

# Prevalence of Periodontal Disease and Caries Associated with Erupted Third Mandibular Molar

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## ABSTRACT

**Aim:** To assess the prevalence of periodontal disease and caries on 2<sup>nd</sup> mandibular molar in association with erupted 3<sup>rd</sup> molars.

**Methodology:** This cross sectional study was conducted at the Periodontology Department, Avicenna dental college, Lahore from July 2021 to June 2022. A total of 81 patients were examined in the age range of 21-50 years. Patients of both genders were assessed. Data was entered and analysed by IBM SPSS 25. Level of significance was kept at  $p$ -value  $\leq 0.05$

**Results:** Total of 81 patients were examined with the total number of teeth evaluated were 156. Age taken as demographic variable was further divided into three groups. Group 1 consisted of patients between the age range of 21-30 years  $n=18$  (22.22%). Group 2 have patients between the age range of 31-40 years  $n=43$  (53.09%) and Group 3 consisted of age range of 41-50 years patients  $n=20$  (24.69%). Highest prevalence of distal caries was related to level A (68.33%) and periodontal disease was prevalent in level C followed by level B molars

**Conclusion:** Regardless of eruption status, 3<sup>rd</sup> molar is associated with occurrence of periodontal disease and caries on 2<sup>nd</sup> mandibular molars. Ergo, regular clinical evaluations and monitoring are required even in apparently symptom free 3<sup>rd</sup> mandibular molars, as their existence is analogous to Distal Surface Caries (DSC) and  $PPD \geq 5$ mm development in mandibular 2<sup>nd</sup> molars. Else, to improve the long term survival of 2<sup>nd</sup> mandibular molars, prophylactic extraction of 3<sup>rd</sup> mandibular molars can be considered as a treatment option.

**Keywords:** Eruption status, distal surface caries, periodontal disease.

## INTRODUCTION

To determine the oral disease prevalence in specific population, epidemiological studies are carried out. They yield accurate standpoint of interrelationship among oral diseases, their treatment plan and their causative factors.<sup>1</sup> Extensive research has been carried on third molars in adults.<sup>2</sup> Eruption time for third molars varied widely, with mostly undergoing eruption in later teens to early 20s.<sup>3</sup> These teeth are found to be different from other teeth and have increase incidence of dental abnormalities.<sup>3</sup> According to research data 96% of population has third molar.<sup>4</sup>

Prevalence quantifies the population that has a specific characteristic in given time period.<sup>5</sup> Enough debate has been carried out in literature with respect to third molar pathology and its extraction.<sup>6</sup> Pathologies related to third molars either manifest clinically or are obscure.<sup>6</sup> Numerous clinical ramifications are related to third molars that may bring about pathologies like caries and periodontal disease in related tissues.<sup>7</sup> In addition to these, it also causes resorption of roots of adjacent tooth, food impactions and periodontium damage.<sup>7</sup> Malady related to these teeth and their associated tissues persist, similarly reported by Allen RT, Witherow H *et al*<sup>7,8</sup>. Clinical examination accompanied by radiographic evaluation helps in identification and eventual treatment of these pathologies.<sup>8</sup>

Dental caries is most frequently related hard tissue defect coupled to 3<sup>rd</sup> molars.<sup>6</sup> A study conducted in USA evince the existence of caries and periodontal pathosis in clinically erupted third molars.<sup>2</sup> Besides this, caries on the distal surface referred as distal surface caries (DSC) of 2<sup>nd</sup> molars are frequently related to retained 3<sup>rd</sup> molars.<sup>5,6</sup> This finding is also supported by Sultan Q. AlHobail in his study carried out on Saudi population.<sup>9</sup> With passage of time incidence of occlusal caries enhances from 29% to 33%.<sup>10</sup> DSC on 2<sup>nd</sup> molar are believed to be late complication of 3<sup>rd</sup> molar, and it implies inadequate maintenance of oral hygiene in that region.<sup>9</sup> Second molars with DSC have reduced upshots rendering the prophylactic extraction of 3<sup>rd</sup> molars. Venta *et al* concluded that 3<sup>rd</sup> molar extraction is requisite for most patients.<sup>5</sup>

