MEDICAL SCIENCE

Prevalence rate assessment of impacted canine among patients with peg shape lateral incisor in Saudi Arabia

Hussain Y A Marghalani[1], **Salma Shahin**[2], **Horia Alghanmi**[3], **Abdulmohsen Alahmari**[4], **Sultana Alshammry**[3], **Hind Alserhan**[4], **Abdulmajeed Alaamri**[4], **Dhuha Alshaikh**[5], **Ammar Wali**[6], **Abeer Alanazi**[7], **Muath Saeedi**[6], **Almaha Alniami**[8], **Khames T Alzahrani**[9]

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Authors' Affiliation:
[1]Assistant Professor and Consultant of Orthodontics, Orthodontic Department, King Abdulaziz University, Faculty of Dentistry, Jeddah, Saudi Arabia
[2]General Dentist, MSA University, Cairo, Egypt
[3]General Dentist, King Abdulaziz University, Jeddah, Saudi Arabia
[4]Dental Intern, King Khalid University, Abha, Saudi Arabia
[5]General Dentist, Riyadh Elm University, Riyadh, Saudi Arabia
[6]General Dentist, Private sector, Jeddah, Saudi Arabia
[7]General Dentist, Ministry of Health, Hail City, Saudi Arabia
[8]General Dentist, King Khalid University, Abha, Saudi Arabia
[9]BDS, PGD in Endo, Saudi Board of Endodontic SR, King Faisal Specialist Hospital & Research Center, Riyadh, Saudi Arabia

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ABSTRACT

Background: In orthodontic facilities, maxillary canine impaction is a common clinical condition. The objective of this study will be to assess the prevalence of impacted canines among orthodontic patients with peg shape lateral in Saudi Arabia. *Methodology:* In this questionnaire-based cross-sectional study, was enroll orthodontists, dental interns and dental general practitioners to assess the prevalence of peg-shaped lateral incisors and impacted canines among orthodontic patients in Saudi Arabia during the period of August 2022 to March 2023. Orthodontists, dental interns and dental general practitioners will be invited to participate in this study. *Results:* The research enrolled 1522 citizens, with 53 percent of them working as general dentists; thirty-seven percent were dental interns and 16.3 percent being orthodontists. Canines were affected in 79.8% of cases. In 65.3% of cases, a panoramic radiograph was utilized for diagnosis, whereas cone-beam computed tomography was employed in 21.6 percent. Canine impaction was reported to be unilateral in 74.6% of subjects and bilateral in 25.4%. There was a significant association between diagnosis of impacted canines with profession of the medical practitioner, their gender and years of experience. Also, a significant association was noted with patients' gender and age ($P < 0.05$). *Conclusion:* The investigation demonstrated a significant frequency of impacted canines in Saudi patients. The right side was hit more frequently than the left side. Males had lower impactions than females. To avoid malocclusion and to maintain a healthy, normal dentition, which would enhance masticatory functioning; early diagnosis of impacted teeth should be done.

Keywords: Impacted canine, Peg shape lateral incisor, Orthodontic patients, Impaction, Dental anomalies, Prevalence.

1. INTRODUCTION

In orthodontic facilities, maxillary canine impaction (MCI) is a common clinical condition. It is described as a slowdown or stoppage of the eruption (Lövgren et al., 2019). It may be linked to other orthodontic malocclusions and lateral incisor anomalies, which can be a result or a reason. MCI is complicated that can be connected to a range of disorders or syndromes. Studies have mentioned that the lateral incisor provides the necessary guidance for the correct eruption of its adjacent canine. Without this guidance, for example, as peg shape lateral, the canine became impacted and failed to erupt as supposed time (Sawhny and Sawhny, 2016; Yadav et al., 2013).

Mercuri et al., (2013) found a relatively high prevalence (10.5%) of peg-shaped lateral incisors associated with palatal displaced canines and (8.1%) of buccally displaced canine. Another study found the prevalence of peg shape lateral is 2.12% (Hussain et al., 2018). In addition, Shumar, (2021) study in the Sana'a population revealed that the associated anomalies with impacted canines have different proportions and the peg shape lateral accounts for 2.5%. The genetic influences the prevalence which may vary from population to population.

According to a previous study done at the University of Baghdad, they suggest that buccal displacement of canines has the same influence as palatal displaced canines as both are often associated with different dental agenesis, impaction and anomalies (Rafeeq et al., 2020). In Kosovo, they found differences in width and length of lateral incisors in patients with palatal impacted canines in comparison to the control group where there is no impacted canine (Simić et al., 2019).

