



**Research Article**

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## Prevalence and gender differences of buccally displaced canines of 12 years school children and 18-23 years adults in Shah-Alam, Malaysia

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### Abstract

**Background:** The buccally displaced canines (BDC) are more commonly encountered conditions in orthodontic clinics. It is a positional variation result of several factors such as retained deciduous canines, crowding, and lateral incisors anomalous. **Aims:** To determine the prevalence and gender differences of one-two-three-four buccally displaced canines in the area of Shah-Alam, Malaysia. **Methods:** A cross-sectional study of 399 subjects; was consist of two age groups; 208 subjects of school children aged 12 years and 191 subjects of adults aged 18-23 years were examined clinically to determine the prevalence of BDC. **Statistical analysis:** The data were statistically analyzed using SPSS version 16; a Chi-square test was performed to assess the gender differences. **Results:** No gender differences were found in the school-children group while in the adults group a significant gender difference was found regarding one and four canine displacements ( $P < 0.05$ ). The prevalence of one-two-three canine displacement was higher significantly between the two groups ( $P < 0.05$ ). However, the frequency of one canine displacement was higher significantly in adult females and girls ( $P < 0.05$ ). The frequency of three canines displacement was approximately equal in both genders. **Conclusion:** The frequency of one canine displacement was higher significantly in females. However, the frequency of four canines displacement was higher significantly in males. These features may help in providing additional clinical signs in diagnosis and interception of such clinical situation. It will be effective in treatment plan procedure if canine displacement is detected early, help clinicians on the prevention of impaction possibility.

**Keywords:** Dental arch, Gender differences, Canine displacement, BDC.

### INTRODUCTION

Despite of the prevalence of palatally canine impaction is low, it is exceed that of buccal impaction<sup>[1]</sup>. Most canine ectopia displaced palatally or labially from the normal eruptive direction, displacement or ectopic eruption of canines were defined as divergence from normal eruptive path; the canine can either erupt in an unusual position or become impacted buccally or palatally<sup>[2]</sup>. Buccally displaced canine (BDC) are more likely to erupt than palatally displaced canine (PDC) because of the thinner buccal mucosa and bone, a studied reported that BDC were strongly related to insufficient space in arches<sup>[3]</sup>. Impaction of maxillary canine occurs about 4% of cases referred to orthodontists, in European samples the prevalence of impacted upper canines has been found six fold greater palatal than facial site<sup>[4]</sup>.

The previous studies endorse that the eruption of the canine was strongly influenced by environmental factors<sup>[5]</sup>. There are many factors that can affect the eruption of canines, including crowding, tooth germ anomaly, or bad habits such as biting an object, beside that, the eruption of first or second premolars is early to canine eruption. Therefore, the mesial drift of premolars may occur. As result of this canine displaced buccally even though there is no crowding<sup>[6]</sup>. A previous studies reported that the canines and the premolars were commonly displaced due to dental arch crowding<sup>[7]</sup>. A study on Lithuanian population reported that the labial displacement of maxillary canine was mostly associated with constriction and crowding of dental arch. However,, the canines impacted in palatal path had required eruptive spaces and caused by reduced teeth width<sup>[8]</sup>.

In South Korea a study was exhibited a strong relationship in maxillary arch between canine displacement and small sized lateral incisor and permanent tooth agenesis<sup>[9]</sup>. A similar finding was reported in Jordan<sup>[10]</sup>. In Turkish patients in addition to genetic factors BDC caused by the lack of guidance due to anomaly of

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lateral incisors [11]. In China, buccally impacted canine was commonly caused by impaction of incisors, tooth size and skeletal deficiency. However, palatal impactions were related to the anomaly of lateral incisors, these finding supports the guidance theory, pre-impacted canines displaced more buccally for buccal impacted and almost mesiopalatal for palatally impacted [12].

A study in Jerusalem was concluded that BDC was not related to delayed dental development, thus there are another etiologies for the prevalence of BDC and PDC in maxillary arch, these findings are inconsistent with the hypothesis of Langberg and Peck [13]. In Jordan, palatally impacted canines more common observed in subjects with Class II/2 malocclusion as well as there was a relationship between palatally impacted canines and lateral incisors anomalies [14].

