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Prevalence of Ectopic Eruption of First Permanent Molars in Panoramic Images of 5-8-Year-Old Children in Sari, Mazandaran Province, North of Iran in 2013-2020

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Abstract

Background

Ectopic eruption is a tooth eruption disorder in which the tooth does not erupt in its proper eruption path. The most common type of ectopic eruption is the mesial eruption of the maxillary first permanent molar, which results in the loss of the second deciduous molars, resulting in a reduction in arch length and loss of space. Therefore, this study aimed to investigate the prevalence of ectopic growth of this tooth in children.

Materials and Methods: This descriptive cross-sectional study was performed on panoramic radiographic images of children aged between 5-8 years. Census sampling method was used in this study. A general dentist under the supervision of an oral and maxillofacial radiologist assessed ectopic eruption according to a grading system described by Barberia et al., all radiographs. The data was analyzed using SPSS software version 16.0.

Results: 772 panoramic radiographs were examined in this study, panoramic radiographs of 79 patients were considered to have ectopic eruption, which 61% of cases were in girls and 39% in boys. 25.6% of the patients had a mild, 60.3% had a moderate, and 14.1% had a severe ectopic eruption. All patients (except one) had a mesial ectopic eruption, 19% of the ectopic eruptions occurred in the maxilla, 59.4% in the mandible, and 59.5% in both jaws. Ectopic eruption in the mandible was more frequent in the mandible than in the maxilla and this finding was statistically significant ($P < 0.05$).

Conclusion

The results of the present study showed that the frequency of ectopic eruption of the first permanent molars in Sari was 10.2%, which is higher than the values reported in studies in other regions of Iran.

Key Words: Children, Ectopic Eruption, Normal Tooth Eruption, Panoramic.

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1- INTRODUCTION

Tooth eruption includes the movement and development of the tooth to its functional position in the occlusal plane in coordination with other teeth. The eruption will continue until a tooth makes contact with its opposing tooth (1). Tooth eruption is mainly controlled by genetic factors, but other factors such as gender and craniofacial morphology can also influence this process (2). Ectopic eruption is a disorder of tooth eruption in which the permanent tooth does not erupt in its proper path which can result in partial or complete tooth resorption of the adjacent deciduous. This disorder is detected during routine radiographic examinations (3). The most common type of ectopic eruption is the mesial eruption of the first permanent maxillary molar, which results in the loss of the second deciduous molars.

Failure to treat this condition leads to a reduction in the length of the dental arch and a lack of space for the eruption of other permanent teeth (4). Ectopic eruption of the first permanent molar is often detected by bitewing and periapical radiographs. Mesial eruption of this tooth can lead to premature root resorption, pulp loss, and loss of space (5). The cause of ectopic eruption of the first permanent molar is not well known, but it is assumed that various environmental and genetic etiological factors can cause ectopic eruption of these teeth, including large permanent molars, severe mesial angle of eruption, crowding, and a small maxillary arch (3). Ectopic growth of the first permanent molar appears as two types: reversible and irreversible. In the reversible type, the molars automatically release themselves from their locked position and enter the occlusion, which occurs in 66% of cases of permanent first ectopic molars. In the irreversible type, the tooth remains in the locked position until treatment is performed or the second primary molars are early extracted (6). Despite the importance of permanent first molars in the occlusion and complications due to non-diagnosis of eruption disorders, and the lack of a study in this field in the population of 5-8 years old children in Sari, this study aimed to investigate the Prevalence of ectopic eruption of the first permanent molars in 5-8-year-old children in Sari, Iran.

2- MATERIALS AND METHODS

2-1. Study design and population

This descriptive cross-sectional study was performed retrospectively on panoramic radiographic stereotypes of children aged 5-8 years (according to the time of eruption of the first permanent molars) who referred to the pediatric ward of Mazandaran University of Medical Sciences Dental Clinic from 2013 to 2020. The sampling method was considered as census and therefore, it was not necessary to determine the sample size as the study included all the panoramic radiographs in the archive of Mazandaran University of Medical Sciences Dental Clinic.

