EFFECT OF DIET ON ERUPTION TIMES FOR PERMANENT TEETH OF CHILDREN IN PESHAWAR

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ABSTRACT

The objective of this study was to find out any association between eruption times of permanent teeth and consumption of meat, rice, vegetables and milk in children of Peshawar. A team consisting of "a dentist and an assistant" visited randomly selected schools. Children with consent from their parents underwent oral check-ups and those having a "just erupted tooth" in the oral cavity were chosen for further investigation. These children were then examined for being 'erupted', 'just erupted' and "unerupted" teeth. Along with the time of eruption, information regarding gender, height, weight and dietary habits (consumption of meat, vegetable, rice and milk) in the family were also collected. Out of 1945 children, 1066 (54.8%) were females with mean age of 8.98 (±2.16) years and 879 (45.2%) were males with mean age of 10.2 (±2.63) years. The mean eruption time of mandibular right central incisor (# 41) was lowest while right mandibular second molar (#47) was the last tooth to erupt. There were no significant associations between eruption times of permanent teeth and consumption of meat, rice, vegetable and milk by the children. However, more frequent use of meat showed a trend of early eruption and more frequent use of vegetables showed a trend towards late eruption of permanent teeth.

Key words: *Eruption times, permanent teeth, effect of diet, school children*

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INTRODUCTION

Eruption of a tooth is a natural biological phenomenon, where the tooth emerges from alveolar bone to its functional position. Permanent teeth start emerging into mouth at about 6th year of age. The time and sequence of eruption differ in various ethnic groups. The eruption timings are said to be dependent on diet, gender, height, weight, socioeconomic status, craniofacial growth & morphology, pre-mature extraction of primary teeth, fluoride intake and environmental factors.[1] Therefore, it is recommended to determine timings and sequence of eruption separately in children of various ethnic groups.[2] It is also recommended to repeat this exercise after certain period of time to find out the effects of changing dietary habits and life style on the timings and sequence of eruption in permanent teeth.[3] The data obtained through eruption timings and sequence studies have vital use in the fields of Pediatric Dentistry, Orthodontics, Forensic Dentistry and Oral Surgery.[4]

Several studies have been conducted recently in Africa (Nigeria[5], Sudan[6] and South Africa[7]), America (USA[8,9], Maxico[10], Brazil[11]), Asia (Paksitan[2,4,12], Saudi Arabia[13-15], Iraq[16], Filipine[17], Malaysia[18], India[19-21], Sri Lanka[22], Jordan[23], Nepal[24], Syria[25], and Turkey[26,27]), Australasia (New Zealand[28]) and Europe (Spain[29], Lithuania[30], Czechoslovakia[31], United Kingdom[32] and Greece[33]) to determine eruption timings of permanent teeth. However, very few studies have investigated the association between the timings of eruption and dietary habits. Only one study has been conducted to determine the association between eruption timings of permanent teeth and dietary habits.[34] This study was conducted before partition of subcontinent in 1946 on children of rice-eating areas (Madras, South India) and wheat-eating areas (Lahore, North-west India). Since then, major changes have occurred in dietary habits during last 70 years. The objective of this study was to find out any association between eruption timings of permanent teeth and the type of food consumed in children of Peshawar, the Capital city of Khyber Pakhtunkhwa Province Pakistan.

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METHODOLOGY

This investigation was part of a countrywide study conducted to determine the timings and sequence of eruption of permanent teeth. A part of the data on Peshawar children has been published in another journal.[4] The detailed methodology has been discussed over there. The study was approved by the Institutional Review Board of Dow University of Health Sciences, Karachi. Inter-examiner reliability and training procedure have been discussed in the earlier article.[4] A team consisting of a dentist and an assistant visited the selected schools on arranged date and time. A consent Form in Urdu was sent to the parents few days before the visit of the dental team. Those children who brought positive consent from their parents and gave assent to be included in the study were screened for oral checkup. Children having a 'just erupted tooth' in the oral cavity were taken out of the class for further investigation. Just erupted tooth was defined as "a tooth where any part of the tooth is just visible in the oral cavity." Tooth was labeled as 'unerupted', if tooth was not visible in the mouth; and tooth was defined as 'erupted', if entire occlusal surface/mesiodistal width of the tooth was visible. Each permanent tooth was labeled as 'erupted', 'just erupted' or unerupted. Along with the time of eruption, information regarding gender, height, weight and dietary habits (consumption of meat, vegetable, rice and milk) in the family were also collected from the children. The questionnaire used for data collection was pre-tested during inter-examiner reliability and training, before the study began. The same questionnaire was used earlier for the data collection in Karachi. Date of birth was noted down from the school records.[5,16] The composition and components of the food items included in this study are as follows:

A cup of rice contains, 242 calories, 53 grams of carbohydrates and 4.39 grams of protein. Different vegetables contain different nutrition. However, in general vegetables contain calcium, fiber, folate, potassium, magnesium, sodium, vitamin A and C. One hundred gram of mutton contain 73.2 grams of moisture, 21.5 grams of protein and 4.0 grams of fat while 100 gram of beef contains 73.1 grams of moisture, 23.2 grams of protein and 2.8 grams of fat. A cup of whole cow milk (240 grams) contains 149 calories, 11.7 grams carbohydrate, 7.7 grams protein, 12.3 grams sugar and 8 grams fat. Milk is a rich source of protein and fat.[35-37]

Data were entered and analyzed using SPSS (version 21.0). Chi-square and two independent sample t test were used for association of categorical variables and comparing two means of continuous variables respectively.

RESULTS

One thousand, nine hundred and forty five children (those with at least one just erupted tooth) were selected from 21 schools (randomly selected) of urban and peri-urban areas of Peshawar. One thousand and sixty six (54.8%) children were females with mean age of 8.98 (±2.16) years [Range: 3-15 years], and eight hundred and seventy nine (45.2%) were males with a mean age of 10.2 (±2.63) years [Range: 3-15 years]. The mean height, weight and Body Mass Index (BMI) for females were 132.51 (±12.99) cm, 29.74 (±8.53) kg and 16.82 (±4.47) kg/m^2, respectively. The mean height, weight and BMI for males were 136.82(±15) cm, 37.40(±12.27) kg and 19.88(±6.13) kg/m^2, respectively. The differences in means of males and females for age, height, weight and BMI were statistically significant ($p<0.0001$). The mean eruption time of mandibular right central incisor (#41) was lowest in the list, while right mandibular second molar (#47) was the last tooth to erupt (Table - 1).

Table - 2 presents possible relationship between per week meat consumption and eruption timings of permanent teeth. Majority (18/28) of teeth type showed no significant ($p>0.05$) association between per week meat use and eruption timings. Six out of 10 teeth types that showed statistically significant ($p<0.05$) association, showed lower mean eruption times in frequent meat users ($\geq$ 4 times/week) as compared to less frequent users ($\leq$ 3 times/week). Remaining four were either central or lateral incisors. In total 16 out of 28 teeth types showed early eruption (irrespective of significance) for the children who eat meat more frequently.

Table - 3 presents information about possible effect of vegetables consumption on the eruption of permanent teeth. Eleven out of 28 teeth type showed significant association ($p<0.05$) between per week frequency of vegetables consumption and the eruption timings. Eight out of these eleven teeth type showed earlier eruption times in children who used vegetables less frequently ($\leq$ 3 times/week) as compared to frequent users ($\geq$ 4 times/week). Remaining three were either central or lateral incisors. In total, 21 teeth type showed early eruption in children who consumed vegetables less frequently.

Table - 4 presents comparison of tooth eruption times between less frequent rice users ($\leq$ 3 times/week) to the more frequent users ($\geq$ 4 times/week). Only 3 teeth out of the 28 showed significant ($p<0.05$) difference between the two categories. No specific trend was observed in the mean eruption time for less or more frequent users of rice.

