RESEARCH ARTICLE

Cheiloscopy and Dactyloscopy as Behavior Assessment Tool in Dental Settings: A Cross-sectional Study

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ABSTRACT

Purpose: Assessment of children's behavior in the dental setting and its correlation with thumb print and lip print.

Materials and methods: The behavior pattern, lip print pattern, and thumb print pattern of 518 children aged 5–12 years were recorded in their first dental visit. The behavior pattern, lip print pattern, and thumb print pattern were determined using Frankl's Behavior Rating Scale, Tsuchihashi's classification, and Cummin's classification, respectively. The data were tabulated according to the classified criteria and statistically analyzed.

Results: It was observed that positive and definitely positive Frankl Behavior was associated with the children bearing an arch pattern of thumb print, whereas their lip pattern had no association with their behavior pattern, particularly in dental sittings.

Conclusion: Thumb print pattern can aid as a behavior marker before a child's first dental appointment and this can prove beneficial for both the child and the clinician in providing a high quality of dental care and modify behavior for future dental appointments.

Keywords: Arch, Behavior assessment tool, Cheiloscopy, Dactyloscopy, Frankl behavior rating scale, Lip print, Pediatric, Thumb print.

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INTRODUCTION

Health encompasses the physiologic, psychologic, and social aspects of a child's development. From a comprehensive definition of health comes a broad range of goals for pediatric health supervision, including monitoring of children's behavioral problems.[1]

Assessment of children based on their behavior is one of the most important skills for a pediatric dentist.[2] To understand a child's behavior during dental treatment, factors that probably arouse a particular behavior should be studied.

Behavioral dentistry is an interdisciplinary science, with an objective to develop an understanding in a dentist about the interpersonal social force that influences a patient's behavior. The foundation of practicing dentistry on children is the ability to guide them through their dental experiences. Successful pediatric dentistry depends not only on the dentist's technical skills but also on his ability to acquire and maintain a child's cooperation.[3]

Frankl et al., in 1962, classified a child's behavior into four groups according to the child's attitude and cooperation or lack of cooperation during dental treatment.[4] This classification is known as the Frankl behavior rating scale and is one of the most reliable tools developed for behavior rating of children in dental sittings. Frankl's behavior rating scale contains clearly defined items for observation.

Lip prints were first described by Fischer in 1902. Cheiloscopy (Greek; Cheilos = lips, Skopein = see) is the study of lip prints, an integral part of forensic odontology and investigation technique dealing with the identification of humans, based on lip traces.[5] The wrinkles and grooves on the labial mucosa form the characteristic lip print pattern and have been named "sulci labiorum rubrorum" by Tsuchihashi.[6] The lip prints are unique and can be identified as early as the sixth week of intrauterine life.[7] There are no changes in lip prints during the life of a person.

The term "fingerprint" predominantly means an impression of the epidermal ridges of the fleshy distal portion of a finger formed

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by applying ink and pressing the finger on paper and is used as means of establishing identity.[8] Study of fingerprints is known as Dermatoglyphics. The term Dermatoglyphics (dermi = skin and glyphe = curve) was coined by Cummins and Midlo in 1926.[9] Dermal ridges start to appear during the 12th week of intrauterine life and are completed by the 24th week of intrauterine life. These patterns are genetically determined and once formed, remain constant for a lifetime, except in overall size.[10]

Few studies have been carried out in the adult population correlating the fingerprint and/or lip print with their character/personality. To the best of our knowledge, there is no literature available which correlates thumb print and lip print with behavior patterns among children.

Therefore, this study aims to assess the behavior of children during their first dental visit and its correlation (if any) with lip print and thumb print.

MATERIALS AND METHODS

The study was carried out at the Department of Pediatric and Preventive Dentistry, Saraswati Dental College, Lucknow, after

obtaining ethical clearance from the Institutional Ethical Committee (SDC/IHEC/2017/MDS-P/20).

