INTRODUCTION

Third molars usually erupt in the oral cavity at the age of 15 to 24 years. Some erupt in the late 30s, while others remain unerupted. The time of eruption, position in the arch and size of the crown varies among individuals. Third molars are considered as impacted when they fail to erupt into a functional occlusion in the oral cavity at a specified time. These impactions are classified according to angulations in the arch, mandibular bone position and crown patterns. Pell GJ and Gregory GT devised a comprehensive system to classify impacted wisdom teeth. Winters categorized the third molars into mesio-angular, disto-angular, horizontal, and vertical impactions - depending on tooth angulation in the oral cavity.

Previous literature showed a high rate of carious lesions in the second molars due to impaction of third molars. Majority of the distal caries was linked to mesio-angular tilting of third molar teeth. Peri-coronal flap makes this area less accessible for routine cleaning and more prone to biofilm and plaque accumulation. Gingival recession further accelerates the process by allowing food impaction and exposure of cementoenamel junction. Carious lesions initiate and progress as a consequence. Pain is the most significant indicator in the detection of caries of this variety. Delay in treatment of distal carries is one of the lead causes of early tooth loss.

A similar study was carried out in Islamabad, Pakistan with the findings that 42.5% of distal caries in mandibular
second molars developed due to adjacent impacted third molars. A total of 200 patients with impacted third molars were included in the study. Another study conducted in Lahore showed the pattern of mandibular third molar impaction and its complications. This study concluded that mesio-angular third molar impaction was most common type of impactions responsible for the occurrence of dental caries in adjacent molars.

Distal caries in mandibular second molars due to mesially tilted impacted third molars is a tremendous public health concern which needs to be addressed. Various studies prove that early extraction of third molars can prevent this; thereby arresting premature tooth loss. There is a lack of local research on the occurrence of distal caries in mandibular second molar due to third molar impactions. There is a need to observe this occurrence especially within the population visiting dental hospital in Multan. A study was required to know the effects of impaction in geographically diverse area such as Multan. Thus, the rationale of this study was evaluate the relationship of distal caries in mandibular second molars to mesio-angular impacted third molars.

The aims of this study were to:

a) Assess the prevalence of distal caries in mandibular second molars.
b) Assess the relationship between the type of impaction of mandibular third molars and distal caries in adjacent mandibular second molars.

**METHODOLOGY**

A cross-sectional survey was conducted at Nishtar Institute of Dentistry, Multan for the duration of eight months. An ethical review committee provided the approval for the study (Ref. 9972/NID). Patients were informed of the goals of the study and their consent was taken. All the patients referred for pain in the second molar region were provisionally diagnosed with proximal caries due to third molar impactions. Concise patient history forms were recorded. After clinical examination, patients aged between 17 to 35 years underwent periapical and bitewing x-rays for assessment and diagnosis of distal caries in mandibular second molars. Panoramic radiographs were used to analyse the angulation of impaction of third molars. A sample of 989 patients - allocated by convenience sampling - was considered for the purpose of this study. A confidence interval of 95% and absolute precision of 5% was established. Taking into account a dropout rate of 10%, the sample was inflated by 10% accordingly. Patients with missing mandibular 2nd molars, systemic diseases and severe periodontitis were excluded from the study. Mandibular third molars were classified as vertical, mesioangular, distoangular and horizontal according to the Pell GJ and Gregory GT classification system. Three clinicians evaluated periapical and bitewing radiographs at different times for detection of distal carries and third molar impactions. An agreement of two or more observers was considered confirmatory for the diagnosis to eliminate any potential bias. It also supported inter examiner reliability.

The study had two variables of interest pertinent to the objectives i.e. "Presence/absence of distal caries" and "Presence/absence of third molar impaction". Data was analysed using SPSS version 23. Descriptive statistics were applied to assess data in frequencies. Prevalence of distal caries and third molar impactions was displayed in graphs. Mean, standard deviation and percentage values were used to analyse and assess data.

**RESULTS**

A total of 989 patients exhibiting impacted mandibular third molars were assessed for the purpose of this study. Amongst them, 408 patients (40.8%) were diagnosed with distal caries in mandibular second molars and included in further analysis. Table 1 presents basic data of the study participants. There were more female patients than that of males. This indicated a higher risk of second mandibular molars distal caries in females. Unilateral impactions were less common than bilateral impactions of mandibular third molars. Data analysis revealed 66% impactions on both sides of the dental arch with 34% limited to one side only. Mandibular third molars were most commonly impacted in a mesio-angular dimension.

Table no 2 presents patient data segregated according to age groups as follows:

<table>
<thead>
<tr>
<th>Group 1: 17 to 22 years of age.</th>
<th>Group 2: 23 to 29 years of age.</th>
<th>Group 3: 30 to 35 years of age.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total: 137(33.08%)</td>
<td>162(39.7%)</td>
<td>109(27.2%)</td>
</tr>
<tr>
<td>Female: 86</td>
<td>Male: 51</td>
<td>Female: 86</td>
</tr>
<tr>
<td>Male: 76</td>
<td>Female: 52</td>
<td>Male: 57</td>
</tr>
</tbody>
</table>

In this study, five different types of mandibular third molar impactions were discussed. Their prevalence and
association with distal caries was described in Table no 2. Mesioangular impacted third molars caused the highest incidence of distal caries in second mandibular molars. On the other hand, no caries was observed in transverse impactions.