Comparison of tooth eruption timings between less

TABLE 1: MEAN ERUPTION TIMES (IN YEARS) OF PERMANENT TEETH (EXCEPT THIRD MOLARS)

Tooth Number	Number of Cases	Mean	Median	SD	Tooth Number	Number of Cases	Mean	Median	SD
17	138	9.3	10.1	3.0	47	363	11.8	11.8	1.6
16	18	6.6	5.3	2.6	46	83	7.0	6.5	1.9
15	40	10.1	10.1	2.2	45	57	9.4	9.8	2.7
14	104	9.5	9.5	1.9	44	143	10.2	10.1	1.9
13	240	10.5	10.7	1.9	43	198	10.1	10.2	1.8
12	139	8.3	8.1	1.7	42	117	7.8	7.5	1.8
11	71	7.4	7.3	1.5	41	59	6.5	6.4	1.3
21	76	6.7	6.6	1.1	31	51	6.7	6.5	1.5
22	112	7.9	7.9	1.7	32	125	7.11	7.2	1.7
23	241	10.3	10.7	2.0	33	212	9.8	10.0	2.0
24	87	9.7	9.7	1.7	34	173	10.2	10.2	1.9
25	42	9.8	10.0	2.1	35	71	10.4	10.3	2.2
26	20	7.1	5.6	2.7	36	103	7.2	6.7	2.0
27	95	11.6	11.8	2.0	37	429	11.6	11.7	1.8

SD: Standard Deviation

TABLE 2: COMPARISON OF ERUPTION TIMES BETWEEN TWO CATEGORIES OF MEAT CONSUMPTION

Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value	Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value
17	55	11.8±1.3	81	10.4 ±1.5	<0.0001	47	303	11.8 ±1.5	55	11.8 ± 1.9	0.898
16	13	5.5 ± 1.1	5	5.6±1.5	0.879	46	65	6.9 ± 1.7	17	7.3 ± 2.5	0.540
15	31	10.3±2.1	8	9.5±2.4	0.339	45	39	10.5 ± 1.9	17	9.4 ± 2.3	0.060
14	82	9.6±1.8	20	8.8±1.9	0.086	44	127	10.1 ± 1.9	13	10.7 ± 2.2	0.273
13	189	10.7±1.8	49	10.0±2.1	0.013	43	149	10.3 ± 1.7	47	9.8 ± 2.1	0.199
12	91	8.3±1.7	44	8.4±1.7	0.791	42	68	7.6 ± 1.6	44	8.4 ± 2.2	0.038
11	34	7.1±1.0	34	8.2±2.0	0.005	41	35	6.6 ± 1.3	22	7.6 ± 2.0	0.028
21	45	6.7±1.2	30	7.6±2.0	0.044	31	30	6.8 ± 1.5	19	6.5 ± 1.7	0.848
22	78	8.2±1.7	32	7.9±1.8	0.424	32	85	7.6 ± 1.6	39	7,2 ± 2.0	0.210
23	194	10.5±1.8	43	9.7±2.5	0.039	33	161	10.2 ± 1.4	47	9.1 ± 2.4	0.004
24	65	9.8±1.7	21	9.5±1.6	0.522	34	128	10.4 ± 1.7	44	10.0 ± 2.1	0.232
25	25	10.3±1.8	17	9.0±2.2	0.032	35	37	11.3 ± 1.9	33	9.3 ± 2.1	<0.0001
26	13	6.2±1.9	7	6.8 ± 2.8	0.171	36	89	7.2 ± 2	14	7.4 ± 2.2	0.697
27	69	11.9±1.5	24	12.0 ± 1.8	0.820	37	353	11.7 ± 1.6	71	11.4 ± 2.2	0.264

