ORIGINAL ARTICLE

CONTENTS

Prevalence and distribution of malposed canines in young adults: A cross-sectional clinical study

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ABSTRACT

Aim: This study aims to evaluate the prevalence and distribution of malposed permanent canines in young adults according to gender, dental arch (maxillary and mandibular), position (buccal and lingual), laterality (right and left sides), and Angle's classification of malocclusion (class I, II, and III).

Materials and Methods: A cross-sectional clinical study was conducted on 302 undergraduate dental students (170 males and 132 females) aged between 19–24 years. Each participant underwent a careful intra-oral clinical examination to determine the malposed canines. Canine malposition was recorded, and data were analyzed using descriptive and inferential statistics.

Results: This study found that 113 participants had malposed canines, giving an overall prevalence 37.4%. Females showed a higher prevalence (47.0%) of canine malposition than males (30.0%). Slightly more malposed canines in the mandibular arch (51.3%) than in the maxillary arch (48.7%). Buccal canine malposition was the most frequent (95.6%) of cases. Also, right-side canine malposition (54.9%) was more frequent than left-side (45.1%). The majority of malposed canines were recorded in Class I malocclusion (73.45%).

Conclusions: Canine malposition is a common clinical finding among young adults. The strong association between Class I malocclusion and malposed canines indicates that canine malposition is mainly affected by local eruption factors rather than skeletal sagittal discrepancies. These findings showed the importance of early clinical examination and interceptive orthodontic treatments to decrease the complexity of future orthodontic treatment.

KEY WORDS: interceptive orthodontic treatments, orthodontic treatment, a cross-sectional clinical

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INTRODUCTION

Permanent canines had a distinctive position in the dental arch because of their important contribution to facial appearance, continuity of the arch, and normal occlusal function. Their situation at the junction between the anterior and posterior segments plays a visible role in lip support and smile harmony. In addition, their long roots and strong morphology allow them to participate effectively in canine guidance and in the regulation of occlusal forces during lateral mandibular movements [1,2]. The eruption of the permanent canine is a more complicated process than other teeth because the canine has a relatively high and deep developmental position within the arch, with a long and irregular eruption pathway. Their eruption occurs relatively late, exceeded only by third molars [2–4]. This makes the canines mostly subjected to local and environmental influences that may interfere with normal eruption, increasing the likelihood of positional disturbances, malposition, or impaction [5–7].

Generally, canine malposition is considered a multifactorial condition rather than a single identifiable cause. Tooth size–arch length discrepancy, arch crowding, prolonged retention or premature loss of deciduous teeth, disturbances in eruption pathways, and anomalies of adjacent teeth are among the most common factors associated with canine malposition. Maxillary lateral incisors play an important role in guiding the eruption pathway of permanent canines, and disturbances affecting these teeth may increase the risk of canine displacement [8–11]. Malposition may still occur in subjects with normal sagittal occlusal relationships, suggesting that local eruption disturbances and abnormalities in eruption guidance may have a greater influence on canine position than sagittal skeletal discrepancies [9, 12].

Recent epidemiological studies demonstrated that the prevalence and distribution of ectopic and malposed canines vary among different populations, genders, skeletal patterns, and dental arches [6, 13–15]. These variations

may be associated with differences in craniofacial morphology, eruption guidance mechanisms, environmental influences, and genetic background among different populations [14, 16]. For this reason, population-specific investigations are important for accurate diagnosis, early interception, and appropriate orthodontic treatment planning because local etiological and developmental factors may vary among different populations [14, 16].

Despite the clinical relevance of eruption problems involving permanent canines, information regarding their prevalence and characteristics among Iraqi young adults is still limited [13, 15]. Recent orthodontic literature has highlighted that ectopic and malposed canines represent a clinically significant eruption disturbance that may adversely affect occlusion, dental arch integrity, periodontal health, and orthodontic treatment complexity. Contemporary studies have demonstrated that canine displacement is associated with multiple interacting factors, including skeletal pattern, eruption guidance disturbances, arch length deficiency, and anomalies affecting adjacent teeth. Furthermore, early diagnosis and interceptive orthodontic management have been strongly recommended to minimize complications and improve treatment outcomes [6, 8, 9, 16].