In Croatia PDC was occurred commonly in Class I occlusion and about 16% of subjects had lateral incisors anomalies or congenital missing premolars [15]. The impaction of upper canines as results of transverse arch deficiency therefore; the early interceptive treatment will be effective in increasing the eruption rate of displaced upper canines. On the other hand, it will reduce the comprehensive orthodontic surgical treatment that needed to bring the impacted canine into normal eruptive path [16].

Buccally canine ectopia sometimes occurs, even though there is adequate space available in the jaw. These conditions have been known as primary tooth germ displacement, thus the tooth develops in abnormal place due to genetic pattern without any associated dental features [17]. Impaction of maxillary canines required comprehensive orthodontic treatment. Therefore, if this condition detected and treated appropriately, the prevalence rate of ectopic eruption and impaction will be minimized [18].

A previous study concluded that assessing the occlusal features at early permanent dentition could help in modifying the preventive and interceptive treatment plans [19]. Diagnosis of tooth disturbances in the early mixed dentition which are genetically associated with canine impaction can play an important role in the early diagnosis of this clinical situation. If canine displacement is detected early, it could help clinicians on the prevention of impaction possibility [20]. Early detection of impacted canines may reduce treatment time, cost, complexity, complications. Thus, the subjects should be evaluated early by age of 8 or 9 years to determine the possibility of potential impaction [21].

The most suitable treatment plan is early diagnosis and interception of such clinical situation it will be effective in treatment plan procedure. Upper canines play critical role in creating a good appearance and support of the upper lip. In addition, it helps in achieving of pleasing anterior dental proportions. Although many studies were conducted in the world on canine displacement, the data on BDC of Malay population was scanty and few researches were published. Therefore, the aim of the present study to increase the base line data on Malay occlusion and to shed light on the prevalence of BDC of 12 years school children and adults 18-23 years that could help in the interceptive treatment modalities.

## METHODS

This cross sectional study was performed in Shah-Alam of a total sample of 399 subjects; which consist of two age groups; 208 subjects of school children aged 12 years and 191 subjects of adults aged 18-23 years. All subjects were examined clinically to determine the prevalence of (one-two-three-four) BDC. Ethical approval letter was given by UiTM research committee and the Ministry of Education (600-RMI (5/1/6/01). Consent letter was signed by all subjects before recording their data. The sample was calculated according to statistical methods employed (Non parametric), confidence interval of 95% and  $\alpha = 0.05$ .

## Inclusion criteria

Subjects were Malaysian Malays (their parents and grandparents were Malay without inter racial marriage). Ages were 12 years for school children group and 18-23 years for adults group. All subjects had permanent dentition and who with mixed dentition were excluded.

## Exclusion criteria

Subjects had syndromes, clefts, systemic disease, previous orthodontic treatment, multiple missing teeth, facial deformity and surgery that could affect occlusion.

## The materials

The material used for dental examination consisted of dental mirror, (HSL 247-51) sliding caliper, artificial light and patient information sheet was designed for the relevant data.

## Clinical examinations

The adult subjects were examined in clinic of Faculty of Dentistry while the school children were assessed in school office using natural and artificial lights. Personal information was recorded as name; age, gender, and race. The assessment of BDC was registered present in case of permanent canines were buccally displaced to line of arch [22]. In addition, it registered present if canine does not erupted in its normal path with asymmetry between the right and left canines [23].

## Statistical analysis

The data was analyzed using SPSS version 16.0, the non parametric methods Chi-square was performed to assess gender differences and confidence interval of 95% and  $\alpha = 0.05$  was considered as significant. Examiners reliability was analyzed by weighted kappa statistics ranged between (0.70-0.83) for intra-examiner reliability and (0.69-0.78) for inter-examiner reliability.

## RESULTS

In distribution of BDC in school children group is presented in Table 1, the prevalence of BDC was higher (53.4%) than no displacement (46.6%). No gender differences was observed in school children group regarding BDC ( $P > 0.05$ ), whereas, the frequency of two canines displacement was the highest finding followed by four canines displacement. Nevertheless, no cases were reported with three canine's displacement among school children group.

