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Time of emergence of permanent teeth of the children of Larkana, Pakistan

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Abstract

Introduction: To establish the sequence and eruption time of permanent teeth of children of Sindh and to find out the effect of gender, height, weight, and body mass index on time of eruption.

Material and methods: This investigation was a part of the nationwide study conducted to determine the standard sequence and time of eruption of permanent teeth of Pakistani children. 15 schools, including 9 private schools, were selected from the schools' list. Children with at least one 'just erupted' tooth were examined. 1205 cases were collected from Kindergarten 1 to grade 8. Height, weight, and information regarding dietary pattern were recorded.

Results: 658 (54.6%) students were males and the largest number (233) was collected from grade 5. The lowest mean eruption time in the maxillary jaw was for the first molars (#16 & #26) and the largest mean eruption time appeared for the right and left 2nd molars (#17 & #27). The left central incisor (#21) and right first molar (#16) showed the minimum mean eruption time in the mandibular jaw, while the maximum mean eruption time belonged to the left second molar (#37). Only left central incisor (#21) showed significant difference between males and females. 28 and 4 teeth showed a significantly positive correlation of eruption time with weight, and height respectively.

Conclusions: Study showed that due to some different genetic composition, the time of eruption of permanent teeth of Sindhi children is similar to Pakhtoon living in Khyber Pakhtoon Khwa, but different than Mahajirs living in Karachi.

Keywords: Eruption time; just erupted tooth; oral pathology; permanent teeth

Introduction

Information of time and sequence of eruption of permanent teeth could be supportive in diagnosis, treatment, and making estimates in pediatric dentistry, orthodontic or forensic dentistry. Estimation of the chronological age of children and adolescents can be determined using dental maturity, which can be used in medico-legal proceedings in case of refugee children, criminals, school admission, or entry into sports competitions with age limitations. In many developing countries, the birth records of the children are not available in rural or under-developed areas, hence the dental maturity using estimated time of emergence of teeth could be used for age estimation.[1]

In Pakistan, the time of eruption of teeth is taught as described in the European and American textbooks, according to their standards.[1] But as described in the literature that the standard of the emergence of teeth

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should be obtained from the population in which it is going to be used.[2] Therefore, studies are conducted in many countries, such as in America (Peru,[3] Costa Rica,[4] USA,[5]), Asia (Sri Lanka,[6] Saudi Arabia,[2,7,8] Lebanon,[9] Indonesia,[10] India,[11] Pakistan,[1,12,13]), Europe (Spain,[14] Czechoslovakia,[15]) Africa (Egypt,[16] South Africa,[17] Nigeria,[18]) and Australasia (New Zealand.[19]). Only a few studies have been conducted for selected Pakistani populations.[1,12,13,20,21] Khan did the studies for Karachi,[1] and Peshawar,[12,13] children. Mahmood covered the children of Islamabad,[21]. One study was conducted on pre-partition time of sub-continent to compare the time of eruption of children of wheat eating area Lahore,[20] and rice eating area of Madras. Even though, as mentioned earlier, a study on this subject was conducted in Karachi, the capital of Sindh province, but overwhelming samples of that study belonged toUrdu speaking children (83.5%) and Sindhi children were only 4.2%. But as far as authors' knowledge is concerned, no study has been published which could involve an overwhelming majority Sindhi ethnic population. As it has been mentioned earlier that it is helpful for diagnosis for dental treatments and estimation of the chronological age of a population if the standard of time and sequence of eruption of permanent teeth is obtained from that population. It should be noted that Sindhi population is quite different that other ethnic groups of Pakistan. Therefore, this study was conducted in the city of Larkana, where there is a predominated population (98%) of Sindhis. The objective of the study was to establish the standard for the sequence and mean eruption time of permanent teeth of Sindhis children. In addition, the effect of gender, height, weight, and body mass index on time of eruption was also aimed.

Material and Methods

This investigation was a part of the nationwide study conducted to determine the standard sequence and time of eruption of permanent teeth of Pakistani children. This study was approved by the Institutional Review Board of Dow University of Health Sciences (No. IRB-B-17/DUHS-10). The team of investigators consists of two dentists (one male and one female), and two assistants (one male and one female), hired by one of the co-principal investigators (Co-PI) (SAA) of the project from Larkana city. Seven thousand five hundred cases (children with just erupted a permanent tooth) were planned to include in the study from all over Pakistan, and out of those cases, one thousand was intended to take from Larkana districts. Ten percent was added for non-respondents and incomplete information. The criterion of the just erupted teeth was defined as: a tooth deemed to have emerged if any part of it was visible in the mouth.