TABLE 3: COMPARISON OF ERUPTION TIMES OF PERMANENT TEETH BETWEEN THE TWO CATEGORIES OF VEGETABLE CONSUMPTION

Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value	Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value
17	80	10.5±1.7	53	11.7±1.2	<0.0001	47	140	11.5±1.7	221	12.0±1.5	0.020
16	9	5.4±0.9	9	5.6±1.2	0.711	46	53	7.0±1.8	29	7.1±2.0	0.803
15	12	9.6±1.6	25	10.6±2.2	0.190	45	26	9.8±2.1	29	10.4±2.2	0.270
14	38	9.4±2.2	62	9.5±1.7	0.784	44	44	9.8±1.7	97	10.4±2.0	0.100
13	92	10.4±1.8	142	10.6±2	0.312	43	94	9.9±1.7	99	10.4±1.9	0.043
12	65	8.6±1.7	68	8.1±1.7	0.120	42	72	8.4±1.7	38	7.1±1.9	0.001
11	44	7.3±1.5	24	6.8±0.8	0.040	41	37	7.4±1.9	18	6.4±1.1	0.034
21	40	7.3±1.9	35	6.7±1.2	0.092	31	29	6.7±1.6	20	6.9±1.5	0.598
22	52	8.2±1.8	54	8.0±1.7	0.684	32	74	7.4±1.4	50	7.5±1.9	0.898
23	86	9.7±2.1	149	10.8±1.8	<0.0001	33	81	9.6±1.7	126	10.2±1.8	0.019
24	33	9.6±1.9	51	9.7±1.5	0.752	34	76	9.9±1.6	90	10.6±1.9	0.025
25	21	9.1±1.6	20	10.7±2	0.006	35	39	10.2±2.3	27	10.7±2.2	0.338
26	9	7.3±2.5	10	6.2±2.0	0.331	36	59	7.2±1.9	44	7.3±2.2	0.817
27	38	11.7±1.7	56	11.9±1.5	0.485	37	147	11.4±1.9	278	11.8±1.7	0.044

TABLE 4: COMPARISON OF ERUPTION TIMES OF PERMANENT TEETH AMONG TWO CATEGORIES OF RICE CONSUMPTION

Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value	Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value
17	111	10.8±1.9	23	11.0±1.7	0.609	47	277	11.8±1.7	83	11.8±1.4	0.832
16	16	5.8±1.5	2	7.4±1.4	<0.0001	46	60	7.0±1.9	23	7.1±1.8	0.902
15	33	10.3±2.3	6	10±1.9	0.695	45	44	9.8±9.8	11	8.4±2.9	0.129
14	77	9.4±1.9	26	9.6±1.9	0.612	44	109	10.1±2.0	32	10.0±1.6	0.646
13	193	10.6±1.8	45	10.1±2.2	0.092	43	149	10.2±1.8	44	9.8±2	0.166
12	101	8.4±1.6	31	8.4±2.1	0.829	42	82	7.9±1.9	29	8.1±2.0	0.618
11	52	7.2±1.2	13	7.1±0.8	0.864	41	35	6.4±1.0	19	6.5±1.1	0.869
21	50	6.9±1.2	22	7.3±1.4	0.338	31	32	7.0±1.7	15	6.2±0.7	0.032
22	72	8.0±1.4	33	8.3±2.3	0.489	32	94	7.4±1.7	26	7.9±2.1	0.196
23	185	10.3±2.1	53	10.5	±1.8	0.572	33	156	51	9.3±2	0.018
24	67	9.7±1.5	20	9.4±2.1	0.554	34	123	10.3±1.9	47	9.9±1.9	0.142
25	28	9.7±2	14	8.9±1.7	0.209	35	57	10.5±2.2	12	9.7±2.2	0.295
26	14	6.6±2.4	5	7.2±2.5	0.602	36	71	7.2±2.2	32	7.3±0.3	0.848
27	75	11.6±2	19	11.5±2.2	0.875	37	321	11.7±1.8	106	11.4±1.7	0.105

frequent users of milk (≤ 3 times/week) and more frequent users (≥ 4 times/week) is presented in Table 5. Only 3 out of 28 teeth showed statistically significant difference ($p<0.05$) between the two categories. Milk consumption also did not show any specific trend in the time of eruption for less or more frequent users.

DISCUSSION

This was the first study carried out on timings of eruption of permanent teeth in children from Khyber Pakhtunkhwa Province in Pakistan; and was one of the few studies that attempted to explore any relationship between the eruption timings and dietary habits.

