, in addition to being the best and most widely used method for personal identification[2]. The basis of identification is in accordance to that no two patterns are same. Recently, recognition of fingerprints among patients with periodontitis, dental caries and

congenital anomalies like cleft lip and palate has drawn attention to the field of dental dermatoglyphics[3]. The basis of considering dermatoglyphic patterns as genetic marker for dental caries is that the primary palate develops during 6 – 13th week of intra uterine life. Also, Epithelium of finger buds as well as enamel has ectodermal origin, and both develop at the same time of intrauterine life. The development of dermal ridges starts from 12th-13th week of gestation and by around 20th week, well differentiated recognizable dermal ridges are formed[4.] As genetic or chromosomal abnormalities might be reflected as alterations in dermal ridges, they can be used as an easily accessible tool in the study of genetically influenced oral health diseases.

There are sparse studies to assess for the presence of any association between Dermatoglyphic pattern of school children in India and their dental caries experience. Hence, the aim of the present study was to assess the association between Dermatoglyphic patterns and dental caries among 12 year old school going children in Chennai city.

Materials and Methods

A cross sectional descriptive study which comprised of a convenient sample of 200, 12 year old school going children from two schools were selected in Chennai city. Ethical clearance to conduct the study was obtained from the institutional review board of Ragas Dental College and Hospital, Chennai and permission to collect data among school children was obtained from the Principals of the selected schools. 12 year old school going children whose parents gave consent for study was included. Children with special health care needs, genetic disorder, systemic illness, trauma or scratch injury in palmer surface were excluded. The data collection comprised of clinical examination of dental caries using DMFT index, as proposed by Klein Knutson and Palmer 1938 and palmer dermatoglypic interpretation as proposed by Cummins and Midlo5.

Dermatoglyphic pattern recording

Dermatoglyphic patterns of all 10 palmar digits were recorded using Cummins and Midlo method. The armamentarium used was A4 size plain paper, cotton, stamp pad, sterlium, 2x magnifying lens.

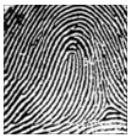
Recording of fingerprints

Children palms were scrubbed thoroughly with an antiseptic solution and blot dried. This was done to enhance the quality of the Dermatoglyphic prints, by removing sweat, oil or dirt from the skin surface. The student's finger in the right hand was pressed in the ink pad followed by pressing it firmly against the A4 size paper 2-3 times; since the second or third recording was satisfactory and readable. The same procedure was repeated for the left hand. In this way, a total of 2000 Dermatoglyphic patterns were obtained. The Dermatoglyphics patterns were then analyzed to determine whorls, loops and arch pattern using 2x magnification lens as proposed by Sir Francis Galton in 1892.

Loop: A loop was recognized 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. Fig1

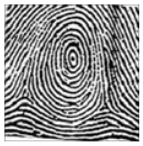
Whorl: A whorl differs from the loop in the aspect of concentric arrangement of ridges.Fig2

Arches: Arches are formed by the succession of one or more parallel ridges which cross the finger from one side to the other without recurving. Fig 3



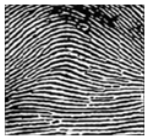
LOOPS

Fig 1



WHORL

Fig 2



ARCH

Fig 3

Statistics

The data recorded was entered in a Microsoft excel sheet and statistical analysis was done using SPSS Version 19(IBM,US). Kolmogrov Smirnov test showed that the data was non-normality distributed and hence non-parametric test of significance was used (p value < 0.05). The number of loops, whorls and arches between subjects with increasing levels of dental caries were compared using Kruskall Wallis ANOVA followed by Mann Whitney test as post hoc test for pair wise comparison. Bonferroni correction was applied by dividing conventional p value by the number of comparisons, after which 0.008 was fixed as significance level for the post hoc tests. Statistical analyses were performed by SPSS version 19 (IBM, US).

Results

The median number of loops for subjects with very low caries experience was 6 whereas for those having low, moderate and high caries experience was 5 and this difference was statistically significant (H value – 13.24; p value – 0.004).The median number of whorl pattern for subjects with very low caries experience was 3 whereas for those having moderate and high caries experience was 4 and this difference was statistically significant (H value – 14.54; p value – 0.002). There was no difference in the median number of arch patterns between subjects with varying level of dental caries (Table 1).

Post hoc analysis showed that the difference between the median number of loops and whorls between subjects with very low and low caries experience alone was statistically significant (Table 2 and 3).