Lists of private and public schools of Larkana districts were obtained from the Ministry of Education, Districts Larkana. Fifteen schools were selected from the schools' list, using systematic random sampling. Nine of them were private schools. The team of dentists and assistants were trained and calibrated by the reference examiner (AC) who was the master trainer for this multi-center project. Clinical pictures of the 'just erupted' teeth and information about the project were sent to the investigators to familiarize them with the study. A training and calibration session was organized for examiners (dentists and assistants) against the reference examiner in a selected Larkana school. A kappa value of 80% plus was considered as the satisfactory level for examiners' reliability. A Co-PI (SAA) visited the selected schools to get permission from the administration and set up the day and time for the visit of the examiners. The consent Proformas have been given to the administration to deliver to the parents to get their permission. Team of examiners (1 male & 1 female dentist, and 1 male & 1 female assistant) visited the selected school on the pre-assigned time and date. Children with parents' consent were requested for their assent before screening for the general check-up. Children with at least one 'just erupted' tooth are requested to come out of the class

for further investigation. Clinical examination of each selected child was conducted using a dental check-up kit under a bright light on a sitting position on a chair. Height and weight were measured using a digital scale without wearing the shoes. Data were entered and analyzed using SPSS (21.0). Descriptive statistics using frequency, mean, median, and standard deviation were computed. Two independent samples 't' test was utilized to compare the mean eruption time between male and female children. Pearson and partial correlation were used to determine the correlation between the mean eruption time with height, weight, and BMI.

Results

Calibration Results: The kappa statistic was calculated for each tooth and then the average value was used for the examiners' reliability. The mean kappa values between reference examiner with other field dentists and between filed dentists were above 80%.

Descriptive statistics of time of eruption:

One thousand two hundred and five (1205) cases were collected from 15 schools of Larkana city. The academic grades covered for the study were from kindergarten 1 to grade 8. Six hundred fifty-eight (54.6%) students were males and largest number of samples were collected from grade 5 (n=223(18.5%)), followed by grade 2 (n=186 (15.4%)).

Table I shows the descriptive statistics related to the eruption time of maxillary and mandibular teeth. The mean eruption time of each tooth is also shown in Figure 1.

The lowest mean eruption time in the maxillary jaw was 6.2 years for first molars (#16 & #26), followed by left central incisor (#21) with a mean eruption time of 6.5±1.1 years. The largest mean eruption time of the maxillary jaw appeared for the right and left 2nd molars (#17 & #27) with the mean value of 10.1 ± 1.5 years. The left central incisor (#21) and right first molar (#16) showed the minimum mean eruption time of 6.2 years for the mandibular jaw. The minimum median eruption time of mandibular teeth was the right first molar (# 46) with a value of 6.1 years. The maximum mean eruption time belonged to the left second molar (#37) with the value of 10.0 ± 1.6 years. The maximum value of median was also 10.0 for right and left 2nd molars (#37 & #47).

