ORIGINAL RESEARCH PAPER
Volume - 14 | Issue - 09 | September - 2025 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

DECODING DENTAL PREDICTABILITY: LINKING DERMATOGLYPHICS AND MOLAR ALIGNMENT IN DECIDUOUS DENTITION: A CROSS – SECTIONAL STUDY

Pedodontics

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ABSTRACT

Aim : To assess various dermatoglyphic patterns and primary second molar relationships in children aged 3-6 years. **Methods :** A cross-sectional study was conducted in 300 children whose age is between 3-6 years, by using stamp pad ink method. Dermatoglyphic patterns in right and left thumb, index finger, middle finger, ring finger and little finger were recorded by taking impressions. The deciduous second molar relationship will be evaluated by clinical assessment. The dermatoglyphic patterns such as loop pattern, whorl pattern and arch pattern will be compared with deciduous second molar relationship such as flush terminal plane, mesial step and distal step. **Results :** No significant association was found between dermatoglyphics and molar relationship in deciduous dentition. **Conclusion :** By understanding the relation between dermatoglyphics and molar relation, we can improve early diagnostic and predictive practices in pediatric dentistry, ultimately leading to better health outcomes for children.

KEYWORDS

Dermatoglyphics; Primary Molar Relationships; Pediatric Dentistry.

INTRODUCTION:

Human skin is the largest organ, covering all body parts and performing various functions. Human skin exhibits topographical differences. Skin on the palms and plantar surface is different from other areas. Palmar and plantar surfaces have rugged lines, which show elevations and depressions, which serve as friction lines. These friction lines are formed when the foetus is developing and is in its third month and completed by the sixth month of gestation. The scientific study of elevations (ridges) and depressions (furrows) is called dermatoglyphics.[1] The term comes from two Greek words derma meaning skin; glyphe meaning carve. The ridge patterns on the skin are unique for an individual and serve as a permanent record of embryonic development. These dermatoglyphic patterns can be associated with certain medical conditions, emphasizing on their diagnostic value in predicting genetic disorders.[2,3]

The position and occlusion of primary molars are key indicators of normal dental development and are used to predict malocclusions in permanent teeth. Proper alignment of the primary molars is essential for guiding the eruption of permanent teeth, thus playing a crucial role in maintaining overall dental health. Deviations from normal can indicate potential dental issues that may require early orthodontic intervention.

Researches have shown significant associations between certain dermatoglyphic traits and the prevalence of dental issues but studies specifically comparing these patterns with molar relationship in primary dentition are limited.[3,4] Additionally, dermatoglyphics seem to have potential as a non invasive diagnostic method for predicting the presence or absence of an impacted tooth.[5] The rationale for investigating the correlation between dermatoglyphic patterns and primary molar relationships in deciduous dentition lies in the shared genetic and developmental origins of these traits. Hereditary and prenatal environmental factors leading to malocclusion may also influence these dermal patterns. These predictions could lead to improved diagnostic tools and preventive measures in pediatric dentistry. Hence, this study aims to investigate the potential correlations between different dermatoglyphic patterns and terminal planes of primary dentition. The null hypothesis states that there is no correlation between dermatoglyphic patterns and terminal planes of primary dentition.

METHODS:

Study Design:

This is a cross-sectional study to investigate the correlation between dermatoglyphic patterns and primary molar relationships in a sample of 300 children aged between three to six years. Study was conducted in the Department of Pediatric and Preventive Dentistry. Ethical clearance was obtained from Institutional Review Board. The purpose and procedure of the study was explained to the participants and parents and informed consent was taken from parents or guardians of all participants. Children aged 3-6 years with proper intercuspation of primary second molars were included in the study. Children with multi-surface carious lesions with no proper intercuspation of molars, deciduous second molars with pre-shedding mobility, different molar relationships on either side of the same subject were excluded from the study.

Primary Molar Relationship Assessment: Children were taught to bite in centric occlusion and molar relationships were assessed based on the classification given by Baume (1950) as mesial step, distal step and flush terminal plane. The assessment was done using a mouth mirror and recorded in the proforma. The dental examination involved using a mouth mirror, explorer and dental probe to evaluate the alignment of deciduous second molar relationship (Figure 1,2,3).