TABLE 5: COMPARISON OF ERUPTION TIMES OF PERMANENT TEETH AMONG TWO CATEGORIES OF MILK CONSUMPTION

Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value	Tooth Number	N	≤ 3 times/ week	N	≥ 4 times/ week	P value
17	42	11.36±1.6	90	10.1±2.4	0.002	47	171	11.7±1.6	164	12.0±1.7	0.098
16	11	5.6±1.2	6	5.2 ±1.0	0.627	46	30	7.0±1.9	43	7.1±2.1	0.891
15	18	10.5±1.8	19	10.2±2.3	0.657	45	16	10.3±1.7	34	10.2±3.1	0.881
14	38	9.7±2	61	9.3± 1.8	0.394	44	53	9.9±1.6	79	10.4±2.1	0.155
13	97	10.5±1.7	127	10.4±2	0.664	43	65	10.1±1.5	118	10.1±2	0.771
12	46	8.2±1.7	80	8.5±1.7	0.414	42	40	7.7±2.0	71	8.1±1.8	0.346
11	18	7.0±1.3	45	7.2±1.1	0.517	41	15	6.5±1.2	42	6.4±1.3	0.801
21	34	6.4±1.0	36	6.7±1.1	0.191	31	16	6.5±1.2	30	6.9±1.8	0.173
22	33	7.5±2.1	64	7.7±1.5	0.030	32	54	7.4±1.8	65	7.5±1.8	0.863
23	102	10.5±1.7	119	10.2±2.2	0.412	33	85	10.1±1.4	113	9.5±2.3	0.048
24	37	9.7±9.7	39	9.9±1.4	0.576	34	64	10.2±10.2	98	10.3±2.1	0.713
25	17	9.7±1.9	22	9.2±2	0.423	35	23	10.9±2	40	10.2±2.4	0.266
26	11	6.3±2.0	9	7.1±2.6	0.420	36	38	7.0±1.8	53	7.3±2.3	0.411
27	49	12.2±1.6	39	11.6±1.5	0.119	37	203	11.7±1.5	194	11.7±2.1	0.878

Only one study has been conducted (in pre-partitioned Pakistan) to determine the effect of diet on eruption timings of teeth comparing rice eaters with wheat eaters.[34] Ortega et al.[38] showed that obese children obtain greater proportion of energy from proteins and fats and less energy from carbohydrates. The results imply that obese children consume foods with high proteins and fats, e.g. meat and milk. Wong et al[39] showed that permanent teeth erupted earlier among obese children as compared to normal or underweight children. It may be concluded from the results of the above mentioned studies that children who consume more proteins and fats display higher number of teeth (at a specific age) as compared to children who consume more carbohydrates. Current study also showed that children who consumed more meat had tendency for early eruption of permanent teeth than the children who consumed more vegetables.

Furthermore, Verma et al[40] showed that children of upper-middle and upper socioeconomic classes carry larger number of teeth than middle and lower socio-economic classes at a specific age. Usually families of upper socioeconomic class utilize meat and milk more frequently than lower socioeconomic class. Shourie[34] (1946) compared the time of eruption of permanent teeth between rice-eating boys of Madras and wheat-eating boys of Lahore.

The first and second molars, the central incisors and the canines erupted earlier in Lahore boys (wheat–eating area) than the Madras boys (rice-eating area). This difference could also be attributed to consumption of larger amount of meat among the children of Lahore due to no restriction in meat consumption in Muslim faith.

Children in the present study were from urban and peri-urban areas of Peshawar. The children in rural areas are likely to have different dietary pattern. The study also did not include children from religious schools (Madaris). Most of these children live in hostels and have controlled diet schedule. So, the results of this study are limited to urban and peri-urban children. Also, the effect of various foods on the eruption timings of various permanent teeth needs to be investigated on larger variety of food. Furthermore, the responses regarding the desirability bias for diet pattern due to social pressure could also affect the outcomes as mentioned by Hebert et al[41]. In addition, most of the time the dining table has mixed food items for our meals. However, asking the question for each food item separately has had somehow reduced this limitation. Due to above mentioned limitations, the results of this study should be read with caution. The information regarding food was obtained from children who were reasonably older enough to provide the information. As already mentioned in the methodology section, data regarding date of birth of children were obtained from schools (more authentic than any other source).

CONCLUSION

This study did not show any significant association

between eruption time of permanent teeth with consumption of meat, rice, vegetable and milk. However, more frequent use of meat comparatively showed a trend towards earlier eruption times among the study sample.

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