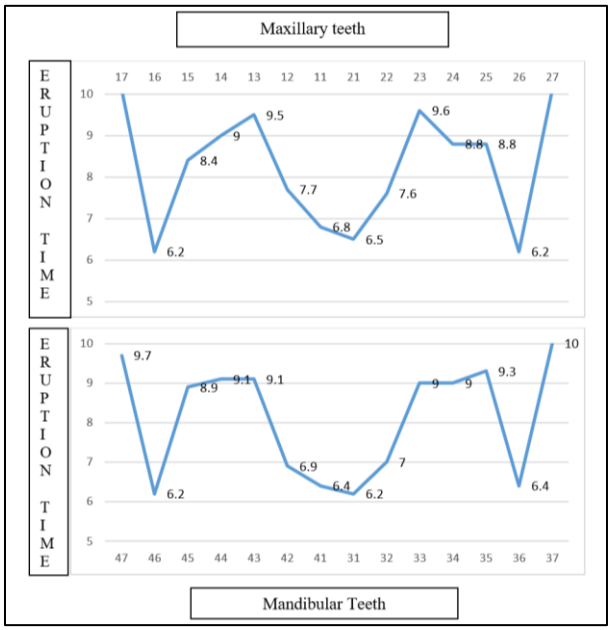

Figure 1: Time of eruption of permanent teeth of mandibular and maxillary teeth

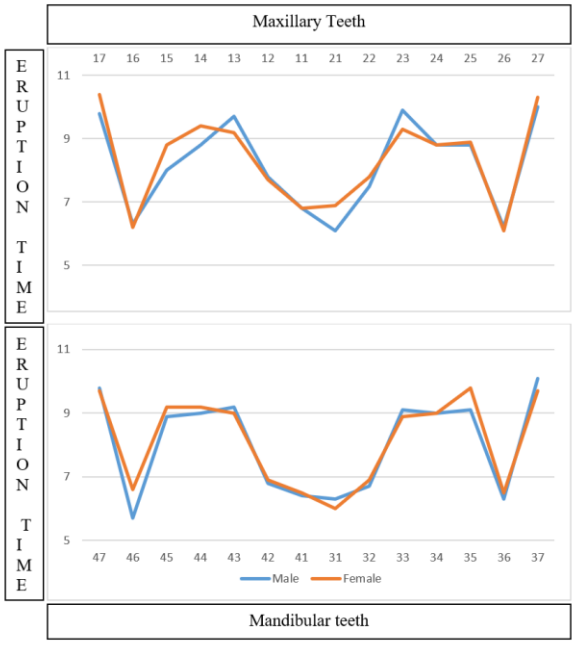

Figure 2: Mean eruption time of male and female children of mandibular and maxillary teeth

Table II shows the comparison between the genders for the mean time of the eruption. All the
mean differences of maxillary teeth, except the left central incisor (#21), were statistically insignificant. None of the teeth of the mandibular jaw showed any statistical significance between males and females. However, the anterior teeth of the mandibular jaw erupted late as compared to the maxillary jaw.

Table I: Descriptive statistics of eruption time of all the teeth, except third molars

Maxillary				Mandibular			
Tooth Number	Number of Cases	Mean±SD	Median	Tooth Number	Number of Cases	Mean±SD	Median
17	33	10.1±1.5	9.8	47	102	9.7±1.6	10
16	22	6.2±1.3	6.0	46	35	6.2±1.5	6.1
15	21	8.4±1.8	8.3	45	34	8.9±1.8	9.0
14	74	9.0±1.7	9.1	44	105	9.1±1.6	9.0
13	123	9.5±1,6	9.4	43	130	9.1±1.6	9.0
12	68	7.7±1.3	7.9	42	83	6.9±1.5	6.8
11	47	6.8±1.2	6.6	41	44	6.4±1.5	6.3
21	58	6.5±1.1	6.4	31	33	6.2±1.1	6.3
22	74	7.6±1.5	7.7	32	74	7.0±1.3	7.0
23	105	9.6±1.7	9.8	33	117	9.0±1.7	8.9
24	66	8.8±1.7	8.9	34	104	9.0±1.8	9.1
25	26	8.8±2.0	8.5	35	30	9.3±1.5	9.0
26	16	6.2±1.9	6.1	36	30	6.4±1.9	6.2
27	42	10.1±1.5	10.0	37	98	10.0±1.6	10.0

Table II: Comparison of mean eruption time between male and female children

Tooth Type	Maxillary				Mandibular			
	Tooth number	Male	Female	P-Value	Tooth number	Male	Female	P-Value
Second molar	17	9.8	10.4	0.1133	47	9.8	9.7	0.6230
First Molar	16	6.3	6.2	0.5682	46	5.7	6.6	0.3409
Second premolar	15	8	8.8	0.1539	45	8.9	9.2	0.2956
First premolar	14	8.8	9.4	0.0500	44	9	9.2	0.2680
Canine	13	9.7	9.2	0.7506	43	9.2	9	0.7612
Lateral incisor	12	7.8	7.7	0.6236	42	6.8	6.9	0.3814
Central incisor	11	6.8	6.8	1.000	41	6.4	6.5	0.4245
Central incisor	21	6.1	6.9	0.0037	31	6.3	6.0	0.7780
Lateral incisor	22	7.5	7.8	0.1922	32	6.7	6.9	0.7508
Canine	23	9.9	9.3	0.9615	33	9.1	8.9	0.7478
First premolar	24	8.8	8.8	1.0000	34	9	9	1.0000
Second premolar	25	8.8	8.9	0.4497	35	9.1	9.8	0.1215
First molar	26	6.2	6.1	0.5455	36	6.3	6.5	0.3909
Second molar	27	10	10.3	0.2561	37	10.1	9.7	0.8872

