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College of Dentistry

The Prevalence of missing lateral incisor
(Cross sectional study)

A Project Submitted to

The College of Dentistry, University of Baghdad, Department of Orthodontics in Partial Fulfillment for the Bachelor of Dental Surgery

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Certification of the Supervisor

I certify that this project entitled "**prevalence of missing lateral incisors** " was prepared by **Zainab Ali Moatee** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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Date :

Dedication

To my beloved family, my inspiration, my biggest support system and my number one fans. I can't wait to see wherethe road takes us next, hand in hand, moving forward together. I love you forever.

Acknowledgment

First and foremost, praises and thanks to Allah Almighty for helping me fulfill my dream, for his blessings throughout my work to complete it successfully.

I would like to extend my deepest respect and gratitude to the Dean of College of Dentistry, University of Baghdad, **Prof. Dr. Raghad Al-Hashimi.**

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Abbreviation	Meaning
CMT	Congenitally missing teeth
FPD	Fixed partial denture
RMB	Resin-modified bridges

Introduction

Agenesis, the absence of permanent teeth, is a common occurrence among dental patients. Prevalence of congenital missing permanent teeth in general, and maxillary lateral incisor in specific varies in different populations from 1.1% to 15.88% **(Rizk, 2018)**. In AfricanAmericans, agenesis has been estimated to be 7.7% with the mandibular second premolar most frequently missing, Studies in Japan have demonstrated tooth agenesis in 9.2% of that population, mostly affecting the mandibular lateral incisor **(Vastardis 2000)**. In Europeans, 5.5% fail to develop one or more permanent teeth. In Turkish patients, it constitutes 5% **(Uzuner *et al* 2013)**. However, in Iranian patients the prevalence was approximately 10.9%, and the most frequent congenitally missing teeth was mandibular second premolars **(Sheikhi *et al* 2012)**.

There are several possible causes of congenital missing teeth, including genetic factors, certain medical conditions, and environmental factors. In some cases, hypodontia may be an inherited trait, meaning that it runs in families.

Esthetically, correcting congenitally missing maxillary, lateral incisors is a common challenge that every orthodontist and dental team will face, dentists must consider the treatment options that are most appropriate for each patient. The specific treatment plan for missing lateral incisors will depend on a variety of factors, and should be discussed with a dentist or orthodontist who specializes in restorative dentistry. They can help determine the best course of action for achieving a natural-looking and functional result.

There is no general agreement about the prevalence of missing teeth nor the modalities of treatment. Furthermore, there is new trend toward optimization of facial aesthetic and smile in specific. Nowadays, patients ' perception toward facial aesthetic is a crucial.

Aim of the Study

This study aimed to determine prevalence of missing lateral incisors among dental and medical students.

The objectives were:

1. To determine the prevalence of permanent missing teeth among dental and medical students.

2. To determine the prevalence of permanent missing teeth in both gender of dental and medical students.

3.To determine the Perception toward treatment of missing lateral incisors among medical and dental students.

4.To determine the Perception toward treatment of missing lateral incisors in both gender of medical and dental students.

1. Chapter One: Review of Literature

1.1. Definition:

Many terms can be used to describe missing teeth. **Anodontia** is the complete absence of teeth; **Oligodontia** or **partial anodontia** means absence of six or more teeth; **hypodontia** denotes missing teeth, but usually less than six and often the size and shape of remaining teeth are altered as well, **Agenesis** is defined as teeth that failed to develop or are not present at birth **(Vastardis 2000 ;Proffit *et al.,* 2007)**.

1.2. Prevalence of missing teeth:

The maxillary lateral incisor is the second most frequently missing tooth after the mandibular second premolar **(Vastardis 2000 ;Polder *et al.*, 2004)**. Missing of lateral incisors experience the most agenesis (not including third molars). Missing of the maxillary lateral incisor is also linked with anomalies and syndromes such as agenesis of other permanent teeth, microdontia of maxillary lateral incisors (peg laterals), palatally displaced canines and distal angulations of mandibular second premolar **(Garib *et al.*, 2010 ;Pirinen *et al.*, 1996 , Peck *et al.*, 2002)**.

