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Timing of primary tooth emergence of a group of Sulaimani Kurdish children

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Abstract:
Background: *Adequate knowledge of the timing of tooth emergence is essential for diagnosis and treatment planning in pediatric dentistry and orthodontics. Furthermore, information on tooth emergence is also used to supplement other maturity indicators in the diagnosis of certain growth disturbances, and in forensic dentistry to estimate the chronological age of children with unknown birth records.*
Objective: *The aim of the present study was to determine the emergence time of primary teeth, their order and sequence of eruption from 4 – 48 months among Kurdish children in Sulaimani city.*
Patients and Methods*: A total of 871 children (467 males and 404 females) was randomly selected from the patients of health care centers and the examinations were performed at the time of receiving mandatory vaccinations.*
Results*: All maxillary teeth precede their mandibular opponent except mandibular central incisor that precedes its opponent. The inter-maxillary sequence in the total sample commenced with three teeth altogether given the first order: mandibular central incisor, maxillary central incisor, and maxillary lateral incisor. The mandibular lateral incisor, the maxillary first molar, and mandibular first molar were given the second order. The third order was given to maxillary and mandibular canine teeth collectively. Both maxillary and mandibular second molar occupied the fourth order. No significant gender differences were observed in the emergence ages.*
Conclusions: *The current findings will provide pediatric dentists with contemporary tooth emergence ages, which can be used for assessing dental growth and development among Kurdish population.*
Keywords: *Primary tooth emergence, tooth eruption, Kurdish children*

I. Introduction

Evidence of the development of human tooth can be observed as early as the 6th week of the embryonic life. At the time of birth, the primary dentition is almost complete in its development [1]. Deciduous teeth are usually lost and replaced by permanent teeth, but in the absence of permanent replacements, they can remain functional for many years. In the deciduous dentition, there is a total of twenty teeth: five per quadrant and ten per arch. The eruption of these teeth begins at the age of six months and continues until thirty-three months of age. Usually, the first teeth seen in the mouth are the central incisors, and the last are the maxillary second molars [2].

Adequate knowledge of the timing of the permanent tooth emergence is essential for diagnosis and treatment planning in pediatric dentistry and orthodontics [3]. Furthermore, information on tooth emergence is also used to supplement other maturity indicators in the diagnosis of certain growth disturbances, and in forensic dentistry to estimate the chronological age of children with unknown birth records [3,4].

The eruption of deciduous teeth is affected by climate, race, diet, nutrition, and disease. Consequently, the deciduous tooth emergence has been used to assess growth and development and for age estimation in children [5].

Baghdady and Ghose in 1981 [6] studied the mean order of eruption of primary dentition of each jaw in Iraqi children and found that it was the same in both genders as follows: Central incisor (A), lateral incisor (B), first molar (D), canine (C), and second molar (E). Also, they found that there was a tendency for the maxillary tooth to erupt earlier, except for the central incisor and second molar. Furthermore, they reported that the boys were slightly advanced the girls in the mean eruption time of all primary teeth except the maxillary central incisor and mandibular second molars. Khamarco and Qasim in 2002 [7] studied the time and the order of eruption of primary teeth of Iraqi children, and they found that the males have their primary teeth to emerge earlier than those of females and the maxillary teeth appear before their mandibular opposing teeth in males with the exception of central incisors while in females the mandibular teeth emerge before their opposing maxillary teeth with the exception of canine and second molar.

The specific times of tooth emergence provide an important resource for general dental practitioners, orthodontists and pediatric dentists [8]. The previous studies in Iraq concentrated on children from the middle parts of the country where the majority of the population is from Arabic ethnicity. This study was conducted

since no data is being reported for Kurdish populations and specifically no research is being conducted in Sulaimani city. This paper provides baseline data concerning the primary teeth eruption for pediatric dentists with updated eruption times of primary teeth that could be used for assessing dental growth and development.

The aim of this research is to determine the emergence time of primary teeth, their order and sequence of eruption and the number of primary teeth at different ages from 4 – 48 months among children in Sulaimani city. No information is available regarding the eruption chronology of Kurdish children and it is important to acquire accurate eruption parameters of the Kurdish population.

II. Patients and methods

In this cross-sectional study, the samples were composed of 871 children (467 males and 404 females) aged 4-48 months selected randomly from the patients of health care centers in Sulaimani city. The selection was performed in a manner to represent children from various socioeconomic status and different geographic localities. Children should attend these local health centers regularly at specific ages in order to receive mandatory vaccinations and clinical and growth level checkups. Children will visit for mandatory growth checking and vaccination in the first year for 5 times (at ages 2, 4, 6, 9 and 12 months), they will be checked 2 times in the second year of age (ages 18 and 24 months) and later once until they reach 5 years of age.