Inclusion Criteria

Children:

- Aged 5–12 years.
- First dental visit.
- With parents who gave informed consent.

Exclusion Criteria

Children with:

- History of systemic and/or infectious diseases.
- Congenital disease/s.
- Special healthcare needs.
- Psychological disorder.
- Pathology on lips.
- Pathology on thumb.
- Allergy to lipstick.
- Allergy to inkpad.
- Allergy to cellotape.
- Parents who did not give informed consent.

Armamentarium

- Cotton.
- Earbuds.
- Spirit.
- Lipstick—Pink colored (Lakme 9 to 5 Primer Matte Lip Color, Fuchsia File MP21).
- Cellotape.
- Scissors.
- Stamp Pad-Blue ink (Faber-Castell Blue Ink Stamp Pad).

- Plain white Bond paper (JK Excel Bond 100 GSM).
- Magnifying lens.

Procedure for Recording

Lip Print

The lips of the children were cleaned and lipstick was applied using cotton ear buds evenly over the vermillion border of the lip and the applied lipstick was spread uniformly. Then the glued portion of the cellophane tape was placed over the lips. The lip prints were taken in the normal rest position by dabbing cellophane tape in the center first and then pressing it comfortably toward the corners of the lips. The cellophane strip was then stuck to the white bond paper for a permanent record. The lip prints were then analyzed following Tsuchihashi's classification[6] using a magnifying glass.

Thumb Print

The left-hand thumb was cleaned with cotton dampened with spirit and then the thumb was pressed on the blue ink stamp pad with gentle pressure followed by placing of the thumb on the white bond paper to make an impression. The prints were examined using a magnifying glass, classified, and analyzed by Cummins method of Fingerprint identification.[9]

Behavior Pattern

Behavior pattern was recorded using Frankl's Behavior Rating Scale at the first dental visit.

Following the records collection, the data were analyzed statistically using SPSS (Statistical Package for Social Sciences) Version 21.0 statistical Analysis Software.

RESULTS (TABLES 1 AND 2)

Table 1: General profile and characteristics of the study population ($n = 518$)

S. no.	Characteristic	Statistic
1	Age	
	5–8 years	286 (55.2%)
	9–12 years	232 (44.8%)
	Mean age ± SD (range) in years	8.30 ± 2.29 (5–12)
2	Gender	
	Male	244 (47.1%)
	Female	274 (52.9%)
3	Lip pattern	
	I	74 (14.3%)
	I'	105 (20.3%)
	II	73 (14.1%)
	III	101 (19.5%)
	IV	78 (15.1%)
	V	87 (16.8%)
4	Thumb print pattern	
	Arches	139 (26.8%)
	Loops	199 (38.4%)
	Whorls	180 (34.7%)
5	Frankl Behavior Pattern	
	Definitely negative (I)	67 (12.9%)
	Negative (II)	146 (28.2%)
	Positive (III)	197 (38.0%)
	Definitely positive (IV)	108 (20.8%)

Table 2: Association of behavioral pattern with age, gender, lip pattern, and thumb print pattern

		Frankl behavioral pattern							
		Definitely negative		Negative		Positive		Definitely positive	
S. no.	Characteristic	No	%	No	%	No	%	No	%
1	Age								
	5–8 Years ($n = 286$)	52	18.2	95	33.2	98	34.3	41	14.3
	9–12 Years ($n = 232$)	15	6.5	51	22.0	99	42.7	67	28.9
	$\chi^2 = 34.71$; $p < 0.001$								
2	Sex								
	Male ($n = 244$)	34	13.9	65	26.6	90	36.9	55	22.5
	Female ($n = 274$)	33	12.0	81	29.6	107	39.1	53	19.3
	$\chi^2 = 1.54$; $p = 0.673$								
3	Lip pattern								
	I ($n = 74$)	13	17.6	22	29.7	26	35.1	13	17.6
	I' ($n = 105$)	12	11.4	25	23.8	43	41.0	25	23.8
	II ($n = 73$)	11	15.1	20	27.4	30	41.1	12	16.4
	III ($n = 101$)	14	13.9	26	25.7	39	38.6	22	21.8
	IV ($n = 78$)	8	10.3	22	28.2	25	32.1	23	29.5
	V ($n = 87$)	9	10.3	31	35.6	34	39.1	13	14.9
	$\chi^2 = 12.478$; $p = 0.643$								
4	Thumb prints								
	Arches ($n = 139$)	12	8.6	34	24.5	55	39.6	38	27.3
	Loops ($n = 199$)	23	11.6	65	32.7	78	39.2	33	16.6
	Whorls ($n = 180$)	32	17.8	47	26.1	64	35.6	37	20.6
	$\chi^2 = 12.918$; $p = 0.044$								