The reported prevalence of missing teeth, excluding third molars, depends on the population studied. Large differences have been reported, varying from 0.3 to 36.5% **(Polder *et al.*, 2004)**. In African Americans, agenesis has been estimated to be 7.7% with the mandibular second premolar most frequently missing, Studies in Japan have demonstrated tooth agenesis in 9.2% of that population, mostly affecting the mandibular lateral incisor **(Vastardis ,2000)**. In

Europeans, 5.5% fail to develop one or more permanent teeth. In Turkish patients, it constitutes 5% **(Uzuner *et al.*, 2013)**. However, in Iranian patients the prevalence was approximately 10.9%, and the most frequent congenitally missing teeth was mandibular second premolars **(Sheikhi *et al.*, 2012)**. In adult Iraqis, the frequency of missing upper laterals is (2%) it was consisting (1.5% for female and 0.5% for males), **(Ibraheem, 2018)**. Lastly, in Sulaimani Kurdish students the prevalence was 3.1% **(Rauf, 2006)**. The prevalence of hypodontia was 14.1% (6% for males, 8.1% for females) with no sex variation. Most cases (51.28%) with hypodontia had only one missing tooth (21.79% for males, 29.49% for females). The most commonly missing teeth were the maxillary lateral incisors (37.8%), followed by the mandibular second premolars (34.1%) **(Jalal, 2015)**. Agenesis of Saudi Arabian lateral incisors was significantly more frequent in the maxilla ($P < 0{\cdot}05$) than in the mandible **(Sulaiman ALErman, 1990).**

The importance f evaluating hypodontia in a community is vital since it can contribute to the masticatory dysfunction, speech alteration, and esthetic problem, in addition to malocclusion **(Vieira *et al.*, 2004)**. Furthermore, Lammi et al, proposed an intriguing possibility that tooth agenesis may be used as an indicator of susceptibility to colorectal cancer **(Lammi *et al.*, 2004)**.

1.3. Etiology

Hypodontia may be an isolated trait, known as non-syndromic or familial hypodontia. Non-syndromic hypodontia is thought to have a multi- factorial aetiology arising from a complex interaction between genetic and environmental factors. Syndromic hypodontia is the term given to hypodontia that occurs with accompanying genetic disorders

(Shimizu and Maeda, 2009).

1. Non-Syndromic hypodontia (Laura and Simon, 2019)

Three key genes have been identified in non-syndromic hypodontia; muscle segment homeobox 1 (MSX1), paired box gene 9 (PAX9), and axis inhibition protein 2 (AXIN2). These are regulatory genes in the morphogenesis stages of tooth development and mutations have been linked to different phenotypes.

Mutations in the MSX1 gene are predominantly linked to familial oligodontia and premolar agenesis, those in the PAX9 gene to molar agenesis, while mutations in AXIN2 involve a wide range of teeth.

2. Syndromic hypodontia (Laura and Simon, 2019)

hypodontia and oligodontia are associated with over 100 and 70 syndromes respectively. Some of the most common syndromes that feature hypodontia :

- Cleft lip and palate syndromes, e.g. ectrodactyly, ectodermal dysplasia, and cleft lip/palate syndrome 1
- Ectodermal dysplasias
- Oral–facial–digital syndromes
- Down syndrome (OMIM 190685)
- Wiktop syndrome (OMIM 189500)

1.4. Effect of missing tooth/teeth

The congenital absence of teeth can seriously affect a young person, both physically and emotionally particularly when the missing tooth is located in the anterior region of the mouth **(Sisman *et al.*, 2007)**. Early detection of hypodontia may allow a more favorable prognosis and minimal functional, esthetical and psychological complications **(Popa *et al.*, 2010)**.

1. Associations of CMT with skeletal changes in the horizontal plane

The results pertaining to skeletal changes are controversial. Some authors did not find a significant correlation between malocclusions and CMT prevalence. While according to others, there could be significant links suggesting a link between CMT and Class II division 2 **(Kim, 2011)**. CMT might accompany reduced intercanine and intermolar widths **(Celikoglu *et al.*, 2010)**.

Anterior missing can accompany retrognathic maxillae, prognathic mandibles and smaller lengths of posterior cranial base **(Kumar *et al.*, 2013)**. It also might be more common in the skeletal Class III malocclusion due to smaller or retrognathic maxillae **(Chung *et al.*, 2008; Vahid-Dastjerdi *et al.*, 2010)** In some studies, Class III was associated merely with severe CMT **(Acharya *et al.*, 2010; Chung *et al.*, 2000)**. CMT might be also significantly less frequent in Class II cases **(Ajami *et al.*, 2010)**. Although a study reported non-significant results for this decrease (possibly due to small sample of Class II cases) **(Kim, 2011).** However, It might depend on the most common missing teeth, as it appears that the missing tooth affects its own jaw **(Rakhshan , 2015)**. A study by Hirukawa et al (**1999)** concluded that Class III might be the most common malocclusion observed among the subjects who had missing teeth only in the maxilla, while when teeth were missing only in the mandible, it was frequently associated with Class II malocclusion **(Hirukawa *et al.*, 1999).**