Dental students represent an appropriate study group, as their age coincides with completion of permanent dentition and the stage at which eruption-related positional anomalies are most likely to be clinically apparent. Accordingly, the present study was performed to assess the prevalence and distribution of malposed canines among Iraqi dental students in Al-Najaf city and to evaluate their association with gender, dental arch, buccal or lingual position, laterality, and Angle's classification of malocclusion.

MATERIALS AND METHODS

STUDY DESIGN AND SETTING

This study was carried out as a cross-sectional clinical investigation at the College of Dentistry, University of Kufa, in Al-Najaf city, Iraq. Undergraduate dental students were selected because they represent a young adult group in which permanent dentition is complete and positional eruption problems can be clinically observed.

STUDY POPULATION

A total of 350 undergraduate students were initially examined. After applying the inclusion and exclusion criteria, 302 students were included in the final analysis. The sample consisted of 170 males and 132 females, with ages ranging from 19 to 24 years.

ELIGIBILITY CRITERIA

This study included undergraduate students aged between 19 and 24 years who had complete permanent dentition and no previous history of orthodontic treatment. Participants with systemic conditions or long-term medication that could affect craniofacial growth or tooth eruption were excluded. Also, participants with craniofacial anomalies such as cleft lip or palate, obvious facial asymmetry, or any history of orthognathic surgery were excluded.

CLINICAL EXAMINATION

In this study, each participant underwent a careful intra-oral clinical examination in an upright position with adequate light using a dental mirror and a portable light source. Standardized infection control measures were applied during the examination. The examination focused on the presence and position of permanent canines. Any deviation from the normal alignment within the dental arch was identified and recorded. Canine malposition was noted when the canine was either buccally or lingually in relation to the ideal arch configuration. Because the evaluation depended only on clinical examination, impacted canines that needed radiographic assessment were excluded from the study.

RECORDED VARIABLES

For each participant, the malposed canines were identified and recorded according to gender, dental arch (maxillary or mandibular), position (buccal or lingual), side (right or left), and Angle's classification of malocclusion (Class I, II, or III). All data were documented using a standardized case sheet.

STATISTICAL ANALYSIS

The collected data were analyzed using descriptive statistics, including frequencies and percentages to describe the prevalence and distribution of malposed canines. The Chi-square test and Fisher's exact test were used when appropriate to assess the associations between categorical variables. A p-value < 0.05 was considered statistically significant.

ETHICAL APPROVAL

The article has ethical approval of University of Kufa College of Dentistry (Ref: FKD/EC/114).

RESULTS

As shown in Table 1, this study included 302 participants who were examined clinically, and it was found that

Table 1. Association between gender and prevalence of malposed canines

Gender	Malposed canines n (%)	Normal canines n (%)	Total	P-value
Male	51 (30.0%)	119 (70.0%)	170	
Female	62 (47.0%)	70 (53.0%)	132	
Total	113 (37.4%)	189 (62.6%)	302	0.002

Source: Compiled by the authors of this study

Table 2. Distribution of maxillary and mandibular malposed canines according to gender

Gender	Total malposed canines	Maxillary malposed canines n (%)	Mandibular malposed canines n (%)	P-value
Male	51	32 (62.7%)	19 (37.3%)	
Female	62	23 (37.1%)	39 (62.9%)	
Total	113	55 (48.7%)	58 (51.3%)	0.007

Source: Compiled by the authors of this study

Table 3. Association between gender and direction of canine malposition (buccal versus lingual)