**DISCUSSION**

An impacted tooth may be defined as a tooth that does not reach the occlusal plane despite two thirds of its root development. Mandibular third molars are the most frequently impacted teeth. Development of third molar impactions can be attributed to a number of etiological factors. These factors include lack of space, retardation of facial growth, late third molar mineralization, distal direction of eruption, early physical maturity, or lack of sufficient eruption force, blockade by physical/mechanical barriers, such as scar tissue, fibromatosis, compact bone, odontogenic cyst, and tumors. The prevalence of impacted third molars has been shown to vary in different populations and ethnicities ranging from 9.6% to 68.5%. These impactions, however, tend to be nearly equally distributed across the two genders in many of the earlier studies with slightly increased frequency in females according to some. The present study also found similar results with regards to the gender predilection of impacted third molars. There were 54% females and 46% males with impacted third molars. This can be attributed to the growth pattern differences between the two genders. The growth of mandible in males, continues during the root development of the mandibular third molars giving a chance for these teeth to erupt in the oral cavity. A slightly increased frequency of impacted mandibular third molars in females...
may be due to an early cessation of jaw growth in this this
gender group. This explanation, however, caters to only a
single etiological factor of impactions in third molars namely
the lack of space.

In the mandible, the impacted third molars tend to occur
more frequently bilaterally than unilaterally. This has been
shown by some earlier studies and is consistent with
our findings of 66% bilateral occurrence versus a 34% unilater presentation. This can also be explained on the
basis of the fact that the local reasons for impacted third
molars like lack of space tend to affect both sides in an
individual at a certain stage of his/her jaw development.
Third molar impactions can be classified in different ways.

One of the most commonly employed classification is the
Winter classification based on the angle formed by the long
axis of the third molar and the second molar. This was the
classification system used in present study categorizing
impactions as mesio-angular, disto-angular, vertical, horizontal
and transverse. The most common type of third molar
impaction according to our findings was mesio-angular
impaction which is in line with most earlier studies from
different populations and ethnic backgrounds. An earlier
study conducted in Pakistani population also identified
mesio-angular impaction as the most prevalent type of
mandibular third molar impaction.

Impacted third molars have been associated with a variety
of different pathological conditions. These conditions include
pericoronitis, caries, food lodgment, pocket formation,
periodontal bone loss, root resorption of adjacent teeth, and
development of cysts and tumors. The frequency of
dental caries in teeth adjacent to impacted third molars has
been reported to be as low as 1 to 4.7% to as high as
15–51% in some of the earlier studies. Our study has
showed similar trend with 40.8% of distal surface of second
molars affected by dental caries. Very similar results were
obtained from an earlier study on Pakistani population
exhibiting 42.5% of second molars affected by distal caries
in the presence of an impacted third molar. Dental caries
is a multifactorial disease that can increase in its frequency
in individuals with local areas of food impaction. This
facilitates the accumulation of dental plaque containing
cariogenic bacteria due to the inability of the normal cleaning
aids to access these areas.

The highest prevalence of dental caries in our study
(56.3%) was associated mesio-angular impaction followed
by the horizontal impactions (24.2%). This is in accordance
with many other studies displaying similar trend. An
earlier study on Pakistani population also exhibited similar
trend with mesio-angular and horizontal impactions displaying
41% and 27% distal caries respectively. Both mesio angular
and horizontal impactions can form plaque accumulating
crevices resulting in the distal caries in second molars. A
change in the microbial flora and inflammatory mediators
has been proposed by earlier study around impacted third
molars strengthening this view point further.

Cervical caries in surfaces adjacent to the impacted teeth
can display carious lesions due to the abnormal contact
between the most mesial surface of the impacted third molars
and the distal surface of mandibular second molars. The area
of contact of impacted third molar with the second molar
has also been explored in some earlier studies with contact
at the amelocemental junction being the most susceptible.
This is an aspect not covered in our study that can have
meaningful clinical implications. Based on the findings of
our study, second molar teeth adjacent to mesio angularly
and horizontally impacted third molars should be closely
either prophylactically removed or followed up closely.

LIMITATIONS

The first limitation of the study was a constrained sample
size. This can be overcome by conducting the review on a
larger scale with an increased number of patients. However,
this is time consuming and requires a greater number of
qualified dentists. The second limitation was the radiographic
technique. In the current study, OPG, periapical and bitewing
radiographs were used for assessment and diagnosis. CBCT
is a more effective diagnostic tool for presurgical analysis.
It eliminates errors of magnification, superimposition and
image distortion. Three dimensional imaging allows clear
identification of important anatomic landmarks like
mandibular canal, mental foramen and maxillary sinus.
Additional information such as the thickness of cortical plate,
cancellous bone patterns, fenestrations, and roots inclinations
can be obtained with the help of CBCT prior to surgical
entry.

CONCLUSION

The current study concluded that the prevalence of distal
caries in mandibular second molars and the positioning of
adjacent impacted mandibular third molars in the dental arch
were interlinked. This relationship provides a favourable
environment for the initiation and progression of distal caries
in mandibular second molars. Among all types of third molar
impactions, mesio-angular type provides the most favourable
space and niche for the colonization of microbes leading to
distal caries in the adjacent second molar.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.
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REFERENCES