2. Associations of CMT with vertical skeletal changes

According to some studies, dental aplasia is not correlated with the

vertical relationship of the jaws **(Chung *et al.,* 2008; Celikoglu *et al.,* 2010)**. However some investigators have found significant associations between the CMT occurrence with reduced anterior lower facial height **(Kumar *et al.,* 2013; Larmour *et al.,* 2005)** and increased overbite **(Fekonja 2005)** which intensifies by increasing the severity of CMT **(Acharya *et al.,* 2010; Chung *et al.,* 2000)** or less severe deep bite in CMT patients **(Hirukawa *et al.,* 1999)** and decreased maxillary- to-mandibular-planes angle, which was clinically relevant only in severe CMT, **(Acharya *et al.,* 2010)**. Furthermore, anterior CMT might have a significant effect on the vertical skeletal relationships with increasing severity of CMT **(Acharya *et al.,* 2010)**. It also might contribute to a more acute mandibular angle and flatter chin **(Kumar *et al.,* 2013)**.

3. Association of CMT with other dental anomalies

CMT can accompany other conditions such as delayed eruption of other teeth, reductions in coronal or radical dimensions, retained primary teeth, ectopic canine eruption and abnormal dental morphologies such as taurodontism and peg-shaped maxillary lateral incisors **(De Coster *et al*., 2009;Gomes *et al*., 2010)** .While some researchers have reported that the size of teeth and the width of the dental arch are not related to dental agenesis,**(Wisth *et al*., 1974)** some others reported conflicting results indicating that CMT is associated with dental anomalies such as microdontia and decreases in the size of the incisors and canines as well as conical or tapered teeth such as peg lateral **(Gomes *et al*., 2010;Gungor , Turkkahraman, 2013)**. However, some investigators did not find a link between tooth agenesis and microdontia but with peg laterals**(Chung *et al*., 2008)**. They concluded that CMT was not associated with changes in the

overall tooth size, while changes in tooth morphology especially in the maxillary lateral incisors might still be possible **(Chung *et al.*, 2008)**. This might be in line with other studies finding correlations between severe CMT and taurodontism **(Küchler *et al.*, 2008; Kan *et al.*, 2010)**, especially in boys, **(Kan *et al.*, 2010)**. It might also be in agreement with studies that could not associate pCMT with microdontia of contralateral teeth **(Küchler *et al.*, 2008)**. Therefore, the literature is not conclusive.

1.5 Diagnosis and classifications of congenitally missing teeth

Dental aplasia is classified based on the number of missing teeth **(Fekonja 2005; Rakhshan 2013)**. Mild and moderate cases have usually less than three and less than six teeth missing, respectively **(AlShahrani *et al.*, 2013)**. The definitions of hypodontia, oligodontia and anodontia differ in the number of missing teeth, on which there is no clear agreement **(Aktan *et al.*, 2010; Gomes *et al.*, 2010; Rakhshan 2013)**. This can account for some of the variation observed **(Rakhshan 2013)**. An ideal CMT diagnosis requires radiographic, clinical and dental cast examinations,**(Kim 2011)** but in any case, radiographic examination is a must,**(Amini *et al.*, 2012; Durrani *et al.*, 2010)**. Since radiographic evidence of tooth germs needs certain level of calcification to appear, inclusion of too young individuals might enter insufficiently calcified tooth buds into the sample, which can be mistakenly diagnosed as missing teeth on the radiograph,**(Rakhshan 2013)**. It can be of a greater concern for the mandibular premolars **(Polder *et al.*, 2004; Goya *et al.*, 2008)** and boys, both with more delayed eruption odds **(Kim, 2011; Amini *et al.*,**

2012). Therefore, scientists should take into consideration the late development of the lower second premolars in boys; and should not include subjects without the canines and premolars neither erupting nor fully erupted **(Kim , 2011)** or at least under 6 **(Goya *et al.*, 2008)**. Some authors have recommended the exclusion of children younger than 9 or 10 or even 12 years old **(Amini *et al.*, 2012; Sheikhi *et al.*, 2012; Rakhshan 2013)**. The third molar bud calcification begins at the age of about 7.5 only in very few people; however, the average age for the initiation of its calcificationis about the age 9.5 **(Daito *et al.*, 1992; Garn *et al.*, 1962)**. Therefore, by including patients younger than 9, or even 11 (as the 85th percentile for initiation of calcification) **(Garn *et al.*, 1962)** researchers might considerably overestimate the third molar missing rate.

