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ASSOCIATION OF DERMATOGLYPHIC PATTERNS WITH DMFT SCORE AMONG THE INDIAN ADULT POPULATION: A CROSS SECTIONAL STUDY.

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ABSTRACT**INTRODUCTION:**

Dermatoglyphics is a branch of genetics that involves the study of ridge patterns in the skin.

The skin ridge system and teeth develop from the same embryonic layer during embryogenesis usually around the sixth week. The details of these ridges are permanent. Correlation between dermatoglyphics and dental caries is rationalized due to its similarity to the environment and genetic factors. This cross-sectional study was executed to interpret the association of thumbprint patterns and dental caries.

AIM:

This study aims to evaluate the association of dermatoglyphics as a genetic predictor of the susceptibility of participants to acquire dental caries using Decayed, Missing and Filled Permanent Scores.

MATERIALS AND METHOD:

The thumbprint pattern of the right hand was recorded for assessment using the Ink Method. The thumb was rolled on the ink pad and the side of the finger bulb was placed upon an A4 size white sheet paper and rolled to the other side until it faced the opposite direction. For each subject, the DMFT index was calculated according to the number of decayed, missing, and filled permanent teeth using no.23 explorer.

RESULTS:

Results showed loop pattern had highest DMFT score followed by whorl pattern and arch pattern.

STATISTICAL ANALYSIS: The data was analysed using IBM SPSS version 21 (SPSS version 21.0; IBM corporation, Armonk, NY, USA) statistical software. Statistical significance was set at 0.05 levels. Test of normality distribution was found to be $p\text{-value} < 0.05$. Intergroup comparison was analysed using F-ANOVA test. The intragroup comparison was analysed using Chi-square test.

CONCLUSION: It can be concluded from this study that specific fingerprint patterns may be used as a potentially noninvasive anatomical tool which could be used for screening for dental caries and for guiding future research.

Keywords: Dental caries, Dermatoglyphics, Forensic dentistry, DMFT

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INTRODUCTION:

The study of dermatoglyphics has been a cornerstone in forensic identification. Dermatoglyphics is a branch of genetics that involves the study of ridge patterns in the skin(1). The ridge formations of the skin of an individual begin to appear during 3rd and 4th month of fetal development. After death, decomposition of the skin ridge patterns occurs gradually, with the dermatoglyphic configurations maintaining their details unchanged. The correlation of dermatoglyphic patterns to dental caries is rationalized due to the parallels of environmental and genetic factors between teeth and skin during their development (2). The skin ridge system and teeth develop from the same embryonic layer known as the ectoderm during embryogenesis usually around the sixth week. Consequently, any disruptions in tooth development and structure during this critical period will be mirrored in alterations in

dermatoglyphic patterns (3).

Extensive studies have been conducted and significant investigations have been carried out into the dermatoglyphic indicators of certain ailments such as congenital heart disease, leukemia, cancer, celiac disease, intestinal disorders, rubella, schizophrenia as well as other forms of mental illness(4). Sharma et al. and Kharbanda et al. have identified correlations between dermatoglyphics and cases of mandibular prognathism and retrognathism (5,6). Several studies have further elucidated connections between dermatoglyphic patterns and various illnesses, including Down syndrome, Alzheimer's disease, and multiple sclerosis (7,8), as well as congenital defects such as cleft lip and cleft palate (9). Additionally, associations have been observed with periodontal diseases, bruxism, malocclusion, and oral submucous fibrosis (10–12).

Dermatoglyphics offers at least two major advantages as an aid in the diagnosis of medical disorders. 1) The epidermal ridge patterns on the hand and soles are fully developed at birth and thereafter, remain unchanged for life. 2) Scanning of the ridge patterns or recording these permanent impressions can be accomplished rapidly, inexpensively, and without any trauma to the patients(13).