Periodontitis is congruous with caries in 3<sup>rd</sup> molar region. Studies reported its prevalence around distal aspect of 2<sup>nd</sup> molar to

be 1-5%.<sup>11</sup> There is increase corroboration that symptom free third molar, particularly the mandibular ones are linked with pathological pocket depths ( $PPD \geq 5$ mm).<sup>6</sup> Periodontal bacterias are shielded in the gingiva of third molars and act as a cache for more generalized periodontal disease. Expectidly periodontal morbidity aggravates with age in adult population.<sup>6</sup> A study by Elter *et al* reports that erupted 3<sup>rd</sup> molars impart increase pocket depth and bleeding on probing (BOP) to adjoining 2<sup>nd</sup> molar.<sup>7</sup> Although prophylactic extraction of 3<sup>rd</sup> molar is still deem to be controversial.

Pell and Gregory have proposed a system to classify the level of maxillary and mandibular third molar occlusal plane with reference to occlusal surface of 2<sup>nd</sup> molars. It classifies level A as when the occlusal plane of third molar tooth is equivalent to that of second molar occlusal plane. However level B implies occlusal level of third molar is betwixt the occlusal level and cemento-enamel junction of the second molar. Moreover level C signifies the occlusal level is beneath the cemento-enamel junction of second molars.<sup>12</sup> Studies have showed high percentage of level C in mandibular molars in comparison to level B in maxillary molars.<sup>12</sup> Occlusal plane is tend to be regulated by various factors like racial differences, study population and selection criteria for patients.<sup>12,13</sup>

Objective of current study is to access the prevalence of periodontal disease and caries experience on distal aspect of mandibular 2<sup>nd</sup> molar, when 3<sup>rd</sup> molars are at different eruption statuses. Aiming that the result would help in formulating a treatment plan to manage erupted mandibular 3<sup>rd</sup> molars particularly with reference to prophylactic extraction or retaining them.

## METHODOLOGY:

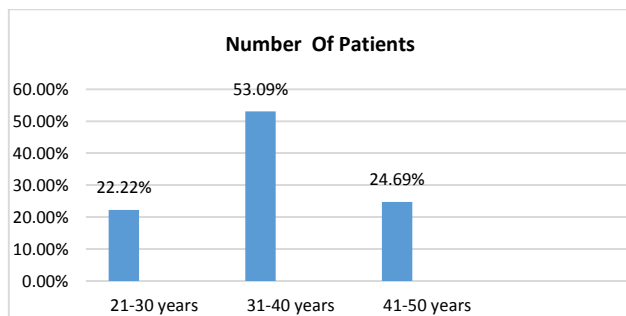
This cross sectional study was conducted in outpatient Department of periodontology at Avicenna Dental College, Lahore from July 2021 to June 2022. Ethical approval was obtained from Ethical committee and institutional review board. After taking inform consent from the patients, they were evaluated for presence of periodontal disease and caries on distal aspect of mandibular 2<sup>nd</sup> molars.

Patients of both gender with age from 21 to 50 years were included in the study. Inclusion criteria also comprise presence of mandibular third and second molars in at least 1 quadrant. Patients with no systemic comorbidities like diabetes, hypertension and haematological disorders were involved in the study. Exclusion criteria included absence of mandibular second molars and indirectly restored second mandibular molars. In addition exclusion criterion encompasses pregnant women, subjects with periodontal surgery in preceding 6 months and smokers.

Detailed oral examination of patients was carried out by a single trained clinician. That involve evaluation for plaque record, bleeding on probing (BOP) and Pathological pocket depth (PPD)  $\geq$  5mm using Michigan probe with Williams marking, in terms of their absence and presence on the distal aspect of second mandibular molars. Occlusal plane level of 3<sup>rd</sup> mandibular molar was evaluated and categorized according to Pell and Gregory classification system into Level A,B and C. Caries were assessed, on distal surface of mandibular second molars through visual tactile method along with periapical and bitewing radiographs as an adjuncts, in term of absence or presence of caries on the aforementioned tooth. **Data Analysis:** Data was entered and analyzed with IBM SPSS 25. P-value  $\leq$  0.05 was termed significant based on the application of post-stratification Chi Square Test.