Table III shows the Pearson correlation between eruption time and height and the partial correlation between eruption time and height controlling the weight. Thirteen teeth showed significant correlations between eruption time and the height of the children. However, only five teeth showed a partial correlation between eruption time and height controlling the weight.

Table III: Pearson and partial correlation of eruption time with height, controlling the weight

Tooth Type	No. of Cases	Pearson Correlation		Partial Correlation		Tooth Type	No. of Cases	Pearson Correlation		Partial Correlation	
		R	p-value	R	p-value			R	p-value	R	p-value
17	33	0.525	0.002	0.224	0.226	47	101	0.292	0.003	0.148	0.148
16	22	0.407	0.060	0.222	0.334	46	35	0.140	0.423	0.140	0.430
15	21	-0112	0.630	-0.257	0.274	45	34	0.245	0.162	0.123	0.497
14	74	0.406	<0.0001	0.178	0.135	44	105	0.360	. <0.0001	0.214	0.029
13	123	0.124	0.170	0.034	0.709	43	130	0.311	<0.0001	0.228	0.009
12	68	0.067	0.588	-0.191	0.121	42	83	0.303	0.005	0.162	0.146
11	47	-0.102	0.448	0.209	0.163	41	44	0.211	0.168	0.119	0.446
21	58	-0.102	0.448	-0.133	0.325	31	33	-0.022	0.905	-0.131	0.473
22	74	0.276	0.017	0.091	0.445	32	74	0.163	0.165	0.050	0.677
23	105	0.264	0.006	0.195	0.047	33	117	0.201	0.030	0.167	0.073
24	66	0.457	<0.0001	0.264	0.034	34	104	0.371	<0.0001	0.198	0.046
25	26	0.139	0.499	0.067	0.751	35	30	0.300	0.107	-0.083	0.669
26	16	0.693	0.003	0.250	0.368	36	30	0.308	0.097	0.184	0.341
27	42	0.362	0.018	0.282	0.098	37	97	0.249	<0.0001	0.158	0.125

Pearson correlation between time of eruption and weight and partial correlation between time of eruption and weight of the children controlling the height is illustrated in Table IV. Seventeen teeth out of 28 showed a statistically positive significant correlation between time of eruption and weight of the children. Five teeth showed a significant positive partial correlation between the time of eruption and the weight of the children controlling the height.

Table IV: Pearson and partial correlation of eruption time with weight, controlling the height

Tooth Type	No. of Cases	Pearson Correlation		Partial Correlation		Tooth Type	No. of Cases	Pearson Correlation		Partial Correlation	
		r	p-value	r	p-value			r	p-value	r	p-value
17	32	0.561	0.001	0.320	0.079	47	101	0.382	<0.0001	0.295	0.003
16	22	0.393	0.071	.628	0.002	46	35	0.035	0.843	-035	0.844
15	21	0.331	0.142	0.398	0.082	45	34	0.219	0.214	0.046	0.800
14	74	0.411	<0.0001	0.190	0.110	44	105	0.331	. 0.001	0.153	0.121
13	123	0.216	0.017	0.181	0.046	43	130	0.225	0.001	0.126	0.258
12	68	0.415	<0.0001	0.447	<0.0001	42	83	0.287	0.009	0.162	0.146
11	47	-0.046	0.759	-0.153	0.310	41	44	0.249	0.168	0.179	0.252
21	58	0.088	0.509	0.123	0.362	31	33	0.172	0.337	0.215	0.238
22	74	0.343	0.003	0.230	0.051	32	74	0.244	0.036	0.190	0.107
23	105	0.206	0.035	0.098	0.322	33	117	0.114	0.222	_0.007	0.943
24	66	0.416	0.001	0.165	0.190	34	104	0.352	<0.0001	0.155	0.119
25	26	0.308	0.126	0.285	0.168	35	30	0.515	0.004	0.445	0.015
26	16	0.707	0.002	0.313	0.256	36	30	0.275	0.142	0.113	0.561
27	42	0.309	0.046	0.175	0.273	37	97	0.276	0.006	0.193	0.061

Table V discusses the Pearson correlation between time of eruption and body mass index (BMI) of the children. Only five teeth out of 28 showed significant positive correlations between the time of eruption and BMI.