Previous studies by Singh et al in 2020(14), Dawasaz AA et al in 2021(15) and Uma E et al in 2021(16) have shown correlation between dermatoglyphics and dental caries in children. Tegginmani Veeresh et al in 2019 conducted a similar study in adult population aged between 18 to 25(17). There is no previous study conducted among Indian adult population on literature exploration.

AIM

The aim of this study was to evaluate the association of dermatoglyphics as a genetic predictor of the susceptibility of participants to acquire dental caries using Decayed, Missing and Filled Permanent (DMFT) Scores.

METHODOLOGY:

The study was conducted in the Tagore Dental College and Hospital which comprised a total number of 184 cases. Data was collected from subjects aged between 25 and 50 years. Individuals with special health care needs (e.g. cleft lip and palate syndromes, medically and physically challenged), a history of maxillofacial trauma/pathology/developmental defects, and previous orthodontic treatment of any kind

were excluded from the study. A4 size plain paper, cotton, stamp pad, soap, gloves, magnifying lens, scale, protractor, micro tip pencil and eraser, oil, and case sheets were used as armamentarium.

Method of Recording of Thumbprints:

The thumbprint pattern of the thumb of both hands was recorded for assessment. The most common method used to record dermatoglyphic prints is the 'Ink Method', first described by Cummins and Midlo (1943). The hands of the study subjects were cleaned using an antiseptic solution and allowed to dry. The thumb was rolled on the ink pad (Kokuyo Camlin private limited) and the side of the finger bulb was placed upon an A4 size white sheet of paper and rolled to the other side until it faced the opposite direction. Pattern evaluation involves analyzing various fingerprint patterns in accordance with established classification standards. Fingerprints obtained were inspected by magnifying glass for the study of different dermatoglyphic parameters.

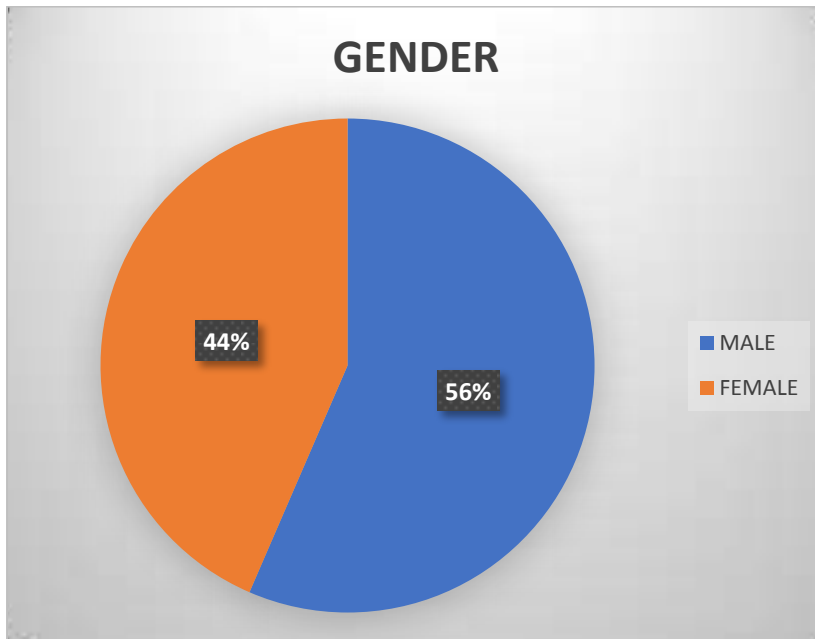
Recording of Decayed, Missing and Filled Permanent (DMFT) Index Score:

The DMFT Index described by Henry T. Klein, Carroll E. Palmer, and Knutson I.W is based on the fact that the dental hard tissues are not self-healing and establishes that caries leaves a scar of some sort(18). The DMFT Index is therefore irreversible, measuring the lifetime caries experience. For each subject, the DMFT index was calculated according to the number of. decayed (D), missing (M), and filled (F) permanent teeth. The DMFT Score was hence interpreted as the total of each component, i.e. D, M, & F separately, then, total $D+M+F = DMFT$ Score using mouth mirror and No.23 explorer (Hu-Friedy Medical Instrument Co. Ltd).