2-2. Measuring

Ectopic eruption was classified according to a grading system described by Barberia et al. (7).

- Grade I. (Mild): Resorption limited to cementum or with minimal penetration into the dentin of the deciduous molars.
- Grade II. (Medium): Dentin resorption without pulp exposure of the deciduous molars.
- Grade III. (Severe): Distal root resorption that causes pulp exposure of the deciduous molars.
- Grade IV. (Very severe): A Resorption that even affects the mesial root of the second deciduous molars.

The present study classified the resorption of the teeth into three grades: moderate, severe, and very severe. Mild analysis cases were not considered in this study due

to the limitation of errors that may exist due to the difficulty of differentiating between mild resorption and the absence of root resorption in radiographic images. The frequency of ectopic erupted molars was calculated by considering the type of dentition (maxilla or mandible, right or left side of the arch) and the type of ectopic eruption and related dental anomalies including supernumerary teeth, microdontia, infra-occlusion, and missing teeth. In this study, a general dentist examined all radiograph archives under the supervision of an oral and maxillofacial radiologist.

2-3. Inclusion and exclusion criteria

The inclusion criteria were children aged 5-8 years who were referred to Sari Dental School from 2013 to 2020. Patients with obvious dentofacial disorders such as cleft lip and palate, patients suffering from craniofacial syndrome or malformation, complete edentulous patients, also patients with any type of bone pathologies such as cysts and granulomas and distorted radiographs were excluded from the study.

2-4. Ethical considerations

The Ethical committee of Mazandaran University of medical sciences approved this study. (Moral code: IR. MAZUMS.REC.1399.7809).

2-5. Data Analyses

Data was collected in terms of percentage, mean, median, standard deviation, and was analyzed using SPSS software version 16.0. Chi-Square and Fisher exact tests were used to analyze the data and a significant level of 0.05 was considered.

3- RESULTS

In this study, 772 panoramic radiographs were examined and panoramic radiographs of 79 patients (61% girls and 39% boys) were considered to have ectopic eruption. The frequency distribution of demographic variables are shown in **Table.1**. The severity of ectopic eruption of 25.6% of the patients was reported mild, 60.3% moderate and 14.1% had a severe ectopic eruption. 78 patients had an ectopic growth that shift mesially, and only one individual had an ectopic eruption with a distal shift. 19% of the ectopic eruptions were located in the maxilla, 59.5% in the mandible and 21.5% of the patients had ectopic eruptions in both maxillary and mandibular arches. No anomalies such as microdenia was observed in any of the patient's radiographs (**Table.2**).

Table-1: Frequency distribution of demographic variables in patients with an ectopic eruption.

Variables (%)		Number (%)
Gender	Female	48 (60.8%)
	Male	31 (39.2%)
Age, year	5	1 (1.3%)
	6	17 (21.5%)
	7	30 (38%)
	8	39.2 (31%)

Table-2: Frequency distribution of clinical variables in patients with an ectopic eruption (n=79).

Variables		Distribution (%)
Arch	Maxillary	15 (19%)
	Mandibular	47 (59.5%)
	Both arches	17 (21.5%)
Number of ectopic eruptions	1	36 (45.6%)
	2	30 (38%)
	3	3 (3.8%)
	4	10 (12.7%)
Grade of ectopic eruption	Mild	20 (25.6%)
	Moderate	47 (60.3%)
	Severe	11 (14.1%)
Ectopic eruption based on Gender	Boys	31 (39%)
	Girls	48 (61%)

Chi-Square and Fisher exact tests were used to analyze the data and a significant level of 0.05 was considered. According to the results, there was no significant relationship between age (P = 0.208), and gender (P = 0.839) of children aged 5-8 years and ectopic eruption. But there is a statistically significant relationship (P=0.023) between the jaw and ectopic growth in children aged 5-8 years, as ectopic eruption is more frequently spotted in the mandible than in the maxilla. The prevalence of ectopic eruption in children aged 5-8 years based on the root resorption grade during 2013 - 2020 is 10.2 per 100 people. 2.6% of this amount is classified as mild, 6.1% moderate and 1.4% is severe. A very severe ectopic eruption was not observed in any of the panoramic radiographs. As an overall result, most patients have experienced moderate ectopic eruption (**Figure.1, Table.3**).