Gender	Buccally malposed canine n (%)	Lingually malposed canine n (%)	Total
Male	48 (94.1%)	3 (5.9%)	51
Female	60 (96.8%)	2 (3.2%)	62
Total	108 (95.6%)	5 (4.4%)	113

Source: Compiled by the authors of this study

Table 4. Association between gender and side of malposed canines (right versus left)

Gender	Right n (%)	Left n (%)	Total
Male	29 (56.9%)	22 (43.1%)	51
Female	33 (53.2%)	29 (46.8%)	62
Total	62 (54.9%)	51 (45.1%)	113

Source: Compiled by the authors of this study

Table 5. Distribution of malposed canines according to Angle's classification of malocclusion

Angle's classification of malocclusion	Malposed canine
Cl I	83 (73.45%)
Cl II	29 (25.66%)
Cl III	1 (0.88%)

Source: Compiled by the authors of this study

113 participants had malposed canines, giving a total prevalence of 37.4%. Statistical analysis using the Chi-square test revealed a significant association between gender and the presence of malposed canines ($p = 0.002$). The prevalence of malposed canines in females (47.0%) was higher than in males (30.0%).

As shown in Table 2, statistical analysis using the Chi-square test showed a significant association between gender and the distribution of malposed canines between the maxillary and mandibular arches ($p = 0.007$). In males, maxillary malposed canines (62.7%) were more frequent than mandibular malposed canines (37.3%), while in females, mandibular malposed canines (62.9%) were more frequent than maxillary malposed canines (37.1%).

Table 3 showed the distribution of malposed canines according to buccal and lingual position in relation to gender. Buccally malposed canine was the predominant presentation in both males and females. Among male subjects, 48 canines (94.1%) were buccally malposed. Similarly, in female subjects, 60 canines (96.8%) were buccally malposed. Statistical analysis using Fisher's exact test revealed no significant association between gender and the direction of canine malposition ($p = 0.656$).

Table 4 showed the association between gender and the side of malposed canines (right versus left). In males, right-side canine malposition was observed in 29 cases (56.9%). Similarly, in females, right-side canine malposition was observed in 33 cases (53.2%). Statistical analysis using the chi-square test revealed no significant association between gender and the side of canine malposition ($p = 0.699$).

According to Angle's classification, this study revealed that most of the malposed canines were associated with Class I malocclusion. In particular, 83 cases (73.45%) were noticed in Class I, followed by 29 cases (25.66%) in Class II. Only one case (0.88%) was noticed in Class III malocclusion as presented in Table 5.

DISCUSSION

This study showed that the overall prevalence of malposed canines in young adults was 37.4%, indicating that canine malposition is relatively common in this age group. Recent investigations also reported that ectopic and malposed canines are commonly observed among young adults, with variations according to gender, skeletal pattern, and dental arch distribution [6]. This is in agreement with previous epidemiological studies, although the reported prevalence varies among populations because of differences in craniofacial characteristics, genetic background, environmental influences, and dental developmental patterns [6, 13–15]. A significantly higher prevalence of malposed canines in female participants than in males has been found; this finding is consistent with several previous studies that reported a higher prevalence of canine eruption disturbances among females [6, 9, 15]. One possible explanation is the difference in growth and maturation patterns between genders. Generally, girls complete craniofacial growth and dental development earlier than boys, which may decrease the chance for spontaneous correction of eruption problems and increase the possibility of malposition [9,12]. Genetic and local developmental factors may contribute to variations in canine eruption disturbances among individuals [16].