Table V: Pearson correlation of BMI with time of eruption

Tooth Type	No. of Cases	Pearson Correlation		Tooth Type	No. of Cases	Pearson Correlation	
		r	p-value			r	p-value
17	32	0.253	0.162	47	101	0.081	0.421
16	22	0.047	0.835	46	35	-0.117	0.505
15	21	0.224	0.330	45	34	0.098	0.583
14	74	0.288	0.014	44	105	0.155	0.115
13	123	0.078	0.390	43	130	0.045	0.614
12	68	0.395	0.001	42	83	0.082	0.462
11	47	-0.126	0.400	41	44	0.196	0.202
21	58	0.225	0.090	31	33	0.236	0.186
22	74	0.165	0.161	32	74	0.065	0.581
23	105	-0.006	0.955	33	117	-0.015	0.872
24	66	0.218	0.078	34	103	0.196	0.047
25	26	0.113	0.583	35	30	0.480	0.007
26	16	0.595	0.015	36	30	0.081	0.672
27	42	0.148	0.350	37	96	0.113	0.561

*Median values **Due to contra-lateral similar values, only right-side quadrants are reported

Table VI and Table VII compare the mean eruption time of male and female children of the current study with other nationalities.

Table VI: Mean eruption time of male children in different countries

Tooth type	America	Asia			Europe	Africa	Australasia	This study
Country	Costra Rica[4]	India[11]	Pakistan Karachi[1]	Pakistan Peshawar[12]	Czchoslo-Vakia*[15]	Nigeria	New* Zealand**	
Year	2021	2020	2011	2019	2017	2014	2012	
17	12.37	12.99	11.6	10.1	11.03	12.01	11.6	9.8
16	6.56	8.17	6.6	7.6	6.35	6.15	5.9	6.3
15	11.23	12.22	10.2	9.6	10.98	11.08	10.6	8.0
14	10.28	11.60	10.1	9.5	9.55	10.25	9.8	8.8
13	11.42	12.16	11.0	11.0	11.32	10.96	10.3	9.7
12	8.55	10.14	8.4	8.5	8.03	8.05	7.6	7.8
11	7.25	8.13	7.5	6.7	7.04	6.89	6.6	6.8
21	7.30	8.21	7.5	6.4	7.02			6.1
22	8.59	10.26	8.5	8.1	8.0			7.5
23	11.24	12.10	10.9	11.1	11.38			9.9
24	10.40	11.69	10.1	9.6	9.56			8.8
25	11.31	12.11	10.0	10.3	10.98			8.8
26	6.49	8.40	6.7	8.6	6.87			6.2
27	12.34	12.98	11.7	12.2	12.77			10.0
37	11.86	12.64	11.3	11.8	12.26			10.1
36	6.24	8.16	6.6	7.5	6.58			6.3
35	11.36	12.18	10.5	11.2	10.97			9.1
34	10.61	12.04	10.3	10.8	10.00			9.0
33	10.59	11.80	10.2	10.3	9.34			9.1
32	7.53	9.08	7.9	6.9	7.36			6.7
31	6.24	7.16	7.0	6.6	6.32			6.3
41	6.36	7.30	6.8	6.0	6.41	5.52	6.0	6.4
42	7.42	9.18	7.8	7.1	7.34	7.01	6.8	6.8
43	10.50	11.77	10.4	10.7	9.41	10.33	9.7	9.2
44	10.49	11.99	10.5	10.6	10.01	10.29	9.8	9.0
45	11.38	12.17	10.7	10.2	10.89	10.85	10.5	8.9
46	6.14	8.19	6.6	7.2	6.47	5.78	5.6	5.7
47	11.83	12.61	11.4	12.0	12.41	11.5	11.0	9.8

