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The inter relationships among growth parameters (weight, height) and ectopic eruption of permanent first molars of children aged 6-9 years in Kerman, Iran

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Original Article

Abstract

BACKGROUND AND AIM: Ectopic eruption (EE) of the permanent first molars (PFMs) results from a discrepancy between the jaw growth rate and the growth rate of these teeth. The present study was undertaken to evaluate the prevalence of EE of PFMs in Kerman, Iran, and then determine the relationship between growth parameters (height and weight) and this developmental anomaly.

METHODS: In the present study, 2025 children aged 6-9 years were examined to determine the prevalence of eruption of PFMs. Examinations were carried out with the use of tongue depressors under adequate light. Height and weight were determined in the control (without EE of PFM) and the case (with EE of PFM) groups, and then registered in the relevant checklist. Descriptive statistical methods were used for the analysis of qualitative data at a confidence interval (CI) of 95%. Chi-squared test was used for comparisons between the two groups in relation to age and gender.

RESULTS: In the present study, prevalence of the EE of PFMs was 2.8% in 6 to 9-year-old children in Kerman. The rate of this developmental anomaly was higher in boys compared to girls and higher in the maxilla than in the mandible; however, the differences were not significant ($P > 0.05$). The prevalence of EE was higher in children with a lower mean age and a lower mean height and weight, which was significant statistically ($P < 0.05$). EE was more common unilaterally than bilaterally, but the difference was not significant ($P > 0.05$). In addition, there was no significant relationship between cleft palate or lip and EE ($P > 0.05$).

CONCLUSION: Children in the lower than normal height and weight percentile are more susceptible to the EE developmental anomaly.

KEYWORDS: Height; Weight; Ectopic Eruption

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Ectopic eruption (EE) is a disturbance of tooth eruption, in which a tooth moves in a path other than its normal path; and if it is not diagnosed on time, it will lead to occlusal problems.¹ Several factors have a role in EE, including a small dental arch, premature eruption of permanent first molars (PFMs), and deviation from the normal path of eruption. The prevalence of EE of PFM has been reported to range from 1.6% to 6%. It

occurs more commonly in boys than girls and in the maxilla than in the mandible. In children with cleft lip and/or cleft palate, EE is more prevalent than healthy children; it is also more prevalent in the family members of an afflicted individual than the general population. In 66% of cases, the PFM with EE is released from its locked position and erupts to reach the occlusal level, which is referred to as reversible EE (jump). In the irreversible state (hold), the PFM remains in

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its locked position, pending treatment.² The odds of spontaneous correction of EE are higher in girls than boys.¹ The EE of PFM is classified in terms of the extent of resorption of the distal root of deciduous second molars.³ Since early diagnosis and informing the parents of the problem are important for managing EE and treatment if necessary, and due to the wide range of the prevalence of EE of PFM, the present study was undertaken to determine the prevalence of EE of these teeth in children in Kerman, Iran. A study on Britain population indicates that EE agent is multifactorial,⁴ and the criteria for the normal growth in children are their height and weight. Developing teeth provides a reliable indication of maturation and biological age; and a balanced diet contains all the elements necessary for the growth of the teeth.⁵

Therefore, in this study, the growth parameters (height and weight) were determined and compared in the control group (without EE of PFM) and the case group (with EE of PFM). The influences of height and weight on the eruption of individual teeth were inconclusive.⁵ A limited number of studies are available in this field, and researchers have suggested further evaluations in order to determine the relationship between growth parameters and EE of PFMs.

Methods

In the present study, 2025 children aged 6-9 years (one third of self-corrections occurred after nine years of age²) were examined to determine the prevalence of EE of PFMs. The children were randomly selected from the private and public sector kindergartens at 6 years of age and from the non-profile and public sector elementary schools in preschool period and in first, second, and third grades up to 9 years of age, which is the normal period for the eruption of PFMs, from the educational districts 1 and 2 in Kerman, Iran. Clinical examinations were carried out using a tongue depressor under proper light by one dental student. The

growth parameters that consisted of height and weight were determined in both the control (without EE of PFM) and case (with EE of PFM) groups. Weight was determined with the use of a perfect glass digital weighing machine and height was determined with the use of a G-Time engineering measuring tape, and they were recorded in a checklist. The criteria for EE of the tooth in question consisted of the following: 1) a tooth with only its occlusal surface visible in the oral cavity, with no visible mesial marginal ridge; 2) a tooth with its occlusal surface visible in the oral cavity and with a definite distal inclination in the tooth axis of the deciduous second molar of the affected side.² A checklist was completed for children with EE in school, consisting of data on gender, the affected jaw, unilateral or bilateral nature of the problem, and the presence or absence of cleft lip and/or palate. The following formula was used to calculate the samples' size by considering the minimum prevalence rate of 1.6% for EE of PFM and by considering $\alpha = 0.05$, $d = 0.01$, $Z = 1.96$, and $P = 0.05$.

$$n = \frac{Z^2_{(1-\alpha/2)} P(1-P)}{d^2}$$

The protocol of the study was approved by the Ethics Committee of Kerman University of Medical Sciences under the code IR.KMU.REC.1394.733 after gaining permission from the Kerman Education Organization.