Complete dental and medical examinations were carried out, and only healthy normal subjects were selected to be included in the study. All children were given an oral examination. Oral examination was performed using a dental mirror and probe in the presence of good illumination. The previously prepared case sheet used during sample collection including, in spite of demographic information, the deciduous dental formula. Tooth eruption was defined as having occurred if any part of the crown had pierced the alveolar mucosa [9].

Statistical analysis was performed using the SPSS computer program, version 20. Descriptive and inferential statistics were calculated. Numerous studies had applied Probit analysis for estimating the ages of teeth eruption [10-13]. Probit analysis is useful in situations where the variables have a dichotomous or a binary outcome, like yes/no, hence tooth eruption. When biological responses are plotted against their causal stimuli, they often form a sigmoid curve. Sigmoid relationships can be linearized by transformations such as probit. For most study systems, the probit (normal sigmoid) gives the most closely fitting results. Probit transformation also helps in calculating the average eruption of permanent teeth and helps in determining the percentage of subjects in whom the tooth was present at specific levels [14] and according to Höffding et al [15]; probit analysis was the best method of analyzing tooth eruptions than any other method.

III. RESULTS

The study sample consists of 871 children with an age range 4-48 months (467 of them were males and 404 were females). Distribution and frequency of age groups and some subjects per group for both total sample and genders are illustrated in Table 1. Testing the difference between sides showed that at the significant level of 0.05 the differences between the median ages in the emergence of contra-lateral tooth pairs were not statistically significant.

The average age for the appearance of maxillary and mandibular teeth of the right side and the corresponding 5^{th} and 95^{th} percentile and standard deviations for the total sample and both genders are shown in Table 2. Additionally, Table 2 demonstrates the inter-gender differences along with their significance at the probability level (P-value) of 0.05. Statistically, there are no significant differences between males and females, the inter-gender differences across all teeth ranged from 0.22-2.3 years with an average of 0.88 years. However, the differences did not reach the statistical differences in all teeth.

Regarding intermaxillary differences in tooth emergence, all maxillary teeth precede their mandibular opponent except mandibular central incisor that precedes its opponent. However, the differences in maxillary precedence were not significant for the mandibular central incisors. Furthermore, the estimated median age shows the eruption of mandibular central incisor were before birth (natal teeth).

Table 1: Distribution of study sample according to age groups and gender

Age groups (months)	Males	Females	Both
4	72	71	143
7	75	76	151
10	42	46	88
13	69	48	117
16	60	43	103
19	23	22	45
22	20	21	41
25	25	15	40
28	21	13	34
31	15	9	24

34	10	9	19
37	6	11	17
40	9	4	13
43	8	10	18
46	12	6	18
Total	467	404	871

Table 2: Emergence of primary teeth (in months) for the total sample, males and females along with inter-gender differences and their significances.

Tooth*	**Maxilla**					**Mandible**				
	51	**52**	**53**	**54**	**55**	**81**	**82**	**83**	**84**	**85**
Total sample										
Median age	9.48	10.76	18.33	14.96	27.3	6.85	14.09	18.97	15.53	29.74
5th percentile	2.29	4.82	10.69	7.73	16.57	-0.75	5.17	10.72	8.65	18.48
95th percentile	16.66	16.7	25.96	22.18	38.02	14.44	23.01	27.21	22.44	41.01
±SD	4.37	3.61	4.65	4.39	6.54	4.61	5.43	5.03	4.18	6.85
Males										
Median age	9.22	10.61	17.26	15.1	26.5	7.05	13.94	18.4	15.15	29.52
5th percentile	4.15	5.23	11.23	7.54	26.5	-1.8	4.17	10.54	9.28	17.18
95th percentile	14.28	15.99	23.28	22.67	26.5	15.89	23.7	26.26	21.02	41.85
±SD	3.08	3.27	3.66	4.61	6.9	5.38	5.95	4.78	0.06	7.52
Females										
Median age	9.78	10.97	19.56	14.77	28.38	6.68	14.16	19.69	16.01	30.11
5th percentile	0.79	4.44	10.62	7.96	19.21	1.2	6.38	11.01	8.21	20.68
95th percentile	18.77	17.49	28.5	21.57	37.55	12.16	21.94	28.36	23.8	39.53
±SD	5.46	3.97	5.43	4.13	5.59	3.33	4.74	5.26	4.74	5.71
m.Female-m.Male**	0.56	0.36	2.3	-0.33	1.88	-0.37	0.22	1.29	0.86	0.59
Significance	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

*** Tooth in FDI notation system.**
**** Median ages.**

Table 3: The significance of the differences in median age of emergence across all possible tooth pairs for the total sample.