Although few studies have been conducted to deter-mine the pre-valence of impacted-canine in Najran but there is no study that evaluates association of impacted canine with peg shape lateral incisors in Saudi Arabia. Therefore, further research including different areas are needed which may improve early recognition and allow to establish an effective early-intervention strategy and prevent undesirable effects (Guarnieri et al., 2016). The main objective of this study will be to assess the pre-valence of impacted-canine among patients with peg shape lateral in orthodontics patients in Saudi Arabia.

2. MATERIALS AND METHODS

In this questionnaire-based cross-sectional study, we invited orthodontists, dental interns and dental general practitioners to participate through an online survey sent via text message using a QR code. Upon accepting to participate in the study, they were-asked to answer a few questions regarding their medical experience with orthodontic patients with peg-shaped lateral incisors and whether those patients have impacted canines.

Following data collection for the enroll orthodontists, dental interns and dental general practitioners and orthodontic patients, the eligibility of each patient-was evaluated. While patients with orthodontics appliance but who don't have peg shape lateral were excluded.

Sample size

Formula would be used for calculating the adequate sample size in prevalence study:

$n = (z)^2 p (1 – p) / d^2$

n = sample size

z = Confidence level which is 1.96

p = Expected prevalence, which is 50%

d = Absolute error, which is 5%

The minimum sample size was 384.

The questioner was divided into two sections. First section related to a question for the medical staff and the second section was about orthodontic patients who have peg shape lateral, attached in the appendix. After collecting data from online questionnaires, responses from participants were downloaded from Google form and saved in "Microsoft Office Excel software" program. Then using (SPSS) statistical package for social science program version 20 to analysis the data.

3. RESULTS

The study included 1522 participants, 53% of them were general dentists, 30.7% were dental interns and 16.3% were orthodontists. 74% of study participants were females and 26% were males. Work experience was 0- 2 years in 52.2% of participants, 3- 5 years in 29.2%, 5- 10 years in 11.3% of participants and more than 10 years in only 7.3%. Age of patient which the peg-shaped lateral

detected was 10- 15 years in 58.5% of patients and above 15 years old in 41.5% of patients. As for patients' gender, 70.8% were females and 29.2% were males. As in Figure 1, 79.8% of patients had impacted canines.

Table 1 Socio-demographic characteristics of subjects (n=1522)

Parameter		No.	%
Profession	Dental Intern	468	30.7
	Orthodontist	248	16.3
	General dentist	806	53.0
Gender	Male	396	26.0
	Female	1126	74.0
Work experience (years)	0-2	795	52.2
	3-5	444	29.2
	6-10	172	11.3
	More than 10	111	7.3
Region in Saudi Arabia	Eastern province	312	20.5
	Middle region	308	20.2
	Western region	641	42.1
	Southern province	193	12.7
	Northern province	68	4.5
Type of dentition was the most affected	Late mixed	757	49.7
	Permanent dentition	765	50.3
Age of patient which the peg-shaped lateral detected	10-15 years	891	58.5
	Above 15 years	631	41.5
Patient gender	Female	1078	70.8
	Male	444	29.2

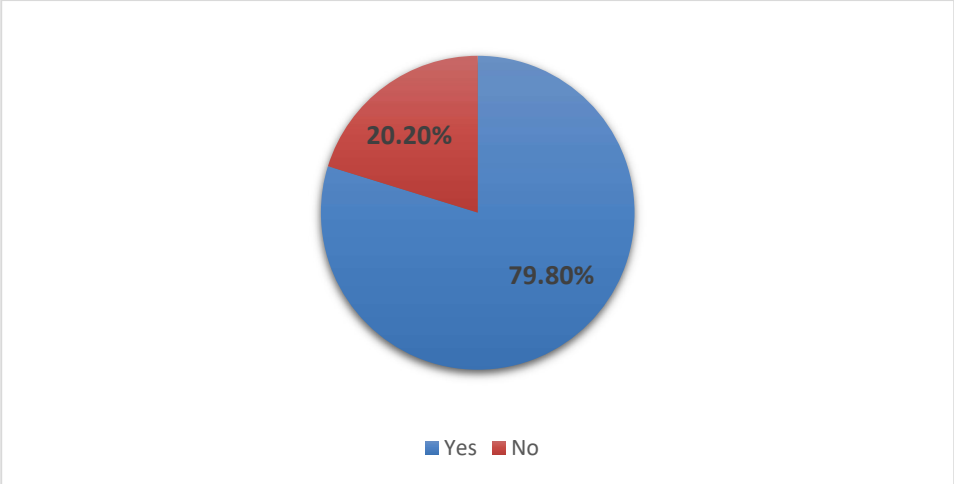

Figure 1 Prevalence of Impacted Canine among Patients with Peg Shape Lateral Incisor studied participants