Results

A total of 2025 children aged 6-9 years underwent dental examinations for the evaluation of EE of PFM. To achieve the aims of the study, data were analyzed with descriptive statistics at a confidence interval (CI) of 95%. Chi-squared test and logistic regression analysis were used to compare variables such as gender, age, cleft lip and palate, jaw type, the unilateral or bilateral nature of the problem, and growth parameters (height and weight) between the control and case groups.

The subjects had a mean age of 7.17 years, with a mean height of 124.33 cm and a mean weight of 24.59 kg. A total of 1248 subjects (61.6%) were male and 777 (38.4%) were female.

Based on figure 1, 56 subjects (2.8%) of all the children evaluated exhibited EE of PFM.

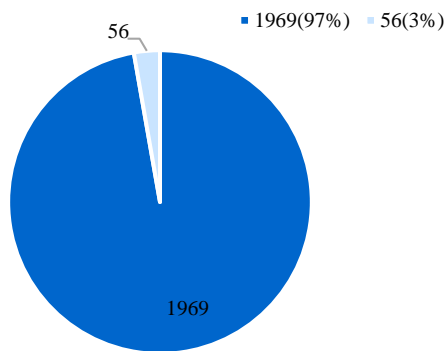


Figure 1. Children's frequencies (percent) in terms of ectopic eruption (EE) of permanent first molar (PFM)

The results of the present study showed a higher rate of EE of PFM in children with a lower mean age, with a significant relationship between the mean age and EE ($P = 0.001$). In addition, there was a significant relationship between EE in any age group and growth parameters (height and weight) in the subjects ($P = 0.001$).

Based on data presented in table 1, in children with lower mean weight and height, there was a higher rate of EE.

In this study, the frequency was higher in boys compared to girls but the difference was not significant ($P = 0.673$).

Figure 2 shows the frequencies of children with EE of PFMs in terms of age. The frequency was higher in 6 and 7 years old.

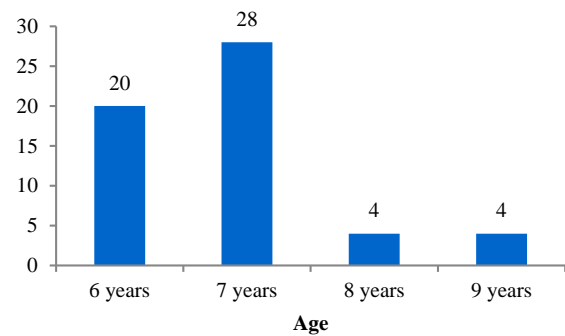


Figure 2. Frequencies of children with ectopic eruption (EE) of permanent first molar (PFM) in terms of age

Figure 3 presents the frequencies of children with EE of PFM in terms of jaw type. Of 56 children with EE, 31 cases were in the upper jaw and 14 were in the lower jaw, with 11 in both jaws.

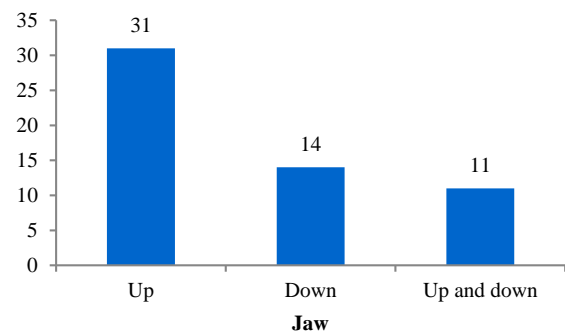


Figure 3. Frequencies of children with ectopic eruption (EE) of permanent first molar (PFM) in terms of jaw type

In the present study, of 56 children with EE, 39 cases were unilateral and 17 were bilateral; however, the difference was not significant, and of 56 children with EE, 3 had cleft lip and/or palate, and the relationship was not significant.