Teeth*		**Maxillary**					**Mandibular**				
		a	**b**	**c**	**D**	**e**	**a**	**b**	**c**	**d**	**e**
Maxillary	**a**		NS**	S†	S	S	NS	S	S	S	S
	B	NS		S	S	S	S	S	S	S	S
	c	S	S		NS	S	S	S	NS	S	S
	d	S	S	NS		S	S	NS	S	NS	S
	e	S	S	S	S		S	S	S	S	NS
Mandibular	**a**	NS	S	S	S	S		S	S	S	S
	b	S	S	S	NS	S	S		S	NS	S
	c	S	S	NS	S	S	S	S		S	NS
	d	S	S	S	NS	S	S	NS	S		S
	e	S	S	S	S	NS	S	S	NS	S	

*** Tooth in Palmar notation system.**
**** NS: Non-significant**
† S: Significant

The significant and insignificant differences in the median age of tooth emergence across all possible intra-arch and inter arch pairs of maxillary and mandibular right teeth for the total sample were presented in Table 3. To test the significances between emergence times of the primary teeth in the present study, the median age is adopted instead of the mean age. Accordingly, when the difference between the median ages at the emergence of two teeth is not significant, it indicates that the two teeth are given the same order in the sequence of emergence. The same approach was followed by testing for the significance of the difference across all tooth pairs, the inter-maxillary, the maxillary and mandibular arch sequences, as summarized for the total sample in Table 4.

Table 4: Inter and Intra – arch order of emergence for the total sample.

Order	Inter- arch	Maxillary	Mandibular
1st	Mandibular and maxillary central incisor, maxillary lateral incisor	A, B	A
2nd	Mandibular lateral incisor, maxillary, and mandibular first molar	D	B, D
3rd	Maxillary and mandibular canine	C	C
4th	Maxillary and mandibular second molar	E	E

The inter-maxillary sequence in the total sample commenced with three teeth altogether given the first order: mandibular central incisor, maxillary central incisor, and maxillary lateral incisor. The mandibular lateral incisor, the maxillary first molar, and mandibular first molar were given the second order. The third order was given to maxillary and mandibular canine teeth collectively. Both maxillary and mandibular second molar occupied the fourth order.

By arch, the sequence of tooth emergence within the maxillary jaw started with the central incisor (first), then lateral incisor (second), first molar (third), canine (fourth) and completed with second molar (fifth). The same order of emergence was present for the mandibular jaw. For males and females, the tooth emergence sequence within each arch was similar to that for the total sample.

IV. Discussion

This cross-sectional study was conducted on 871 Kurdish children in order to have knowledge about eruption time and sequence of primary teeth in a sample of the Kurdish population in Sulaimani City - Kurdistan region, Iraq. For purposes of this study, an erupted tooth was defined as any tooth with any part of its crown penetrating the gingiva and visible in the oral cavity. As the present study relies on the clinical examination only without using a confirming radiograph, it is considered to be one of the limitations of the study.

Studies have shown both the timing of primary incisor emergence and sequence of primary tooth emergence is under strong genetic control [16, 17]. Gam [18] suggested that the development and calcification of teeth prenatally demonstrate a programmed sequence of tooth development and emergence. However, whether tooth emergence is coded as a cascading sequence of events commencing once the first primary tooth has emerged, or whether each tooth's emergence is coded more individually remains unknown [19].

In comparison with other studies, the timing of primary teeth eruption in the present study found to be earlier than Saudi children by Al- Jasser and Bello [20], while later than that reported for Swedish children by Haag and Taranger [21]. The order of eruption of primary dentition in each jaw was the same in both genders, this finding is in agreement with other studies conducted by Barrett and Brown [22], Baghdady and Ghose [6], Singh et al [23] and Agarwal et al [24]. In the present study most of the maxillary teeth emerged earlier than opposing mandibular teeth for both genders this finding is in agreement with an Iraqi study by Baghdady and Ghose [6] and a Korean study by Choi and Yang [25], while disagreement with the Senegalian study by Yam et al [26] and another Iraqi study by Khamarco and Qasim [7].

Many reasons have been considered as influential factors in the time and order of tooth emergence. These include nutrition, socioeconomic status, sex, climate, and premature extraction of the deciduous teeth [20]. Lee et al. (1965) however, noted that interpopulation differences have little meaning in themselves unless when socioeconomic conditions, nutritional status, and environmental factors such as the fluoride content in the study were defined [27]. The present study did not observe any significant gender differences, same results are reported in other studies and accordingly, gender is reported to have no effect on the timing of teeth emergence [12,13]. On the other hand, gender appeared to play a significant role in the eruption of teeth in Saudi Arabian children with boys erupting teeth earlier in both jaws [20].

V. Conclusion

The current findings will provide pediatric dentists with contemporary tooth emergence ages, which can be used for assessing dental growth and development in Kurdish children.

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