Table VII: Mean eruption time of female children in different countries

Tooth Type	America	Asia			Europe	Africa	Australasia	This study
Country	Costra Rica	India	Pakistan Karachi	Pakistan Peshawar	Czchoslo-vakia*	Nigeria	New* Zealand**	Pakistan Larkana
Year	2021	2020	2011	2019	2017	2014	2012	
17	11.84	13.04	12.0	8.3	12.48	11.61	11.3	10.4
16	6.54	7.96	6.6	6.3	6.62	5.95	5.7	6.2
15	11.05	12.37	10.8	10.7	10.86	10.75	10.3	8.8
14	10.03	11.56	10.1	9.4	9.37	9.76	9.5	9.4
13	10.83	12.07	10.7	9.8	10.45	10.45	9.7	9.2
12	8.06	10.57	8.4	8.3	7.61	7.68	7.3	7.7
11	7.05	8.17	7.5	7.7	6.89	6.45	6.4	6.8
21	7.10	8.16	7.5	*6.9*	6.93			6.9
22	8.01	10.52	8.3	*7.8*	7.58			7.8
23	10.93	12.08	10.9	*9.5*	10.47			9.3
24	10.05	11.65	10.1	*9.8*	9.37			8.8
25	10.94	12.32	10.7	*9.4*	10.78			8.9
26	6.53	8.15	6.7	*6.7*	6.58			6.1
27	11.92	13.08	12.0	*10.6*	12.60			10.3
37	11.44	12.80	11.5	11.2	11.84			9.7
36	6.32	8.54	6.5	6.7	6.20			6.5
35	10.86	12.19	10.7	9.6	10.68			9.8
34	10.13	11.91	10.3	9.6	9.72			9.0
33	9.98	11.63	10.0	9.2	9.19			8.9
32	7.41	8.68	8.0	7.3	7.20			6.9
31	6.15	7.36	7.1	6.7	6.16			6.0
41	6.08	7.54	7.0	6.8	6.21	5.83	5.6	6.5
42	7.30	8.98	7.7	8.1	7.18	6.58	6.5	6.9
43	10.04	11.55	10.0	9.6	9.12	9.65	9.0	9.0
44	10.13	11.89	10.4	9.6	9.75	9.80	9.4	9.2
45	10.89	12.13	10.8	8.3	10.62	10.56	10.1	9.2
46	6.25	8.34	6.4	6.6	6.17	5.59	5.4	6.6
47	11.47	12.79	11.2	11.2	11.81	11.25	10.7	9.7

*Median values **Due to contra-lateral similar values, only right-side quadrants are reported

Only one country has chosen from each continent to avoid large tables. A quick review showed that Larkana children show early eruption as compared to other races and nationalities. However, the eruption time of Larkana children (both boys and girls) is much closed to the Peshawar children.[12]

Using the parentage of teeth erupted at the time of eruption of any tooth, the sequence of eruption in maxillary and mandibular jaws were as follows:

Maxillary teeth: first molar, central incisor, lateral incisor, first premolar, canine, second premolar, and second molar.

Mandibular teeth: first molar, central incisor, lateral incisor, canine, first premolar, second premolar, and second molar.

Table VIII shows the sequence of eruption of time of few countries along with the Pakistani data and current study.

Table VIII: Sequence of eruption of teeth of different countries

Country	Gender	Maxillary	Mandibular
Pakistan (Larkana) Current study	**Combined**	**6,1,2,4,3,5,7**	**6,1,2,3,4,5,7**
Pakistan (Peshawar)[12]	Combined	6,1,2,4,5,3,7	1,6,2,3,4,5,7
Pakistan (Islamabad)[21]	Boys	6,1,2,4,3,5,7	6,1,2,4,3,5,7
	Girls	6,1,2,4,3,5,7	6,1,2,3,4,5,7
Pakistan (Karachi)[1]	Combined	6,1,2,4,5,3,7	6,1,2,3,4,5,7
Costa Rica[4]	Boys	6,1,2,4,3,5,7	6,1,2,3,4,5,7
	Girls	6,1,2,4,3,5,7	1,6,2,3,4,5,7
Lebanon[9]	Combined	6,1,2,4,5,3,7	6,1,2,4,3,5,7
Indonesia[10]	Boys	6,1,2,4,5,3,7	1,6,2,3,5,4,7
	Girls	6,1,2,4,5,3,7	6,1,2,3,4,5,7