Figure1 : Flush terminal plane

Figure 2 : Mesial step

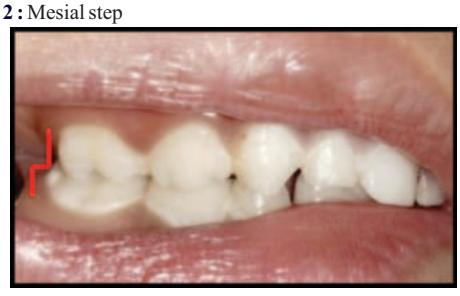

Figure 3 : Distal step

Recording Dermatoglyphic Patterns: By using stamp pad ink method, dermatoglyphic patterns in right and left thumb, index finger, middle finger, ring finger and little finger were recorded by taking impression. All participants were asked to clean their hands with soap and water, and then wiped with hand antiseptic to remove dirt or sebaceous secretions on the palms. The bulb of each distal phalange of the digits in both hands were placed at right angles to the stamp pad and were rolled over from one side of the nail to the other. Children were asked to transfer the finger print to blank white sheet by rolling in the same manner with minimal pressure to obtain complete ridge patterns. Each print was evaluated for clarity and if any smudging were present, the print was repeated once again. The prints were allowed to dry before proceeding with further assessment.

Assessment Of Dermatoglyphic Patterns : Magnifying lens was used for clear visualization and identification of finger prints pattern. Dermatoglyphic patterns were classified into loops, whorls and arch (Figure 4,5,6).

Figure 4 : Arch Pattern

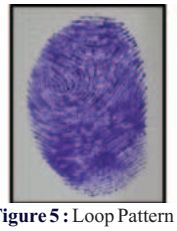

Figure 5 : Loop Pattern

Figure 6 : Whorl Pattern

Statistical Analysis : The data values were tabulated and subjected to statistical analysis. Statistical analysis was conducted using SPSS version 20.0 (IBM Corp., Armonk, NY). Chi-square test was employed to analyze the relationships between dermatoglyphic patterns and molar relationships.

RESULTS:

Overall, the results indicate no significant correlation between dermatoglyphics and molar relationship in deciduous dentition (Table 1). The flush terminal plane was the most prevalent molar relationship and loop was the most common dermatoglyphic pattern across all age group (Table 2,3). Among males and females, loops were the most common pattern and flush terminal plane was significantly seen in increased numbers across all fingers (Table 4,5).

Table 1: Dermatoglyphic Distribution Among The Study Participants

VARIABLES		ARCH		LOOP		WHORL		P-VALUE
		N	%	N	%	N	%	
RIGHT THUMB	FLUSH	39	13	133	44.3	68	22.7	0.829
	MESIAL	13	4.3	29	9.7	11	3.7	
	DISTAL	1	0.3	4	1.3	2	0.7	
RIGHT INDEX	FLUSH	54	18	131	43.7	55	18.3	0.531
	MESIAL	11	3.7	31	10.3	11	3.7	
	DISTAL	0	0	6	2	1	0.3	
RIGHT MIDDLE	FLUSH	62	20.7	140	46.7	38	12.7	0.395
	MESIAL	11	3.7	30	10	12	4	
	DISTAL	1	0.3	6	2	0	0	
RIGHT RING	FLUSH	58	19.3	117	39	65	21.7	0.775
	MESIAL	10	3.3	29	9.7	14	4.7	
	DISTAL	1	0.3	3	1	3	1	
RIGHT LITTLE	FLUSH	54	18	143	47.7	43	14.3	0.230
	MESIAL	18	6	28	9.3	7	2.3	
	DISTAL	1	0.3	6	2	0	0	
LEFT THUMB	FLUSH	70	23.3	124	41.3	46	15.3	0.063
	MESIAL	8	2.7	33	11	12	4	
	DISTAL	4	1.3	1	0.3	2	0.7	
LEFT INDEX	FLUSH	69	23	129	43	42	14	0.132
	MESIAL	13	4.3	24	8	16	5.3	
	DISTAL	0	0	5	1.7	2	0.7	
LEFT MIDDLE	FLUSH	67	22.3	152	50.7	21	7	0.064
	MESIAL	15	5	28	9.3	10	3.3	
	DISTAL	0	0	5	1.7	2	0.7	
LEFT RING	FLUSH	56	18.7	141	47	43	14.3	0.589
	MESIAL	14	4.7	30	10	9	3	
	DISTAL	0	0	6	2	1	0.3	
LEFT LITTLE	FLUSH	58	19.3	153	51	29	9.7	0.308
	MESIAL	8	2.7	35	11.7	10	3.3	
	DISTAL	1	0.3	6	2	0	0	