In terms of dental arch distribution, a slight predominance of malposed canines was found in the mandibular arch. Although maxillary canine malposition has been more frequently highlighted in the literature, particularly because of its elevated impaction rate, mandibular canine malposition should not be disregarded. Small arch length, lower anterior teeth crowding, and limited adaptability of the mandibular arch may interfere with the normal canine eruption, resulting in malposition [10, 11]. The noticed variation between males and females further encourages the role of local dental factors rather than generalized skeletal discrepancies. Buccal canine malposition was the predominant pattern in the present study, while lingual canine malposition was rare. This is in agreement with other studies reporting that buccally malposed canines are more common, while palatal or lingual malposition is mostly associated with impaction [5, 7, 16]. Recent studies similarly demonstrated that labial or buccal displacement represents a frequent clinical presentation of ectopic canines, particularly in association with arch length deficiency and crowding [6]. Since the present study depended only on clinical examination and excluded canine impaction, the low frequency of lingual malposition is expected [8].

According to Angle's classification, most malposed canines were associated with Class I malocclusion. Similar findings were reported in recent epidemiological studies, which observed a greater prevalence of ectopic canines in subjects with skeletal and dental Class I relationships [6]. This finding supports the concept that canine malposition is mainly related to local eruption disturbances rather than sagittal skeletal relationships [9, 12]. Factors such as arch length discrepancy, prolonged retention or early loss of deciduous canines, and anomalies affecting adjacent teeth, particularly maxillary lateral incisors, may interfere with the normal eruption guidance pathway of permanent canines [8, 17, 18].

The distribution of malposed canines between the right and left sides did not show a significant difference. This is consistent with previous studies that reported that Canine malposition may be influenced by developmental and environmental factors affecting eruption pathways and dental arch morphology [6, 19]. The findings of this study showed that canine malposition is a multifactorial problem with local dental eruption factors rather than skeletal pattern alone. Early clinical examination during the mixed dentition stage is essential, and early interceptive orthodontic management, including space supervision, extraction of retained deciduous teeth, and monitoring of canine eruption pathways, may reduce the severity of canine malposition and simplify subsequent orthodontic treatment [1, 16, 20, 21].

Recent evidence has demonstrated that ectopic and malposed canines remain a significant orthodontic problem because of their association with eruption disturbances, adjacent root resorption, periodontal complications, and increased treatment complexity. Contemporary studies have emphasized the importance of early radiographic and CBCT-based assessment for accurate localization and evaluation of ectopic canines, particularly in cases associated with abnormal eruption pathways or skeletal discrepancies. Moreover, current orthodontic approaches support early interceptive management to reduce complications, facilitate canine eruption, and improve long-term treatment outcomes [22, 23]. Contemporary clinical guidelines also support careful monitoring of eruption pathways and appropriate space management during the mixed dentition stage to facilitate more favorable eruption outcomes and reduce the need for complex surgical-orthodontic interventions [24].

The findings of the present study support the concept that canine malposition represents a multifactorial eruption disturbance influenced by the interaction of

local dental, developmental, and possibly genetic factors rather than sagittal skeletal relationships alone. The observed variations in prevalence and distribution patterns among different populations reported in contemporary orthodontic literature further suggest that environmental influences, craniofacial characteristics, and eruption guidance mechanisms may contribute differently across populations. Therefore, population-based epidemiological investigations remain important for improving early clinical recognition and establishing more individualized orthodontic diagnostic and preventive strategies for eruption abnormalities involving permanent canines [25, 26].

LIMITATIONS

This study was limited by its cross-sectional design and dependence on clinical examination without radiographic confirmation, which may have resulted in underestimation of impacted or unerupted canines. In addition, the sample was restricted to dental students from a single institution, which may limit the generalizability of the findings to the wider Iraqi population.

CONCLUSIONS

Malposed canines were frequently observed in the investigated young adults. In this study, they occurred more frequently in females, exhibited a slight predominance in the mandibular arch, and were predominantly displaced buccally. The common correlation between canine malposition and Class I malocclusion suggests that the former is primarily influenced by local eruption conditions rather than sagittal skeletal discrepancies. These results emphasize the significance of early clinical assessment and prompt interceptive interventions to mitigate the complexity of subsequent orthodontic treatment.

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CONFLICT OF INTEREST

The Author declares no conflict of interest

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