INTRODUCTION

Hypodontia refers to developmental absence of one or more teeth with the exclusion of third molars. Hypodontia as a result of congenital absence of teeth is a common developmental anomaly of human dentition and it leads to various clinical complications. Abnormalities of dental epithelium and failure of initiation of tooth development by underlying mesenchyme have been considered as the etiological causes of congenital absence of teeth. Other causes of tooth agenesis may be environmental factors such as radiation and chemotherapy. Congenitally missing teeth may be transmitted as autosomal dominant, autosomal recessive or X-linked genetic condition. Hypodontia may occur as an isolated, non-syndromic condition or as hypodontia associated with syndromes. Two mutated genes in humans, MSX1 and PAX have been reported to cause agenesis of permanent teeth.

The average age for third molar crypt formation is 7 years. Its earliest occurrence was reported at 5 years and its latest at 15 years. Richardson indicated that if third molar formation is delayed beyond the age of 10 years, the possibility of all third molars developing is reduced by about 50 percent.

Third molar is one of the most commonly reported congenitally missing tooth in the oral cavity. Third molar agenesis has also been correlated with various dental structural and developmental anomalies. It was found that other teeth are more frequently missing when one or more third molars are congenitally absent. Since, third molars are the last standing teeth of their class, agenesis of third molars may be considered as a symptomatic expression of a field affecting lateral incisors and second premolars too. Therefore, agenesis of third molars should never be considered alone, but always in relation to hypodontia of other teeth.

Garn et al. have suggested that when a third molar is absent, agenesis of the remaining teeth is more likely to be 13 times. Endo et al. reported a significant increase in prevalence rate of mandibular lateral incisor agenesis in patients with third molar agenesis. Hypodontia poses a problem in terms of its management. It requires multidisciplinary approach with input from an orthodontist, a restorative dentist and an oral surgeon.

Relationship between missing third molars and hypodontia of other teeth has been a focus of interest in international literature. In Pakistan, literature regarding this association is scanty. The aim of this study was to investigate the association between third molars...
molar agenesis and co-related agenesis of other teeth in an orthodontic population, so that an interdisciplinary approach towards dental management for such patients can be devised.

**METHODOLOGY**

This was a cross-sectional observational study conducted on pre-treatment orthopantomograms and dental casts of patients enrolled in the orthodontic department for treatment during January 2008 to August 2012. Age group selected for this study ranged from 12 to 35 years. It was ensured that none of the patients had previously received any kind of orthodontic treatment. After a detailed clinical assessment, further presence of any syndrome and congenital deformities such as a cleft palate were ruled out. Patients with history of extracted third molars were also excluded from the study. This resulted in the final sample size of 270 patients being 17.79 ± 4.17 years old. Teeth were classified as congenitally missing when there was no evidence that they had been extracted or there was no sign of crypt formation on panoramic radiographs. All radiographs were evaluated by three clinicians for hypodontia of teeth. Data was recorded in specially designed proforma for patients. The statistical analysis was performed using the SPSS software package (Statistical Package for Social Sciences, version 16, SPSS Inc Chicago, Ill). The prevalence of third molar agenesis in the sample population was assessed and then it was divided into two groups. The first group had missing third molars (1-4) and the other one was with all third molars present. The Pearson chi-square test was used to determine the relationship between third molar agenesis and agenesis of other teeth. P- Value of 0.05 or more was considered statistically significant.

**RESULTS**

The total study sample consisted of 270 patients, 86 were males and 184 were females as shown in Fig 1. Ages of the sample population ranged from 12 to 35 years. In this sample, 184 patients had third molars present (67.6%). A total of 86 patients (31.7%) had missing third molars, out of these 8.5% were males and 23.2% were females. This frequency is attributed to the fact that initially there was a non random gender selection.