Discussion

Dermatoglyphics is considered as a window of congenital abnormalities and is a sensitive indicator of intrauterine anomalies. The dermatoglyphic patterns have been used as an oral health marker, which can determine the genetic predisposition of children to dental caries. The children and their parents are observed to show similar pattern of occurrence of dental caries. This can be attributed to the genetic inheritance of salivary pH, enzymes, salivary flow and tooth morphology.[6]

Dermal ridges originate from fetal volar pads composed of mesenchymal tissue starting at the sixth to seventh week of development. The size and position of the volar pads are largely responsible for ridge patterns observed. In general, small pads produce arches and larger pads produce loops or whorls. Lateral displacement of the volar pad creates asymmetry of the pattern.[10]

It has been postulated by Schaumann and Alter, 1976 that ridges are influenced by blood vessel-nerve pairs at the border between the dermis and epidermis during prenatal development. Features such as inadequate oxygen supply, abnormal nerve growth, unusual patterning or distribution of sweat glands, alterations of epithelial growth, or other features could influence ridge patterns[7]. Because growth is a dynamic process, one in which many components contribute and can mutually interact, there must be many genes involved. The epidermal ridges of the fingers and palms as well as the facial structures like the lip, alveolus, teeth and palate are formed from the same embryonic tissues (ectoderm) during the same embryonic period 6-9 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.[9] Thus, the genetic and environmental factors which are responsible for causing dental caries may also cause peculiarities in the dermatoglyphic patterns, mal occlusion and cleft lip and palate.

Tikare et al in 2012 conducted study to assess the relationship between fingerprints and malocclusion among a group of high school children aged 12-16 years in Dharwad, Karnataka, India. The study showed no overall

association between fingerprint patterns and malocclusion[11].A study by Mathew et al in 2005,on comparison of the fingerprint patterns on the distal phalanges of the ten fingers of the fifty oral cleft children with that of fifty normal children, it was observed that the oral cleft individuals had an increased frequency of ulnar loops (310) as the ridge configuration as compared to the normal children who had a higher frequency of whorl patterns (208) which was found to be very highly significant . On comparison of dermatoglyphic patterns of arches, loops and whorls at the interdigital areas, no significant differences were seen between the oral cleft and normal children.[1]

In the present study 200 children with a total number of 2000 valid finger prints were examined. The results of the present study showed that loop type was found to be most prevalent among study population followed by whorls and the arch type was found to be least prevalent pattern which was similar to the study by Mathew et al.

A study by Abilash et al 2012 stated that the dental caries susceptibility of an individual increased with precidence of whorl pattern and it decreased with incidence of loop pattern[12]. Our study results show that overall caries prevalence was found more in whorl type compared to other types of dermatoglyphics patterns. Though our study results were in line with that of Abilash et al, an association between the dermatoglyphic pattern and higher levels of caries was not demonstrated in the present study. Due to the heterogeneity of results among various dermatoglyphic patterns, a steady or definite conclusion could not be arrived to state that caries prevalence increases with any particular type of dermatoglyphic pattern.

Conclusions

Less time and cost requirements make dermatoglyphics an easy alternative for genetic risk predictor than much preferred but expensive DNA testing. Dermatoglyphic studies are noninvasive investigations which have good patient compliance. Though dermatoglyphics is still an inexact science, it has been proven to be effective in predicting certain genetic disorders. Dental caries, being a multifactorial disease with the influence of genetic pattern, early prediction for high risk children can help in using effective caries preventive measures. Hence, further studies are warranted to include dermatoglyphics in risk prediction models for dental caries.

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Table 1: Comparison of Dermatoglyphic patterns among subjects with different levels of caries experience

Caries Status	Loops Median (IQR)	Whorls Median (IQR)	Arches Median (IQR)
Very Low(<1.2)	6(3.75)	3(4.75)	1(2)
Low (1.2 – 2.6)	5(4)	5(3)	1(2)
Moderate (2.7-4.4)	5(4)	4(3)	1(2)
High (>4.4)	5(4)	4(3)	1(1)
H Value	13.24	14.54	4.26
P Value	0.004	0.002	0.23

Table 2: Post-hoc analysis for pair wise comparison of Loops

Caries Level	Low	Moderate	High
Very low	0.001	0.05	0.24
Low		0.33	0.12
Moderate			0.58

Table 3: Post-hoc analysis for pair wise comparison of Whorls

Caries Level	Low	Moderate	High
Very low	0.002	0.01	0.07
Low		0.41	0.21
Moderate			0.51