χ^2 = Chi-square value, "p" is level of significance (> 0.05 not significant, <0.05 significant, <0.01 highly significant, <0.001 very highly significant)

DISCUSSION

The essence of Pediatric Dentistry is in transforming the dental treatment of a child into a pleasing journey where a pediatric dentist strives to model a child's behavior so that he/she willingly accepts the dental treatment. Behavioral pedodontics is the study of science that helps to understand the development of fear, anxiety, anger, and associated acts as it applies to the child in the dental situation.[11] Frankl's Behavior Rating Scale is the convenient method to categorize a child's behavior qualitatively. Assessment of the probable behavior of a child can provide an additional advantage in dealing with potentially uncooperative patients. This can be possible by identifying markers that can predict the behavior of children before they enter a dental setting. Through this study, we aimed to find a correlation (if any) of the behavior of children with their lip print and thumb print pattern.

In the present study, we found that there was no predominant pattern of lip print amongst the study population. However, a slightly higher ratio of lip print pattern I' ($n = 105$; 20.3%) was observed which was closely followed by pattern III ($n = 101$; 19.5%), V ($n = 87$; 16.8%), IV ($n = 78$; 15.1%), I ($n = 74$; 14.3%), and II ($n = 73$; 14.1%), respectively. Gazge et al. also observed predominant type I' lip patterns among females in their study population.[12] Jeergal et al. reported the occurrence of Type I' lip print pattern predominantly in males.[7] Contrary to our findings, Tsuchihashi observed Type III lip pattern to be predominant in both males and females.[6] Sivapathasundharam et al. observed that type III was the predominant lip pattern in their study population.[13] Verghese

et al. recorded Type IV pattern predominantly in both males and females.[14] This variation in the distribution of lip patterns reported by different investigators may be explained by the difference in the study population size and varying ethnic and racial backgrounds.

Analyzing the pattern of thumb prints, the present study demonstrated that loops ($n = 199$, 38.4%) were the more predominant type and were closely followed by whorls ($n = 180$, 34.7%). Arches ($n = 139$, 26.8%) were the least common pattern among the population. Similar findings were observed in a study reported by Azhagiri et al., where the loop pattern thumb print of the studied population was predominant followed by whorls while arches ranked the least frequent pattern.[15] Nandan et al. observed the predominance of plain loop patterns.[16] Nithin et al., in their study of fingerprint classification and gender distribution among the South Indian population, observed that the most frequent pattern of thumb print among the study population was the ulnar loop pattern.[17] In other studies carried out by Reddy[18] and Rastogi and Pillai,[19] it was recorded that whorl pattern of fingerprint predominated in males and loop type in females. Kanchan and Saurabh observed a predilection of whorls pattern of thumb print in their study of the distribution of fingerprints.[20] The difference in racial and ethnic groups of the various studies and the sample size might be a reason for the variations observed.