The aim of this study was to investigate the association between third molar agenesis and co-related agenesis of other teeth. The most frequently missing tooth in this sample was the upper lateral incisor (3.1%), followed by the mandibular lateral incisors (2.6%), mandibular central incisors (1.8%) and mandibular

<table>
<thead>
<tr>
<th>Variable 1</th>
<th>Variable 2</th>
<th>P-values</th>
<th>Co-efficient correlation</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Missing third molars</td>
<td>Maxillary lateral incisors</td>
<td>.014</td>
<td>.150</td>
<td>Significant P&lt; 0.05</td>
</tr>
<tr>
<td>Third molars present</td>
<td>Maxillary lateral incisors</td>
<td>.014</td>
<td>-.150</td>
<td>Insignificant P&gt;0.05</td>
</tr>
<tr>
<td>Missing third molars</td>
<td>Mandibular central incisors</td>
<td>.100</td>
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<tr>
<td>Missing third molars</td>
<td>Mandibular lateral incisors</td>
<td>.037</td>
<td>.127</td>
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<tr>
<td>Missing third molars</td>
<td>Mandibular second premolar</td>
<td>.438</td>
<td>.047</td>
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</tbody>
</table>

Correlation is significant at the 0.05 level (2-tailed).
Correlation of third molar agenesis with hypodontia

second premolars (0.55%) as shown in Table 1 and 2. In order to establish any statistically significant co-relation between third molar agenesis and other missing teeth, we used the Pearson chi-square test. A p-value of < 0.05 was considered significant. The correlation is shown in Table 3.

Our results established a significant correlation between third molar agenesis with agenesis of maxillary laterals and mandibular lateral incisors. Such correlation could not be identified in patients who had third molars in their dentition.

DISCUSSION

Hypodontia of teeth is one of the most intriguing phenomena as it is frequently associated with other dental anomalies, structural variations and malformations of other teeth, late eruption, transposition and crowding.14,20

Third molars are the most often congenitally missing teeth. According to Richardson13, the percentage of persons with one or more third molars missing ranged from 9 to 20% in a sample of European population. In our study, 31.7% of the patients included in the sample had at least one third molar missing. Most of the studies done in Asian populations1,19 have reported the prevalence of third molar agenesis close to the value in our study with a range of 27.2% in Jordanians to 36.4% in Turkish population; Whereas Western studies have reported a significantly lower percentage of third molar agenesis with a maximum percentage of 24%.27,31

The association of third molar agenesis with other missing teeth was shown by Garn et al.14 According to them the association between third molar agenesis and reduction in the number of other teeth fits the hypothesis of a field of variable intensity, which in its greatest degree of expression, eliminates all four third molar teeth and a maximum number of other teeth. The association between third molar reduction and developmental delay in the dentition is susceptible to at least two hypotheses, one involving pleiotropic manifestations of a single gene and the other involving two independent genes, the first favouring developmental suppression and the second affecting formation timing. While the degree of independence between these two phenomena may show which hypothesis is correct, the possibility of closely linked genes must also be considered. In this latter event, the monogenic and polygenic hypotheses would be operationally identical.14

Our study also established a positive association between third molar agenesis and missing maxillary and mandibular lateral incisors. This is in accordance with international studies14,22-24 in which maxillary lateral incisor has been found to be the most frequently missing tooth in the presence of third molar agenesis. However in contrast with our findings, studies by Magnusson and Rolling25,26 show that the most frequently absent teeth are: the mandibular second premolar.

In our study, agenesis of mandibular lateral incisor was also significantly associated with third molar agenesis. This is in accordance with studies conducted by Niswander and Sujaku34, and Davis35 who reported that the mandibular incisors were the most commonly missing teeth in Japanese and Chinese populations, respectively. Endo et al36 characterized hypodontia in a Japanese population with a high prevalence of mandibular lateral incisor agenesis in children along with minor tooth agenesis of other teeth. He further stated that the high prevalence of mandibular lateral incisor agenesis may be one of the marked characteristics of Asians including the Japanese. Despite these positive associations, certain studies in the literature have negated this relationship. Study by Shah and Boyd37 indicated that third molar agenesis was not associated with agenesis of other teeth.

In our study, we observed that occurrence of missing maxillary and mandibular lateral incisors were significantly related to the group of patients who had third molars absent compared with the group of patients who had third molars present. This association needs to be further elaborated in detail to probe into the etiology of this condition i.e. frequency of missing teeth in both jaws associated with third molar agenesis.

CONCLUSION

This study concluded that agenesis of third molar teeth does associate with the agenesis of other teeth. Moreover, agenesis of maxillary and mandibular lateral incisors was found to be positively associated with missing third molars. Further research studies are required to elucidate the different etiological factors responsible for this agenesis.

REFERENCES
Correlation of third molar agenesis with hypodontia