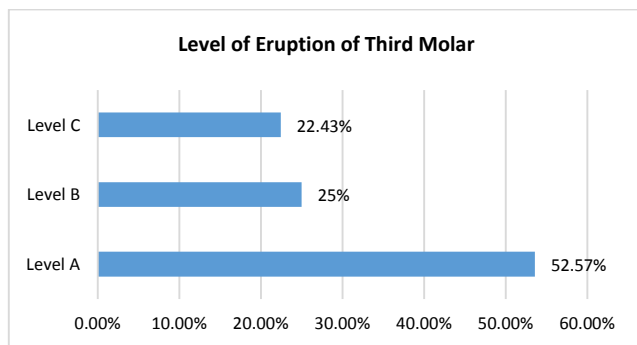
**RESULTS**

Total of 81 patients were examined with the total number of teeth evaluated were 156. Age was taken as demographic variable which was further divided into three groups. Group 1 consisted of patients between the age range of 21years to 30 years n=18 (22.22%). Group 2 consisted of patients between the age range of 31years to 40 years n=43 (53.09%) and Group 3 consisted of patients between the age range of 41years to 50 years n=20 (24.69%) as illustrated in Graph 1



Graph 1| Data distribution according to age groups

According to the Level of eruption of third molar as defined by Pell and Gregory i-e., A, B, and C. Results revealed that majority of third molars falls in Level A category, n= 82 (52.57%) , Level B category consists of n=39 (25%) , whereas Level C has n=35 (22.43%) third molars, illustrated in Graph 2



Graph 2| Level of eruption of third molar

Distribution of mandibular third molars at level A,B and C according to Pell and Gregory randomly, in relation to age that showed total of 35 teeth been examined in age group of 21-30 years similarly 85 teeth were examined of age range 31-40 years and 36 teeth fall in age range of 41-50 years , summarized in table 1

Table 1: Distribution of 3<sup>rd</sup> mandibular molar at level A,B & C in relation to age groups

Age groups (years)	Molar occlusal Level			Total
	Level A	Level B	Level C	
21-30	9	15	11	35
31-40	43	22	20	85
41-50	30	2	4	36
Total	82	39	35	156

Distal surface caries (DSC) on 2<sup>nd</sup> molar was found among n=41 (68.33%) molars that were present in relation to level A 3<sup>rd</sup> molars, which was greater than on the 2<sup>nd</sup> molars present with third molars at level B i.e n=15(25%)and level C i.e n=4(6.67%). Pathological pocket depth (PPD $\geq$  5mm )prevalled among 38.64% (n=17) molars who were at Level C, 31.82% (n=14) in molars who were at Level A and 29.55% (n=13) in molars who were at Level B. Plaque record was recorded lowest in molars present at level C i.e 25% (n=11) followed by increase in plaque record at level A with 29.55% (n=13) and highest among the molars present at level B molar relation making 45.45% (n= 20). Bleeding on probing (BOP) followed the prevalence of highest been recorded on molars present in association with level C molar relation i.e 42.22% (n=19) followed by level A 37.78% (n=17) and level C was recorded in 9 molars (20%) , as illustrated in Table 2

Table 2: Relationship of Level of eruption of Third molar to distal surface caries and periodontal parameters

Level of Eruption of Third Molar	Distal surface Caries (DSC) on 2 <sup>nd</sup> molar	Pathological pocket depth (PPD $\geq$ 5mm )	Plaque Record	Bleeding on probing (BOP)
Level A	41 (68.33%)	14 (31.82%)	13 (29.55%)	17 (37.78%)
Level B	15 (25%)	13 (29.55%)	20 (45.45%)	9 (20%)
Level C	4 (6.67%)	17 (38.64%)	11 (25%)	19 (42.22%)

Co-relation of age groups with distal surface caries and periodontal parameters showed that the highest prevalence of all these variables was associated with age group of 31-40 years of age, which showed high frequency of caries on distal surface of 2<sup>nd</sup> molars and also high percentages of all periodontal parameters like pathological pocket depth (PPD $\geq$  5mm ) and bleeding on probing (BOP) , as illustrated in table 3

Table 3: Relationship of Age groups with DSC and periodontal parameters

Age groups	Distal surface Caries(DSC) on 2 <sup>nd</sup> molar	Pathological pocket depth (PPD $\geq$ 5mm )	Plaque Record	Bleeding on probing (BOP)
21-30years	13(19.40%)	7(17.50%)	14(23.33%)	11(18.33%)
31-40years	36(53.73%)	21(52.5%)	38(63.33%)	33(55%)
41-50years	18(26.87%)	12(30%)	17(28.33%)	16(26.67%)