India[11]	Combined	6,1,2,4,3,5,7	1,6,2,3,4,5,7
Spain[14]	Combined	6.1.2.4.5.3.7	1,6,2,3,4,5,7
Czechoslovakia[15]	Boys	1,6,2,3,4,5,7	6,1,2,4,5,3,7
	Girls	6,1,2,4,3,5,7	1,6,2,3,4,5,7
Egypt[16]	Boys	1,2,6,4,5,7,3	6,1,2,4,3,5,7
	Girls	1,2,6,4,5,7,3	1,2,6,3,4,5,7
Sothern African[17]	Boys	6,1,2,4,3,5,7	1,6,2,3,4,5,7
	Girls	6,1,2,4,3,5,7	6,1,2,3,4,5,7
Nigeria[18]	Boys	6,1,2,4,3,5,7	1,6,2,4,3,5,7
	Girls	6,1,2,4,3,5,7	1,6,2,3,4,5,7
New Zealand[19]	Combined	6,1,2,4,3,5,7	6,1,2,3,4,5,7

1 = central incisor, 2 = lateral incisor, 3 = canine, 4 = first premolar, 5 = second premolar,
6 = first molar, 7

The sequence of eruption of maxillary teeth of this study matched with the children of Islamabad,[21] Costa Rica,[4] India,[11] Czechoslovakia (girls).[15] South Africa,[17] Nigeria,[18] and New Zealand[19]. However, the second pre-molar indicated early eruption than canine among the children of Peshawar,[12] Karachi,[1] Lebanon,[9] Indonesia,[10] Spain,[14] and Czechoslovakia (boys)[15] as compared to the current study. Elkhatib[16] reported a very different result for this jaw, of not only first molar erupted after first and lateral incisors, but canine erupted by the end after the second molar for both boys and girls.
The sequence of the eruption of mandibular teeth of this study agreed with the children of Islamabad,[21] Karachi,[1] Costa Rica (boys),[4] Indonesia (girls),[10] Southern Africa (girls),[17] and New Zealand.[19] However, in some studies,[4,11,12,14,15,16,17,18] central incisor erupted earlier than first molar and, in some studies,[9,10,15,16,18] canine erupted earlier than first premolar.

Discussion

Khan et al have conducted a series of studies on the time and sequence of eruption of permanent teeth for the children of Pakistan.[1,12,13] Khan et al[1,12,13] discussed the time of the eruption of Pakhtoon children, living in the province of Khyber Pakhtoon Khwa and Khan[1] illustrates the time of eruption of Karachi children. Even though Karachi is the largest city and capital of Sindh province, the data of this study showed that an overwhelming majority (83.5%) of the children belonged to Mohajir (emigrant from India) background and only 4.2% of children indicated the Sindhis background.[22] This small percentage of children from the Sindhis ethnic population was not adequate to make any reasonable standard for the time of eruption of this population. Therefore, this study was conducted in Larkana, Sindh, where an overwhelming population (98%) consisted of Sindhis ethnicity.
Literature indicates that the eruption of permanent teeth is influenced by many biological and environmental factors. It is affected by genetics, gender, nutrition, preterm birth, socioeconomic factors, height and weight, craniofacial morphology, hormonal factors, systemic diseases, ethnicity, congenital abnormalities, cleidocranial dysplasia, and environments.[2,3] One of the major factors is ethnicity, which is related to many other factors which are mentioned above. Therefore, to conduct a study of the eruption of teeth in a population, this factor should be kept in mind. As Mehdi et al[24] reported in research of 'Y' chromosome analysis of Pakistani samples the North-south distinction of the population of Pakistan could be due to two different migrations, one from North Africa and the other from sub-Sahara regions. Hence Sindhis could be ethnically different from the population living in the northern part of Pakistan. Therefore, the observations of this study are dealing with the different ethnical populations as compared to other studies conducted earlier for other regional populations of Pakistan.
As indicated in the introduction that as far as the authors' knowledge is concerned, no study has been published on the Sindhi population for the time and sequence of eruption of permanent teeth. Hence, this is the first study that has been conducted to establish the time and sequence of permanent teeth for the children of the Sindhi population. Since the sample size of 1205

cases drawing from 15 primary and permanent schools is quite large enough, therefore, the outcome of this study could be considered as the estimated values for the standard time and sequence of the children of the Sindh ethnic population.