As in Table 2, panoramic radiograph was sued for diagnosis in 65.3% of participants while cone-beam computed tomography was used in 21.6%. Type of canine impaction was reported to be unilateral in 74.6% and bilateral in 25.4% of participants. In unilateral type, the most common side of impaction was right in 65% and left in 35%. The most sagittal location for the impaction was palatal in 53.2%, labial in 35.1% and mid-alveolar in 11.7%. The overbite measurement rate mostly seen was deep bite in 52.1%, normal in 37.2% and open bite in 10.7%.

Convex shape was the most seen facial profile in 54.8% of patients and concave in 11.3%. Cyst formation was reported in 21.4% of patients as sequelae of impacted canines, 36.2% ankylosis, 19.8% external resorption of impacted or neighboring teeth and 10.4%

internal resorption of the impacted tooth. 42.3% of patients have other medical/systemic problems. As in Figure 2, the most sagittal location for the impaction was palatal in 53.2%, labial in 35.1% and mid-alveolar in 11.7%.

Table 2 Determinants of peg-shape lateral incisor among studied participants (n=1522)

Parameter		No.	%
Impacted canine was diagnosed using	Panoramic radiograph	994	65.3
	Cone-beam computed tomography	329	21.6
	Others	199	13.1
	No	450	29.6
Type of canine impaction	Unilateral	1136	74.6
	Bilateral	386	25.4
In unilateral type, the most common side of impaction	Right	989	65.0
	Left	533	35.0
The most sagittal location for the impaction	Labial	534	35.1
	Palatal	810	53.2
	Midalveolar	178	11.7
The overbite measurement rate mostly seen	Normal	566	37.2
	Deep bite	793	52.1
	Open bite	163	10.7
Overjet measurement rate mostly seen	Normal	423	27.8
	Increased	382	25.1
	Decreased	717	47.1
Space problems	No crowding	586	38.5
	Mandibular crowding	248	16.3
	Maxillary and mandibular crowding	246	16.2
	Maxillary crowding	383	25.2
	Maxillary excess	59	3.9
The most seen facial type	Mesofacial	780	51.2
	Dolichofacial (long face)	558	36.7
	Brachyfacial (broad, square face and straight profile)	184	12.1
The most seen facial profile	Normal	516	33.9
	Convex	834	54.8
	Concave	172	11.3
Sequelae of impacted canines as the following	Cyst formation	325	21.4
	Internal resorption of the impacted tooth	158	10.4
	External resorption of impacted or neighbouring teeth	301	19.8
	Ankylosis	551	36.2
	Infection and migration of neighbouring teeth with loss of arch length	50	3.3
	Others	137	9.0
Patient have any other medical/systemic problems	Yes	644	42.3
	No	743	48.8
	Do not mention	135	8.9