The data was analysed using IBM SPSS version 21 (SPSS version 21.0; IBM corporation, Armonk, NY, USA) statistical software. Statistical significance was set at 0.05 levels. Test of normality distribution was found to be $p\text{-value} < 0.05$. Intergroup comparison was analysed using F-ANOVA test. Intragroup comparison was analysed using Chi-square test.

RESULTS:

GRAPH 1: Distribution of study participants based on gender.



GRAPH 2: Distribution of study participants based on fingerprint pattern.

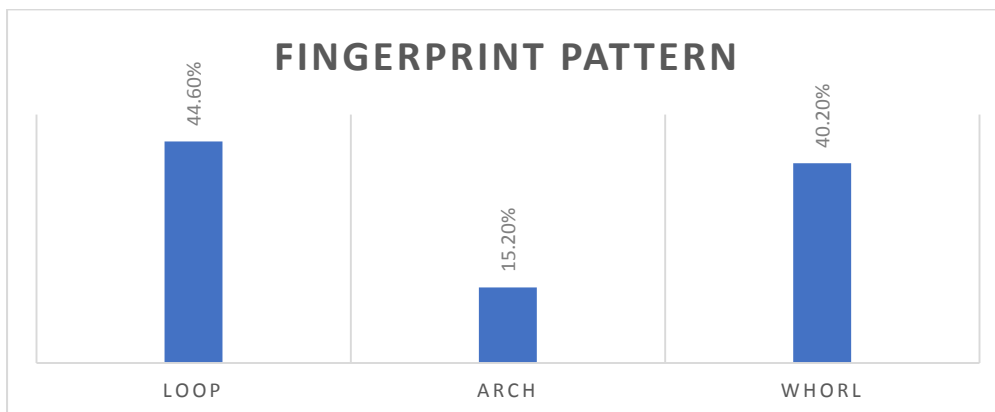


TABLE 1: Association between fingerprint pattern and gender.

GENDER	FINGERPRINT PATTERN			X2	P
	LOOP	ARCH	WHORL		
MALE	46	17	41	0.244	0.8
FEMALE	36	11	33		
TOTAL	82	28	74		

X2 Chi square test $p < 0.05$ is statistically significant

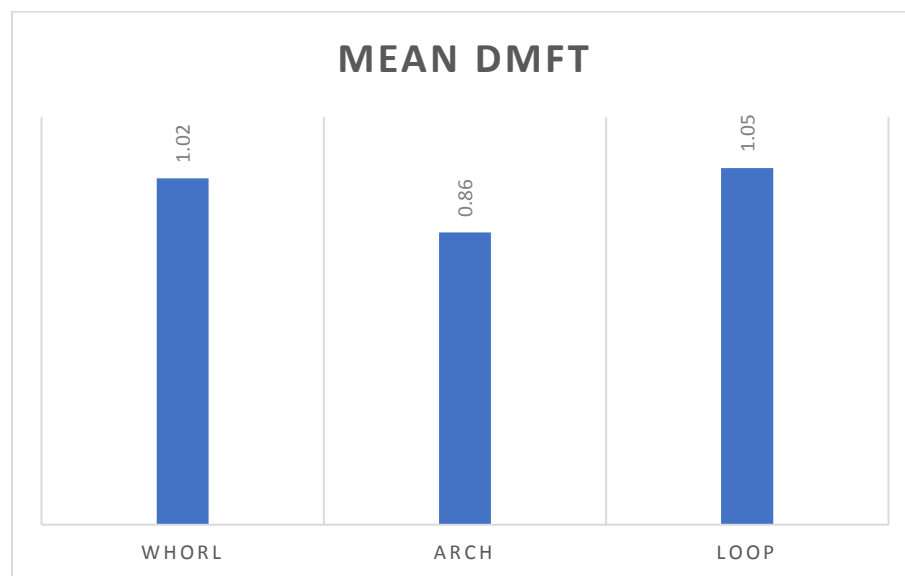
From Table 1, it is seen that the loop pattern was recorded highest of 46 in males and 36 in females. The whorl pattern recorded in males had the second largest score of 41. Arc pattern

was the lowest pattern seen among both males and females.