Table-3: Prevalence of ectopic eruption of first permanent molars in children aged 5-8 years based on root resorption.

Grade of ectopic eruption	Prevalence
Mild	2.6%
Moderate	6.1%
Severe	1.4%
Total population	10.2%

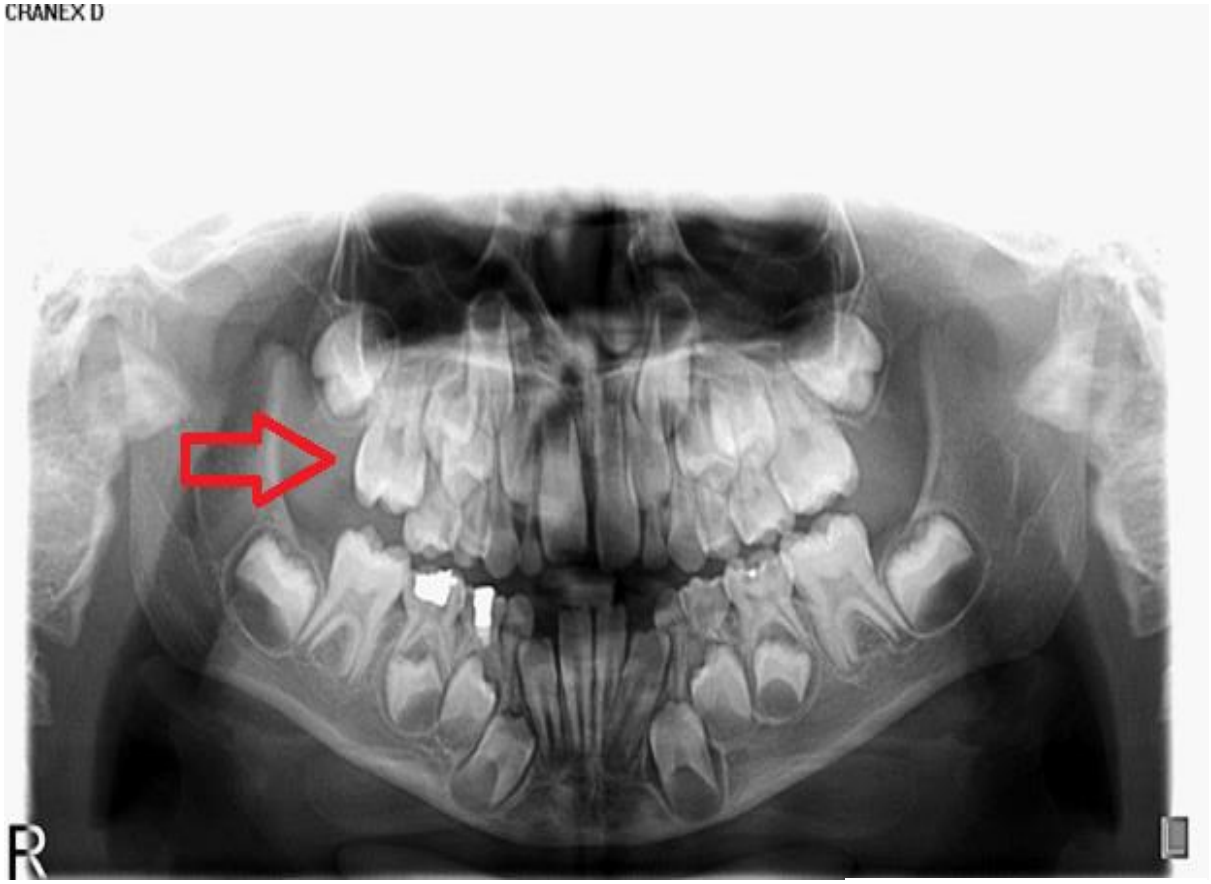

Fig.1: Panoramic Radiograph, which shows the ectopic eruption of the right permanent maxillary first molar. (R=right, L=left).