This present study revealed that children in the age group of 9–12 years ($n = 232$) expressed more positive and definitely positive behavior ($n = 166$; 71.6%) in their first dental visit as compared to the younger age group, i.e., 5–8 years ($n = 286$; 48.6%) in the study

population. This difference is very highly significant statistically ($p < 0.001$). Lakhani et al. observed that positive behavior was exhibited by 55.5% of 7-year-olds, 56% of 8-year-olds, 71% of 9-year-olds, 90% of 10-year-olds, 80% of 11-year-olds, and 93% of 12-year-olds; suggesting more positive behavior among children of older age group.[21] Kamran et al., in their study, noted that the older the child, the more positive behavior was exhibited.[22] Results obtained by El-Housseiny et al. varied in a way that a weak significant correlation was found between CFSS-DS score and age in their study population.[23] The influence of age on behavior can be explained by the immature psychological development of children. In early childhood, fear of the unknown is prominent and by 9 years of age, fears are linked to blood and body injuries, situations mostly encountered in a dental clinic.[24]

In the present study, it was observed that Frankl Behavior Rating 1 and 2 was associated with the children bearing loop pattern and whorl pattern of a thumb print, and Frankl Behavior Rating 3 and 4 was associated with the children bearing the arch pattern of a thumb print. The result of the present study could not be compared with any other study because no literature was found that correlated thumb print with the behavior pattern among children in a dental setting.

Few studies have been conducted correlating thumb print with personality patterns in adults. Agarwal et al. observed that individuals with loops were found to have a possible lack of concentration while individuals with whorls are quite aggressive.[25] White mentioned that whorl pattern was associated with individuals who were very selective and otherwise non-committal.[26] Singh and Majumdar found that individuals with whorls are quite aggressive and obstinate, whereas, people with arches on any finger are settled, skillful, and socializing.[27] White emphasized that the arch indicates a person with accepting nature.[26]

Personality could be an outcome of mixed experiences from their environment, family, education, socioeconomic status, job, and personal life. These personality patterns cannot be standardized to assess and qualify a child's behavior. However, it is quite possible that few traits, if not all, developed in childhood might continue to remain in adults and reflect in their behavior.

So correlating behavior pattern in children (5–12 years) with the thumb print is one of the novelties of the present study. The results obtained in our present study are exclusive findings.

The present study revealed that the lip pattern of the children in the study population was not associated with their behavior pattern, particularly in dental sittings. Again, this finding cannot be compared with other studies due to the lack of literature regarding lip patterns in children and their behavior patterns in dental sittings.

In the present study, gender was an insignificant cofactor related to the behavior of a child in a dental setting. The behavior of children in dental sitting was not found to be related to his/her gender in the present study. A similar finding was observed by Kamran et al. in their study that no significant difference regarding definitely negative behavior was found between male and female children.[22] Diaz et al. observed that the differences in mean Dental Fear and Anxiety scores between male and female children were not statistically significant.[28] Gender differences in neurological processing of emotional information and regulation may provide additional insight into the relationship between behavior and gender. However, further research is required in the bio-psycho-social field to understand the mechanisms regarding gender differences and its behavioral correlates.

The results obtained from the present study creates a unique set of findings. In the present study, the association between thumb print and behavior of a child was observed whereas no association could be established while correlating the lip print of a child with his/her behavior. Our results and observations are beneficial in a way that, thumb print can be used as a marker of behavior pattern and can help us assess the behavior of a child before he/she enters the dental clinic. The dental operators and their assistants can prepare accordingly in advance of the child's entry into the clinic. This shall prove beneficial for both the child and the clinician. However, a more systematic study on a larger population is defensible.

Conclusion

Based on the observations of this study and results obtained through statistical analysis, the conclusion can be listed as:

- There was no statistically predominant lip print pattern amongst the study population.
- The loop pattern of thumb print was the most prevalent pattern followed by whorls. Arches were the least common pattern among the population.
- Children in the age group of 9–12 years expressed more positive behavior as compared to the younger age group (5–8 years) in the study population.
- Among the children, a significant association between age, thumb print, and their behavior was observed. Frankl Behavior Rating 1 and 2 was associated with younger children aged 5–8 years and the children bearing loop and whorl pattern of thumb print.
- However, the gender and lip pattern of the study population was not associated with their behavior pattern.

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