The minimum eruption time among maxillary teeth of boys belonged to the left central incisor (#21) followed by left first molar (#26) and maximum time of eruption attributed to the left 2nd molar. These values are lower than the respected teeth in all the studies mentioned in Table 6. The right first molar showed the lowest eruption time among the mandibular teeth, followed by the left central incisor. The maximum eruption time belonged to the left 2nd molar for this jaw. Again, most of the eruption times mentioned in Table 6 were above the current study. However, they are closed to the study conducted on the children of Peshawar[12] and New Zealand[19]. The minimum eruption time among girls in the maxillary jaw was for the left 1st molar (#26), followed by the right 1st molar (#16). The maximum eruption time belonged to the right 2nd molar (#17). The eruption time of female children is also earlier than American and European children but closed to Peshawar[12] and New Zealander[19] children. Literature indicates that the eruption time of permanent teeth of African children is mostly earlier than the American and European children[2]. The dietary pattern is somehow similar all over Pakistan due to national and religious similarities. Probably, the outcome of this study is similar to the Peshawar children due to these factors. However, further studies are needed to determine, why the time of eruption of permanent teeth of this population is quite lower than European children but similar to New Zealanders children, even though the majority of Aucklandians (location of New Zealand study) are European.

Comparing the eruption time of males and children showed that there was no trend of early or late eruption in any direction and only one tooth (#21) showed a significant difference. This result is similar to Pakistani (Karachi)[1] and Indian[11]children. However, other studies[10,11,15,16,18,19,23,25] mostly belonged to the European and South African children showed that most of the teeth of girls erupt earlier than male children with a significant difference. Furthermore, few studies[5,17,20,22] belonged to Central America (Costa Rica), North Africa (Egypt), and Asia [Pakistan (Rawalpindi)] showed a trend of the early eruption of girls than boys, but without statistical significance.

The early eruption time of mandibular teeth than the opposite maxillary teeth are similar to the other studies.[1,2,8,16] Eruption time of left and right contralateral teeth are in almost the same as reported in other studies.[1,2,8,14,15]

Thirteen teeth showed a significant correlation between eruption time and height of the children and five teeth showed the partial correlation between these two variables, controlling the weight. However, seventeen teeth displayed a significant correlation of eruption time with the weight of the children, while 5 teeth showed a significant correlation of these two variables, controlling with the height of the children. Considering BMI, 5 teeth showed a significant correlation with eruption time. The study of Karachi[1] and Peshawar[12] showed a greater number of teeth significantly correlated with the height and weight of children. However, as this study showed that the height is correlated with time of eruption in larger number of teeth as compared to the correlation with weight, is similar to the previous studies of Karachi[1]. However, the Peshawar[12] study showed vice versa. The result of only a few significant correlations of eruption teeth with BMI is similar to the Karachi[1] study, but other studies of Peshawar[12] and India[11] indicated a higher number of significant positive correlations between BMI and eruption time. The partial correlation of eruption time with height controlling weight, and weight controlling height were in fewer numbers than the

children of Karachi[1] and Peshawar[12] studies. The study indicates that the taller and heavy children of Larkana showed late eruption, irrespective of their weight or height. It was also re-emphasized by the fewer cases of correlation of eruption time with BMI.

In this study, radiographs were not used, which could also give information of hypodontia and impacted teeth. Oznurhan[26] indicated that without radiographic evaluation, studies led to overestimation of the eruption time. However, most of the investigations on this subject conducted cross-sectional studies on oral screening. Therefore, for comparison purposes, this methodology was adopted. The results should be read with caution, because in many children the chronological age and teeth development do not match, within the same population, due to other factors such as hereditary and dietary habits of the families[16], and consequently, the outcome summary statistics become inconsistent.

Conclusions

It showed that even though Sindh is a province of Pakistan, but due to some different genetic composition, the time of eruption of permanent teeth of Sindhi children is similar to Pakhtoon living in Khyber Pakhtoon Khwa, but somehow different than Mahajir living in Karachi.

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