TABLE 2: Association between fingerprint pattern and DMFT.

FINGERPRINT PATTERN	Mean DMFT	SD	F	P
WHORL	1.02	1.065	0.270	0.76
ARCH	0.86	1.113		
LOOP	1.05	1.423		

F- ANOVA test $p < 0.05$ is statistically significant



Graph 3: Association between fingerprint pattern and DMFT.

Graph 3 illustrates loop pattern had the highest DMFT score followed by whorl pattern and arch pattern.

DISCUSSION:

Dental caries is one of the most widespread chronic diseases globally, with individuals being susceptible to tooth decay throughout their lives. The multifactorial etiology is the cause for its demineralising action on the dental hard tissues such as interaction of fermentable carbohydrates and acid producing organisms, environmental factors, such as diet, quality of dental hygiene, fluoride exposure (19,20). The genetic factors that influence dental caries are enamel structure, eruption, morphology of teeth, salivary composition, flow, and immune response(14).

According to Walker NF in 1957 proposed that genetic abnormalities disrupt the

structural integrity of teeth and their supporting tissues during formation, thereby enhancing susceptibility to dental caries(21).

Our study included individuals aged 18-25 with fair to good oral hygiene, aiming to eliminate potential environmental influences and emphasize the genetic component for evaluation.

The diagnostic value of dermatoglyphic patterns in chromosomal and genetic disorders was first suggested by Jan Purkinjie who proposed that these patterns hold both genetic and diagnostic significance (22).The dermal patterns are unique and are based on the genetic characteristics of each individual.These patterns remain constant throughout life(23). Metin Atasu (1992) was the first to conduct a study on patterns in a group comprising 24 patients to analyze the dermatoglyphic patterns in dental caries (24). From the results of this study we can conclude that the dermatoglyphic patterns varied significantly among the patients with dental caries and healthy individuals. This study results were similar to other studies like Cummins et al (25) on Down's syndrome and Bierman et al (26) on breast cancer, who noted significant variations in the whorl and loop patterns.

The findings of our study corroborate with the results of Akyuz which concluded that loop patterns were seen most in individuals with high DMFT (27). The results of this study are in accordance to the results obtained in the study done by Madhussudan et al.(28) and Agravat et al.(29) wherein the prevalence of dental caries was highest among students with loop pattern compared to other finger patterns.Tegginmani V. et al. in 2019 conducted a dermatoglyphic study correlating dental caries and salivary pH which concluded that whorl pattern is more recorded among caries-affected individuals(17) which are in contrast to the results of this study.

The abnormalities in tooth structures, such as alterations in dental enamel, tooth eruption, and development, may manifest in dermatoglyphics, specifically in whorl and loop patterns, indicating susceptibility to dental caries(14). Thus, dermatoglyphics could serve as an indicator to assess an individual's susceptibility to dental caries.

The use of stamp pad ink for recording fingerprints presents certain drawbacks. The quality of the imprint is influenced by the pressure applied during palm recording. Thus, caution is necessary to ensure the application of an adequate amount of ink material during printing. Insufficient or excessive application results in faint or excessively dark prints, respectively(3).However, this method is preferred due to its cost effectiveness and less technique sensitivity.

Further extensive research and studies in this field have to be done in order to determine, ascertain and to evaluate the significance of these variations in the dermatoglyphic features of patients with dental caries.

CONCLUSION

It can be concluded from this study that specific fingerprint patterns may be used as a potentially noninvasive anatomical tool which could be used for screening for dental caries and for guiding future research.

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