**Table 1:** The distribution of buccally displaced canines (BDC) in school children group.

BDC	School children				Total	
	Boys		Girls		n	%
	n	%	n	%		
No displaced	52	44.8	45	48.9	97	46.6
One canine displaced	10	8.6	6	6.5	16	7.7
Two canines displaced	34	29.3	24	26.1	58	27.9
Three canines displaced	0	0.0	0	0.0	0	0.0
Four canines displaced	20	17.2	17	18.5	37	17.8
Total	116	100	92	100	208	100

Note: Chi-square=0.713, p value=0.870.

Table 2 showed the distributions of BDC in adult group. The prevalence of BDC was higher (53.4%) than no canine displacement (46.6%). A significant gender difference was found in the adults group ( $P < 0.05$ ).

The frequency of one canine displacement was significantly more common in females ( $P < 0.05$ ), while four canines displacement was more frequent in ( $P < 0.05$ ) males.

**Table 2:** The distribution of buccally displaced canines (BDC) in adults group.

BDC	Adults				Total		Chi-square	P value
	Males		Females					
	n	%	n	%	n	%		
No displaced	29	39.7	60	50.8	89	46.6	2.242	0.134
One canine displaced	6	8.2	26	22.0	32	16.8	5.171	0.013
Two canines displaced	18	24.7	17	14.4	35	18.3	3.166	0.075
Three canines displaced	3	4.1	2	1.7	5	2.6	1.032	0.310
Four canines displaced	17	23.3	13	11.0	30	15.7	5.129	0.024
Total	73	100	118	100	191	100	14.248	0.007

In comparison of the prevalence of canine displacement between two groups, a significant difference was found ( $P < 0.05$ ). The frequency of one canine displaced was higher significantly in the adults group, while two canines displaced were higher in school-children group ( $P < 0.05$ ). In adults group, three displaced canines were the lowest finding (2.6%). However, in school children group no case was observed as shown in Table 3.

**Table 3:** The prevalence of buccally displaced canines (BDC) (adults group versus school children group).

BDC	Adult		School children		Total		Chi-square	p value
	n	%	n	%	n	%		
No displacement	89	46.6	97	46.6	186	46.6	< 0.001	0.994
One canine displaced	32	16.8	16	7.7	48	12.0	7.726	0.005
Two canines displaced	35	18.3	58	27.9	93	23.3	5.091	0.024
Three canines displaced	5	2.6	0	0.0	5	1.3	5.514	0.019
Four canines displaced	30	15.7	37	17.8	67	16.8	0.309	0.578
Total	191	100	208	100	399	100	16.402	0.003

A significant gender differences were found, whereas the frequency of one canine displacement was higher significantly in adult females and girls ( $P < 0.05$ ), while, four displaced canines were higher in adult males and boys ( $P > 0.05$ ). The frequency of three displaced canines was equal in both genders ( $P > 0.05$ ) as shown in Table 4.

**Table 4:** The prevalence of buccally displaced canines (BDC) (adult males and boys versus adult females and girls).

BDC	Adult Males and Boys		Adult Females and Girls		Total		Chi-square	p value
	n	%	n	%	n	%		
No displacement	81	42.8	105	50.0	186	46.6	2.039	0.153
One canine displaced	16	8.5	32	15.2	48	12.0	4.311	0.038
Two canines displaced	52	27.5	41	19.5	93	23.3	3.552	0.059
Three canines displaced	3	1.6	2	1.0	5	1.3	0.324	0.569
Four canines displaced	37	19.6	30	14.3	67	16.8	1.993	0.158
Total	189	100	210	100	399	100	9.584	0.048

## DISCUSSION

The permanent canines are the last teeth to be erupted. Therefore, the lateral incisors and first premolars have adequate space to erupt. In case

of crowding in the dental arch the canines will be buccally displaced [17].

In the present study, a significance difference was found regarding the frequency of (one-two-three-four) canines displacement between the two groups ( $P < 0.05$ ). No significant gender differences were found in the school-children ( $P > 0.05$ ). In contrast with the adults group significant difference was observed ( $P < 0.05$ ), one displaced canine was significantly higher in females and four canines displacement was highest in males ( $P < 0.05$ ).