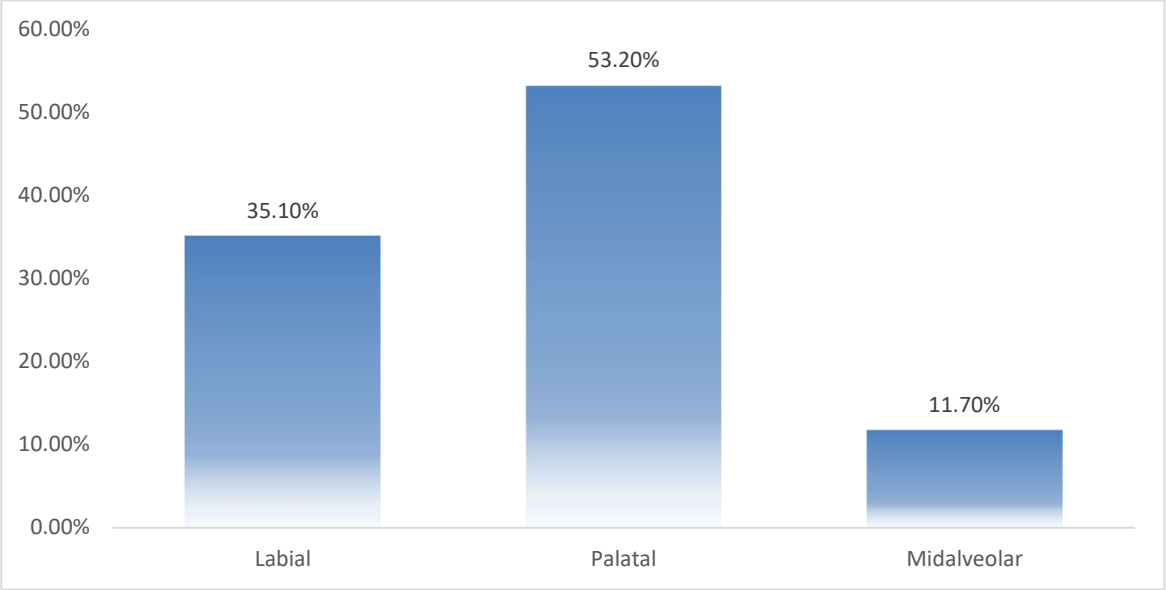

Figure 2 Determinants the most sagittal location for the impaction of peg-shape lateral incisor among studied participants

Table 3 shows significant association between diagnoses of impacted canines with profession of the medical practitioner. Also, a significant association was noted with patients' gender and age (P< 0.05).

Table 3 Association between diagnosis of impacted canines among patients with participants profession and work experience (n=1522)

		The patient has impacted canine(s)		Total (N=1522)	P value
		Yes	No		
Profession	Dental Intern	354	114	468	0.001
		75.6%	24.4%	30.7%	
	Orthodontist	142	106	248	
		57.3%	42.7%	16.3%	
	General dentist	718	88	806	
		89.08%	10.92%	53.0%	
Gender	Male	262	134	396	0.001
		66.2%	33.8%	26.0%	
	Female	952	174	1126	
		84.5%	15.5%	74.0%	
Work experience (years)	0-2	680	115	795	0.001
		85.53%	14.47%	52.2%	
	3-5	377	67	444	
		84.91%	15.09%	29.2%	
	6-10	113	59	172	
		65.70%	34.30%	11.3%	
	More than 10	44	67	111	
		680	115	7.3%	
Residence region	Eastern province	280	32	312	0.001
		89.74%	10.26%	20.5%	
	Middle region	263	45	308	
		85.39%	14.61%	20.2%	
	Western	477	164	641	

	region	74.41%	25.59%	42.1%	
	Southern province	140	53	193	
		72.54%	27.46%	12.7%	
	Northern province	54	14	68	
		79.41%	20.59%	4.5%	
		60.81%	39.19%	29.2%	

Table 4 shows significant association between diagnosis of impacted canines with gender and years of experience. Also, a significant association was noted with patients' gender and age (P< 0.05).

Table 4 Association between diagnosis of impacted canines among patients with their age and gender (n=1522)

		The patient has impacted canine(s)		Total (N=1522)	P value
		Yes	No		
Age of was the peg-shaped lateral detected	10-15 years	794	97	891	0.001
		89.11%	10.89%	58.5%	
	Above 15 years	420	211	631	
		66.56%	33.44%	41.5%	
Patient gender	Male	270	174	444	0.001
		60.81%	39.19%	29.2%	
	Female	944	134	1078	
		87.57%	12.43%	70.8%	

4. DISCUSSION

Orthodontic dental offices regularly meet dental abnormalities. Orthodontics, prosthodontics, restorative dentistry and surgical intervention are frequently necessary for their treatment. As a result, the length and cost of the treatment increase, posing difficulties for the orthodontist and placing a pressure on the family's financial resources. So, for the clinician, orthodontic treatment of impacted canines might be somehow difficult (Lövgren et al., 2019). Because there are so many different racial and cultural groupings, the prevalence of these dental aberrations varies greatly (Alassiry, 2020).

To deter-mine the pre-valence of impacted-canine among patients with peg shape lateral in orthodontics patients, this study was especially conducted on orthodontists, dental interns and dental general practitioners in Saudi Arabia. There have been a few researches to estimate the prevalence of impacted-canines in Najran, but none have looked at the relationship between impacted canines and lateral incisors in Saudi Arabia that have a peg shape. In our analysis the prevalence of clinicians who detected patients with impacted canines was (79.8%). This proportion was consistent with some other studies and inconsistent with some.

Adversely, a retrospective study in Saudi-Arabia's Eastern-Province revealed that the frequency of impacted-teeth was 13.2 percent (Al-Turaihi et al., 2020). According to Yadav et al., (2013) 13.7% of the Greek population had impacted teeth. According to Sawhny and Sawhny, (2016) 16.8% of individuals in the northern portion of India had impacted teeth. On the other side, a recent study of a similar type found that in the central region of Iran, there was at least-one impacted-tooth in 44.1 percent of Pt (Shumar, 2021).