According to **Table.4**, the prevalence of ectopic eruption was 12.5% in girls and 8% in boys. In addition, this rate was 0.9% in 5-year-old, 9.3% in 6-year-old, 13% in 7-year-old and 12.9% 8-year-old children.

Table-4: Prevalence of ectopic eruption of first permanent molars in children aged 5-8 years.

Variables	Prevalence, %
Ectopic eruption in girls (total population = 384)	12.5
Ectopic eruption in boys (total population = 386)	8.0
Age	Prevalence
Ectopic eruption in 5-year-old children (total population = 117)	0.9
Ectopic eruption in 6-year-old children (total population = 182)	9.3
Ectopic eruption in 7-year-old children (total population = 230)	13.0
Ectopic eruption in 8-year-old children (total population = 241)	12.9

4- DISCUSSION

In the present study, all panoramic radiographs of the archive of Mazandaran University of Medical Sciences dental clinic, from 2013 to 2020, were examined to determine the prevalence of first permanent molars ectopic eruption in children. Determining the onset of ectopic eruption and comparing it with other studies and understanding its etiology allows dentists to diagnose the disorder promptly to inform the child's parents of the presence of the tooth and prevent future dental malformations (8). In the present study, the frequency of ectopic eruption of first permanent molars in children aged 5 to 8 years who were referred to the dental clinic of Sari Dental School was measured. The results of the present study report the prevalence of ectopic eruption by 10.2%, which is higher than the previous similar studies. According to studies conducted in different countries, the prevalence of ectopic eruption of the first permanent molars is between 0.075 to 8% (4, 9, 10).

In the study by Anoush et al., the prevalence of the first permanent molars ectopic eruption was 2.1% (11). Also, studies conducted by Guven et al. (12) Shojaeipour et al. (13), and Mendoza et al. (14) reported the prevalence of the first permanent molars ectopic eruption by 2.65%, 2.8%, and 6.7%, respectively. The frequency of ectopic eruption of the first permanent molar in our study was higher than the mentioned studies. In the present study, no significant relationship was observed between the gender of the children and the frequency of ectopic eruption (P- value< 0.05). Although according to the results, the total number of cases of ectopic eruption was higher in girls than boys, according to statistical calculations, there is no statistically significant relationship between sex and ectopic eruption in children aged 5 to 8 years (P-value <0.05). According to the results of the present study, ectopic eruption in the first permanent molars is greater in the mandible than in the maxilla and this difference was reported to be statistically significant (P-value <0.05). Contrary to the results of the present study, in the studies of Güven and Afshar et al. (12, 15), it was stated that the prevalence of ectopic eruption of first permanent molars in the maxilla is higher compared to the mandible. Also, according to the results of the study of Anoush et al. (11) this difference was not statistically significant. The reason for this difference in the mentioned results can be attributed to racial and geographical differences as well as the sample size in different studies. In most cases, the ectopic eruption of the first permanent molars will correct itself spontaneously as the child gets older. Although, it should be noted that the correction of the eruption path may occur even after the age of 9 years, therefore, in such cases, it is advised to postpone the treatment of these teeth to older ages and to recall the patient for frequent sessions, to monitor the eruption path of the teeth (16). Severe cases of ectopic eruption of the first permanent molars, can lead to root resorption of the second deciduous molars and cause premature loss of these teeth. Other effects of ectopic eruption of the first permanent molars include changes in the location of the maxillary molars from normal to class II malocclusion, occlusal interactions, and subsequent aesthetic and functional problems (17).

4-1. Study Limitations

According to the results, in some variables of the present study, the results were not statistically significant, which seems to be due to the limited statistical population, which is one of the limitations of this study. It is recommended to conduct studies with a larger sample size in different cities of the country to obtain more results that are accurate.

5- CONCLUSION

In general, the results of the present study reported that the prevalence of ectopic eruption of the first permanent molars in Sari between 2013 – 2020 was 10.2%, which is higher than the values reported in studies in other regions of Iran and other countries (approximately between 2-6%). Factors such as racial and ethnic differences can mainly justify the difference.

6- CONFLICT OF INTEREST: None.

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