In the present study, the frequency of two canine displacement of children group was slightly higher in boys than girls (29.3%, 26.1% respectively) whereas four canine displacements was approximately equal in both boys and girls (17.2%, 18.5% respectively). This finding is in agreement with the result in Chinese orthodontic patients maxillary canine impact ratio between males and females were 1.8:1 while the buccally and palatally displaced ratio were 2.1:1 [24].

In this study, the frequency of one canine displacement of adult group was significantly higher in females than males (22%, 8.2% respectively) while the frequency of four canine displacements was significantly higher in males than females (23.3%, 11% respectively).

In comparison of the two groups, the rate of displaced canines was equally in both groups (53.4%). This finding is higher than the results reported in USA, 3.06% of subjects had BDC in maxilla [25]. In many previous studies showed that the prevalence rate of BDC has been rarely reported, whereas PDC was ranged from 1 to 3 % of cases [4, 26]. A similar finding of impacted canines were ranged from 0.2% to 2.8% [27], in Chinese orthodontic patients maxillary canine impaction was 2.05% [24], in Saudi Arabia canine impaction was 5.35% with palatal impactions occurred more frequently than labial impaction [28].

In the current study, the frequency of one displaced canine was higher significantly ( $P < 0.05$ ) in adult group was (16.8%) while in school children was (7.7%). This in agreement with the finding in Jerusalem among of 7 patients (6.2%), one canine was buccally displaced and the other palatally [29]. In the current study, the prevalence of two canine displacements is higher significantly in school children than adults group (27.9%, 18.3% respectively). This finding is higher than the result reported in Jerusalem, whereas bilateral maxillary canine displacement was (41.6%) of these (20.4%) exhibited bilateral palatal displacement and (15.0%) bilateral buccal displacement [29].

In this study, a significant difference was found between the two age groups regarding the frequency of BDC, hence the frequency of one canine displaced was higher in adults group, whereas two canines displaced was higher in school-children group ( $P < 0.05$ ). This finding is agreed with studied reported (16.8%) of sample was one canine displacement [30]. In Germany the prevalence of palatal canine displacement was 2.75% [31]. In USA orthodontic population, the prevalence ratio of Unilateral to bilateral BDC was 33:16 subjects, while male to female ratio was 25:24 subjects [25].

In the present study, the frequency of three canines displaced was 2.6% in adult while no case was observed in school children. The frequency of four canine displaced was higher in school children than adults ( $P > 0.05$ ).

A significant gender differences were found between regarding BDC, adult females and girls had more frequently one canine displaced than adult males and boys ( $P < 0.05$ ). In contrast with four canines displacements was higher in adult male and boys than adult females and girls (19.6%, 14.3%) respectively. This result is agreed with the finding reported in Czech Republic where there was a tendency to a significant increased occurrence of the BDC in males [32]. In Jerusalem the prevalence of bilateral BDC was observed in 35% of females and 75% of males [17]. In Italy the prevalence of PDC was (2.43%), while the ratio of

unilateral to bilateral PDC was 58:30 subjects. The male to female ratio was 1:3 [26]. Canine impaction was more common in girls (8%) of canine impactions was bilateral [20].

## CONCLUSION

In school-children group, the higher incidences of BDC without gender differences. However, in the adults group the gender differences were found. The frequency of one canine displacement was the highest finding in females, while the frequency of four canines displacement was higher significantly in males. These findings may help in the early diagnosis and detection of these clinical situations. Thus, it will be effective in treatment plan procedure and it could help clinicians on the prevention of impaction possibility.

## Limitations

The selection of sample was not random because the school children were controlled by the school principles; therefore, it was purposive. The adult male collection was difficult since the most of patients were females. Furthermore, the patients should be examined early by age of 8 years to determine canine displacement and assess the potential for impaction. Addition possible causes of canine displacement should be investigated in future studies.

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## Declaration of Competing Interest

The authors declare that there is no conflict of interest.

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