In our study, panoramic radiograph was the most used technique for the diagnosis of impacted canine with a percentage (65.3%), followed by cone-beam computed tomography (21.6%). Almost three quarters (74.6%) were unilateral impaction, like results by Mercuri et al., (2013) who reported approximately (80%) unilateral impaction. Another study held in 2019 revealed that about (63%) had unilateral canine impaction (Hussain et al., 2018). Back to our study, the most sagittal location for impaction was palatal (53.2%) and we also found that the right side (65%) had more impaction than the left side (35%).

Our findings was inconsistent with Mercuri et al., (2013) findings which reveal that impaction on the left side was more common (42%) and on the right side the percentage was less (38%). Remarkable finding in our study is that the prevalence of impacted teeth in male and female patients varies greatly, as female patients account for (70.8%) and male patients were only (29.2%) of total patients. This is consistent with Al-Turaihi et al., (2020) study, stated that (71.8%) were impacted females, compared to (28.2%) impacted males.

According to Alassiry, (2020) females (58.38%) were more likely than males (41.62%) to have impacted maxillary canines. The maxillary arch had a higher incidence of impaction. Impaction was observed to occur in 59.5% of men' maxillary arches and in 40% of males' mandibular arches. According to Alassiry, (2020) and Omeish et al., (2022) results, in females the percentage of impaction was 78% of the maxillary arch and 22% of the mandibular arch. Back to our results, the most seen space problem was maxillary crowding (25.2%) followed by mandibular crowding and maxillary and mandibular crowding (16.3%) and (16.2%) respectively.

Furthermore, ankylosis was the most seen sequelae of impacted canine (36.2%), followed by cyst formation (21.4%). The following are suggested sequelae for canine impaction by Rajendran and Sundharam, (2006) internal resorption, dentigerous cyst formation, external root-resorption of the impacted-tooth, as well as the neighbouring-teeth, infection, particularly with partial-eruption, referred-pain and combinations of the sequelae. Labial or lingual mispositioning of the impacted tooth. Immigration of the neigh-bouring-teeth and loss of arch length (Rajendran and Sundharam, 2006).

In our study, we found association between diagnosis of impacted canines among patients with participants' profession and work experience. The profession showed significance (p=0.001), as general dentists encountered more patients (53%), (89.08%) of them had impacted canine. The gender showed significant difference as well (p=0.001), as females made up (74%) of the clinicians and (84.5%) of their cases had impacted canine. Work experience showed significant difference also (p=0.001).

Residence region showed significant difference as well (p=0.001), western region showed the highest prevalence (42.1%). There was also association between diagnosis of impacted canines among patients with their age and gender. Age of the peg-shaped lateral showed significant difference (p=0.001). Also, the patient gender showed significant difference as well (p=0.001), as female patients made up (70.8%) of the total patients with (87.57%) having impacted canine (s).

Limitation

The included studies have relatively small sample sizes. There were almost no similar previous studies on our topic, which made it harder for us to compare our results, resulting in low power and reliability to our study results.

5. CONCLUSION

In Saudi patients, the study discovered a high prevalence of impacted canines. The right-side experienced impacts more frequently than the left side. Males showed less impactions than did females. To avoid malocclusion and to maintain a healthy, normal dentition, which would enhance masticatory functioning; early diagnosis of impacted teeth should be done.

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Author Contributions

The authors confirm contribution to the paper as follows: Study conception: Hussain YA Marghalani and Salma Shahin; data collection, analysis, interpretation of results and draft manuscript preparation: Hussain YA Marghalani, Salma Shahin, Horia Alghanmi, Abdulmohsen Alahmari, Sultana Alshammry, Hind Alserhan, Abdulmajeed Alaamri, Dhuha Alshaikh, Ammar Wali, Abeer Alanazi, Muath Saeedi, Almaha Alniami and Khames T Alzahrani. All authors reviewed the results and approved the final version of the manuscript.

Ethical Approval

Ethical approval was obtained from the Research Ethical Committee at faculty of Dentistry at King Abdul-Aziz University in Jeddah, Saudi Arabia (Ethical approval number: 130-10-22). Participants were informed that their participation is voluntary and filling the questionnaire indicates their consent to participate.

Informed consent

Written consent was obtained from all individual participants included in the study

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This study has not received any external funding.

Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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