When distal surface caries (DSC) of 2<sup>nd</sup> mandibular molar was co-related with level of eruption of mandibular 3<sup>rd</sup> molar, level A third molars were mainly associated with DSC n=41 (68.33%), with a statistical significant difference of P =.000 ( table 4)

Table 4: Relationship of DSC with level of eruption of third molar

Level of Eruption of Third Molar	DSC on 2 <sup>nd</sup> mandibular Molar		X <sup>2</sup>	P- value
	Present	Not Present		
Level A	41(68.33%)	19(31.67%)	54.15	.000
Level B	15(25%)	45(75%)		
Level C	4(6.67%)	56(93.33%)		

Co-relation of level of eruption of mandibular third molar with periodontal parameters, table 5, showed that there is non-significant difference of level of eruption with pathological pocket

depth and plaque record i.e P= .642 and P=.102 , respectively. While there is significant difference present between level of eruption and bleeding on probing (BOP) that is P=.000

A significant difference was found between age groups and distal surface caries on 2<sup>nd</sup> molar (X<sup>2</sup>=20.037, P=.000). Age group

of 31-40 years showed high prevalence, with 36(53.73%) teeth of patients who were between this age range presented DSC on second mandibular molars, as illustrated in table 6

Table 5: Correlation of periodontal pathological parameters with level of eruption of third mandibular molar

Level of Eruption of Third molar	Pathological pocket depth		Plaque record		Bleeding on probing (BOP)	
	Present	Not Present	Present	Not Present	Present	Not Present
Level A	14 (31.82%)	30(68.182%)	13(29.55%)	31(70.455%)	17(37.78%)	54(62.22%)
Level B	13(29.55%)	31(70.455%)	20(45.45%)	24(54.54%)	9(20%)	31(80%)
Level C	17(38.64%)	27(61.364%)	11(25%)	33(75%)	19(42.22%)	49(57.78%)
P- value	.642		.102		.000	
X <sup>2</sup>	.887		4.569		19.657	

Table 6: Relationship of DSC with age groups

Age groups	Distal surface caries on 2 <sup>nd</sup> Molar		X <sup>2</sup>	P- value
	Present	Not Present		
21-30years	13(19.403%)	55(82.09%)	20.037	.000
31-40years	36(53.73%)	31(46.27%)		
41-50years	18(26.87%)	49(73.13%)		

Relationship of associated pathologies with the age groups revealed that there is a significant difference between age groups and the associated pathologies ( P=.003, P=.000 ,P= .000 ) with highest prevalence was present in the age group of 31-40 years (table 7).

Table 7: Distribution of associated periodontal pathologies with age groups of patients

AGE GROUPS	Pathological pocket depth		Plaque record		Bleeding on probing (BOP)	
	Present	Not Present	Present	Not Present	Present	Not Present
21-30 years	7(17.50%)	33(82.50%)	14(23.33%)	55(91.67%)	11(18.33%)	49(81.67%)
31-40 years	21(52.5%)	19(47.50%)	38(63.33%)	31(51.67%)	33(55%)	27(45%)
41-50 years	12(30%)	28(70%)	17(28.33%)	52(86.67%)	16(26.67%)	44(73.33%)
P- value	.003		.000		.000	
X <sup>2</sup>	11.325		22.304		19.95	

**DISCUSSION**

Eruption of 3<sup>rd</sup> mandibular molars in young adults occur after the jaw growth completion. Disposing the 3<sup>rd</sup> molar region favourable for growth of anaerobic pathogens.<sup>10</sup> Thus, mandibular third molars encounter periodontal pathology more in comparison to 1<sup>st</sup> and 2<sup>nd</sup> molars, while caries experience is contrary to it, as illustrated by white et al.<sup>10</sup> Similar results were also supported by John Campbell in his study describing that periodontal maladies around 3<sup>rd</sup> molars enhances over time in young adults.<sup>6</sup> In accordance with the aforementioned studies, study by Rachel Garaas on middle aged and old Americans also revealed that only less than 2% of total subjects have mandibular 3<sup>rd</sup> molars free of periodontal maladies and caries.<sup>6</sup>