Table 2 : Association Between Age And Dermatoglyphics Among Study Participants

VARIABLES		3YEARS		4YEARS		5YEARS		6YEARS		P-VALUE
		N	%	N	%	N	%	N	%	
RIGHT THUMB	ARCH	25	8.3	20	6.7	6	2	1	0.3	0.282
	LOOP	79	26.3	61	20.3	21	7	5	1.7	
	WHORL	33	11	33	11	16	5.3	0	0	
RIGHT INDEX	ARCH	29	9.7	24	8	10	3.3	2	0.7	0.215
	LOOP	76	25.3	70	23.3	18	6	4	1.3	
	WHORL	32	10.7	20	6.7	15	5	0	0	
RIGHT MIDDLE	ARCH	30	10	28	9.3	13	4.3	2	0.7	0.786
	LOOP	81	27	69	23	24	8	4	1.3	
	WHORL	26	8.7	17	5.7	6	2	0	0	
RIGHT RING	ARCH	23	7.7	36	12	9	3	1	0.3	0.023
	LOOP	68	22.7	58	19.3	18	6	4	1.3	
	WHORL	46	15.3	20	6.7	16	5.3	1	0.3	
RIGHT LITTLE	ARCH	31	10.3	28	9.3	11	3.7	2	0.7	0.825
	LOOP	85	28.3	63	21	25	8.3	4	1.3	
	WHORL	21	7	23	7.7	7	2.3	0	0	
LEFT THUMB	ARCH	35	11.7	36	12	12	4	0	0	0.699
	LOOP	73	24.3	58	19.3	23	7.7	4	1.3	
	WHORL	29	9.7	20	6.7	8	2.7	2	0.7	
LEFT INDEX	ARCH	39	13	33	11	7	2.3	3	1	0.472
	LOOP	72	24	57	19	25	8.3	3	1	
	WHORL	26	8.7	24	8	11	3.7	0	0	
LEFT MIDDLE	ARCH	41	13.7	29	9.7	9	3	3	1	0.650
	LOOP	80	26.7	70	23.3	30	10	3	1	
	WHORL	16	5.3	15	5	4	1.3	0	0	
LEFT RING	ARCH	42	14	21	7	7	2.3	1	0.3	0.174
	LOOP	71	23.7	73	24.3	27	9	5	1.7	
	WHORL	24	8	20	6.7	9	3	0	0	
LEFT LITTLE	ARCH	36	12	27	9	4	1.3	1	0.3	0.305
	LOOP	85	28.3	70	23.3	32	10.7	5	1.7	
	WHORL	16	5.3	17	5.7	7	2.3	0	0	

Table 3 : Association Between Age And Molar Relation Among Study Participants

VARIABLES	3YEARS		4YEARS		5YEARS		6YEARS		P-VALUE
	N	%	N	%	N	%	N	%	
FLUSH	109	36.3	93	31	34	11.3	3	1	0.401
MESIAL	26	8.7	18	6	7	2.3	3	1	
DISTAL	2	0.7	3	1	2	0.7	0	0	

Table 4 : Association Between Gender And Dermatoglyphics Among Study Participants