Table 1. Comparison of age and growth parameters (height and weight) in both control (without ectopic eruption of permanent first molar) and target (with ectopic eruption of permanent first molar) groups

Variable	EE	n	Mean ± SD	P	SE
Age	Yes	56	6.8571 ± 0.8405	0.0001	0.11232
	No	1969	7.6369 ± 1.0210	0.0001	0.02301
Height	Yes	56	119.8554 ± 14.2334	0.0001	1.90202
	No	1969	124.4664 ± 7.3860	0.0190	0.16645
Weight	Yes	56	21.7866 ± 4.4343	0.0001	0.59255
	No	1969	24.6760 ± 5.6647	0.0001	0.12766

SD: Standard deviation; SE: Standard error; EE: Ectopic eruption

Discussion

In the present study, 2025 children who were 6-9 years old, which is the normal period for the eruption of PFM,⁷ underwent clinical examinations for the evaluation of EE of PFM. The prevalence of EE in the study population was 2.8%. The reported prevalence of EE of the first PFM varies from 1.8% to 6.0% in normal population.⁸ Minor difference between the values might be attributed to sample sizes, the age of the children evaluated, and differences in study populations. The prevalence of eruption disturbances was higher than reported earlier, and, even if the disturbances do not occur frequently, it is important to develop an early diagnosis in order to start the treatment at the optimal time.⁹ It was shown in the present study that EE was more prevalent in children with a lower mean age. Although no similar study was found in order to explain the relationship between EE of PFMs and lower mean age in the present study, it might be pointed out that EE of molars is common during the early mixed dentition period;⁷ and the majority of these cases are reversible and are spontaneously corrected before 7 years of age.¹⁰ Therefore, such cases are seen at younger ages rather than at older ages, as confirmed in the present study.

It was shown in the present study that EE of PFMs was more prevalent in children with lower growth parameters (lower means of height and weight). A large number of studies have shown a relationship between the dental system and different variables of growth and development. Physical parameters such as weight, height, skeletal maturation, and tooth development are biometric tests that are considered as standard health parameters in large communities. Height and weight are the physical manifestations of growth and development that have the highest use in diagnostic procedures.¹¹ Kutesa et al. evaluated the relationship between the time of the eruption of permanent teeth and height

and weight in 4 to 15-year-old children and adolescents in Uganda and concluded that there was no significant relationship between them.¹² In many cases, however, the etiology of EE cannot be identified.¹³ EE might be an indication of a discrepancy in the individual's growth and development due to congenital problems or environmental interferences.¹ Of all the numerous studies that have evaluated growth parameters, there was no similar study to show a significant relationship between a low growth parameters and EE; however, the present study showed that although the main reason for EE is still unknown,² the growth parameters (weight and height) might be a factor effective in EE.

In the present study, the relationship between EE and gender was not statistically significant. Yaseen et al. reported that boys exhibited EE at a higher rate compared to girls.¹ In studies by Barberia-Leache et al.³ and da Silva Filho et al.,¹⁴ also, there was no significant relationship between gender and EE. Therefore, despite the absence of a significant relationship between gender and EE in children, this developmental anomaly is more common in boys compared to girls, which might be attributed to the higher possibility of spontaneous correction in girls compared to boys.¹

In the present study, the relationship between EE and upper or lower jaw was not statistically significant. Other studies also have reported a higher rate of EE in the upper jaw.^{2,15} In a study by Afshar et al., the difference was statistically significant.¹⁵ Therefore, despite the absence of a significant relationship between the jaw type and EE, this anomaly in the present study was more prevalent in the upper jaw compared to the lower jaw, consistent with other studies.

The most frequent tooth to exhibit EE is the maxillary PFM, with Moyers¹⁷ reporting a prevalence rate of 10.3% for this anomaly in American children. Cheyne and Wessels¹⁸ reported that of every 50 children, one exhibits the EE of maxillary PFM.

In the present study, of 56 children with

EE, 39 exhibited it unilaterally and 17 exhibited it bilaterally. Although unilateral EE of PFM was more frequent than bilateral EE, the difference was not statistically significant. Moreover, In the study by Barberia-Leache et al., 36.4% of the cases were bilateral and 63.6% were unilateral.³ However, in the study by Afshar et al., bilateral EE was more frequent than unilateral cases, with a statistically significant difference.¹⁵ Bilateral EE in boys increases the odds of tooth impaction and is an indication of irreversible EE, which requires early intervention for treatment.²

However, more than half of the cases of EE of PFMs are corrected spontaneously in a few months.¹⁶ Therefore, it might be guessed that the majority of cases are unilateral, and in the present study, also, unilateral cases were twice as frequent as bilateral cases, indicating that they are normal in many cases and do not require therapeutic intervention.

In the present study, the relationship between EE and cleft lip and/or palate was not statistically significant. Bjerklin et al. reported a prevalence rate of 25% for EE in

children with cleft lip and/or palate,¹⁶ with Bjerklin et al.¹⁶ and da Silva Filho et al.¹⁴ reporting prevalence rates of 21.8% and 20.0%, respectively.

Limitation of this study is that primary diagnosis of EE is carried out with radiography; therefore, the prevalence of EE of PFMs in children in Kerman is higher than that reported in the present study based on clinical observations; moreover, a large number of self-corrected teeth are missed.

Conclusion

The children in lower means of height and weight are more susceptible to the EE developmental anomaly.

Conflict of Interests

Authors have no conflict of interest.

Acknowledgments

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