According to the study done by Falci et al, prevalence for distal surface caries (DSC) for mandibular 2<sup>nd</sup> molars was found to be 13.4% in patients with mean age of 24.17 years.<sup>14</sup> Periodontal and caries status of the mandibular 2<sup>nd</sup> molar are negatively affected by the presence of 3<sup>rd</sup> molar as illustrated by the study done by Yu-Hsiang Chou in elderly patients.<sup>14</sup> In current study prevalence of distal surface caries increases in 2<sup>nd</sup> mandibular molars when 3<sup>rd</sup> molars are at level A according to Pell and Gregory classification. These results are in accordance with the split mouth study conducted on elderly patients.<sup>14</sup> These results also comply with the results of Nikhil and Sultan Q ALHobail studies that showed the similar trend.<sup>8,9</sup>

In this study distal surface caries have high incidence in elder age group of 31-40 years, these results are in line with the study carried out by Toedtling et al who claimed that caries incidence enhances with the period of time the 3<sup>rd</sup> molar remains in the erupted state in oral cavity.<sup>14</sup> Thus the occurrence of pathologies on 2<sup>nd</sup> molar adjacent to erupted 3<sup>rd</sup> molar advances with the age.

Presence of erupted third molars are kindred with increased occurrence of Pathological pocket depth (PPD≥ 5mm) on 2<sup>nd</sup> mandibular molar. This is chiefly due to expanded gingival biofilm interface on erupted molar in comparison to impacted 3<sup>rd</sup> mandibular molar. This concept was supported in the review study conducted by G.S.kaveri.<sup>3</sup> The result of our study also support this concept, with incidence of PPD≥5mm on distal aspect of 2<sup>nd</sup> molars and plaque too, adjacent to 3<sup>rd</sup> molars at different eruption levels. In current study , increase incidence of PPD>5mm was present in age range of 31-40 years, that is in line with the result of community based study conducted in North Carolina that

showed increase prevalence in adults above 25 years.<sup>15</sup> Similar results were also revealed in the study by Zhi-bang, that infer enhanced prevalence of periodontal disease on 2<sup>nd</sup> molar in individuals above 35 years of age.<sup>15</sup> Additionally, the existence of deep PPD on 2<sup>nd</sup> molar is 1.87 times more correlated with adjacent erupted 3<sup>rd</sup> molar contrary to absent 3<sup>rd</sup> molar.<sup>16,17</sup>

In current study we excluded 2<sup>nd</sup> molars with prosthesis as it enhances the bias by swaying the periodontal health of tooth, similar was done in a study by Li-Juan Sun.<sup>16</sup>

Presence of DSC and deep PPD≥5mm on 2<sup>nd</sup> molar is colossal health concern. Regular clinical examinations and radiographical follow ups are suggested by some researchers to timely rule out the development of pathology and appropriate treatment should be provided reducing prophylactic extractions of seemingly symptom free 3<sup>rd</sup> molars.<sup>7</sup> Premature extraction of 3<sup>rd</sup> molar is considered as a treatment option to prevent before time loss of 2<sup>nd</sup> molar.<sup>18</sup> This concept is also supported by numerous studies. In order to come up with accurate treatment, studies with prolong observation period and follow ups are required.

In order to curtail the bias, examinations were carried out by single experienced clinician and data was analysed by independent statistician. However there are certain shortcomings that may have an impact on study results. The study was not carried out on general population and had constrained sample size. Moreover, all patients were selected from single hospital setting affecting the broad base application of results. Hence randomized controlled trials are advocated to knock out repercussions of these deficiencies.<sup>15</sup>

**CONCLUSION**

Regardless of eruption status, 3<sup>rd</sup> molar is associated with occurrence of periodontal disease and caries on 2<sup>nd</sup> mandibular molars. Ergo, regular clinical evaluations and monitoring are required even in apparently symptom free 3<sup>rd</sup> mandibular molars, as their existence is analogous to DSC and PPD≥5mm development in mandibular 2<sup>nd</sup> molars. Else, to improve the long term survival of 2<sup>nd</sup> mandibular molars, prophylactic extraction of 3<sup>rd</sup> mandibular molars can be considered as a treatment option.

**Conflict of Interest:** None

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