VARIABLES	MALE		FEMALE		P-VALUE
	N	%	N	%	

RIGHT THUMB	ARCH	23	7.7	29	9.7	0.914
	LOOP	81	27	86	28.7	
	WHORL	37	12.3	44	14.7	
RIGHT INDEX	ARCH	29	9.7	36	12	0.374
	LOOP	82	27.3	86	28.7	
	WHORL	30	10	37	12.3	
RIGHT MIDDLE	ARCH	30	10	43	14.3	0.742
	LOOP	87	29	91	30.3	
	WHORL	24	8	25	8.3	
RIGHT RING	ARCH	35	11.7	34	11.3	0.097
	LOOP	59	19.7	89	29.7	
	WHORL	47	15.7	36	12	
RIGHT LITTLE	ARCH	29	9.7	43	14.3	0.230
	LOOP	84	28	93	31	
	WHORL	28	9.3	23	7.7	
LEFT THUMB	ARCH	40	13.3	43	14.3	0.828
	LOOP	76	25.3	82	27.3	
	WHORL	25	8.3	34	11.3	
LEFT INDEX	ARCH	37	12.3	45	15	0.434
	LOOP	78	26	79	26.3	
	WHORL	26	8.7	35	11.7	
LEFT MIDDLE	ARCH	30	10	52	17.3	0.086
	LOOP	94	31.3	89	29.7	
	WHORL	17	5.7	18	6	
LEFT RING	ARCH	28	9.3	43	14.3	0.584
	LOOP	86	28.7	90	30	
	WHORL	27	9	26	8.7	
LEFT LITTLE	ARCH	29	9.7	39	13	0.814
	LOOP	91	30.3	101	33.7	
	WHORL	21	7	19	6.3	

Table 5 : Association Between Gender And Molar Relation Among Study Participants

VARIABLES	MALE		FEMALE		P-VALUE
	N	%	N	%	
FLUSH	107	35.7	132	44	0.135
MESIAL	31	10.3	23	7.7	
DISTAL	3	1	4	1.3	

DISCUSSION:

Every human is unique and distinct in that they exhibit their own characteristic dermatoglyphic pattern. These unique patterns can be exhibited commonly as dermal ridges in the palm and distal digits of hands and feet. These were commonly used in the field of forensic dentistry for individual identification as "Dermatoglyphics".[3] Dermatoglyphics has been reported to be associated with a number of physiological and pathological conditions in the oral cavity such as periodontal diseases, dental caries, cleft lip and palate, oral carcinomas, bruxism, malocclusions, etc.[6,7] A case control study done by Saujanya K et al, on the cheiloscopy and dermatoglyphics as genetic markers in the transmission of cleft lip and palate, various pattern types of lip prints and dermatoglyphics in parents of cleft lip and palate [CL(P)] children were analysed to detect if any specific type can be contemplated as a genetic marker in the transmission of CL(P).[8] The study observed that Types IIa (Proximal branched grooves) and O lip patterns, can be considered as genetic markers for the transmission of CL(P) deformity to offsprings. This study also concluded that dermatoglyphic asymmetry of atd angles (angle formed by connecting lines from digital triradius 'a' to the axial triradius and from this triradius to the digital triradius 'd') provide positive objective criteria for estimating the relative risk and could be used as genetic markers. The epidermal ridges of the fingers and palm and the facial structures like lip, alveolus and palate originate during the same embryonic period concurrently from the same embryonic tissue, i.e. the ectoderm.[9] The genetic message present in the genome during this period may reflect in the dermal patterns.

The results of the present study demonstrated no significant correlation between dermatoglyphic patterns (arches, loops, and whorls) and primary molar relationships (flush terminal plane, mesial step, distal step) across different fingers, thereby the null hypothesis was accepted. These results are consistent with previous studies with similar parameters. A study done by Reddy et al,[10] concluded that though malocclusions 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 malocclusions. In a study conducted by Harini M et al,[11] no significant association between dermatoglyphic patterns and primary canine relationships was found. Contrary to this, a study conducted by George SM et al,[2] significant association between dermatoglyphic patterns and sagittal skeletal discrepancies was observed. Though the results of the present study did not indicate any correlation between dermatoglyphic patterns and primary molar relations, it provided an understanding into specific dermatoglyphic patterns which could be used as potential diagnostic tool for predicting the occlusion of succedaneous dentition.

Dermatoglyphics could be used as a cost effective tool for the diagnosis of dental discrepancies and craniofacial abnormalities. Identifying these problems at an early age by the utilization of this dermatoglyphic information, we can improve predictive practices in pediatric dentistry, ultimately leading to better health outcomes for children.

CONCLUSION:

Relationship between dermatoglyphic patterns and dental characteristics is still an evolving sector which needs further explorations. Future research should include longitudinal study designs and diverse populations with different racial and ethnic backgrounds to assess potential interactions over time.

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