This might explain the very high prevalence reported by some studies (34.8%), **(Sheikhi *et al.*, 2012)**. It should be noted that even the initiation of calcification does not guarantee well detection in radiographs; and older ages might be needed for some cases, in order to make sure calcification has reached a detectable minimum **(Vahid Rakhshan ,2015)**.

1.6 Treatment Options

Treatment options available for patients with missing lateral incisors and no other malocclusion include implants resin-modifed bridge (RMBs), or even a conventional bridge. Orthodontics may not need to be a part of this procedure if the teeth are in good alignment and the lateral space is sufficient for a prosthesis. Treatment of malocclusions having agenesis of one or both maxillary lateral incisors generally falls into two possible options. The space can be either opened or closed **(Sabri, 1999).** If the space is opened, a

prosthetic procedure is required to replace the missing tooth. Implants are becoming the treatment of choice, but Resin-Modified Bridges (RMB), cantilevers, or conventional fixed partial dentures are still performed due to finances or because they are a less invasive procedure, or there is deficient bone volume for implants (**Kinzer, 2005; Kinzer, 2005**). If the space is closed, the canine must be reshaped to resemble a lateral incisor, and the first premolar will substitute for the canine. This is called canine substitution **(Kinzer, 2007; Thordarson, 1991).** There will be different esthetic demands depending on the treatment., for example, canine substitution cases may present more difficulty in achieving the golden proportions or matching the shade and shape with the contralateral lateral incisor. RMBs make it difficult to create a good emergence profile and maintain a good bony alveolar ridge. Ideally, canine substitution, RMBs, or an implant will aim for correct papilla projection, contour, and a natural zenith point. For example, a canine substitution case will require disguising the canine eminence and a higher gingival contour in the lateral site, while an implant restoration may have difficulty creating an ideal papilla projection and no gray coloring of the gingiva **(Jergensen, 2011)**.

1.6.1 Types of Tooth-Supported Prostheses

There are 3 basic types of tooth-supported prostheses available. They are acantilevered fixed bridge, a conventional full-crown fixed bridge and resin- bonded fixed bridge. The primary consideration among these treatment options is conservation of tooth structure. Ideally, the treatment of choice should be the least invasive option that satisfies both aesthetic and functional objectives for the patient **(Kiliaridis *et al*., 2016)**.

1.6.1.1 Resin-bonded Fixed Bridge (Figure 1.6.1.1)

This is the most conservative method for replacing a missing lateral incisor with a tooth-supported prosthesis. The specific criteria for a successful treatment using a resin-bonded fixed bridge include the position, mobility, thickness, and translucency of the abutment teeth as well as the overall occlusion. Resin- bonded fixed bridges placed in a deep overbite relationship have been shown to have a higher prevalence of failure. The ideal anterior relationship for a resin-bonded fixed bridge is a shallow overbite. Another concern regarding tooth position is inclination of the abutment teeth **(Rosen *et al*., 2016)**. Abutment teeth with increased inclination are more prone to debonding **(Bishop *et al*., 2007)**. The mobility of the abutment teeth is a contraindication for a resin- bonded fixed bridge. A final area of concern regarding placement of a resin-bonded fixed bridge is occlusal parafunction, which places too much stress on the pontic and subsequently results in prosthesis failure **(Willhite *et al*., 2002)**. Abutment teeth that are immobile, moderately thick, and have translucency mainly localized in the incisal one third are ideal candidates for a resin-bonded fixed bridge. A shallow overbite allows maximum surface area for bonding retainers with little or no tooth preparation **(Stylianou *et al*., 2016)**. Management of patients with congenitally missing lateral incisors often plays a vital role in the success of the treatment. The combined efforts of the prosthodontist and orthodontist can produce predictable and aesthetic treatment results for congenitally missing lateral incisors **(Watted *et al*., 2016)**.

Figure 1.6.1.1: a-e. Resin-Bonded to Replace Missing Lateral Incisors **(Watted et al., 2016).**

1.6.1.2 Cantilever Bridge

A more predictable tooth-supported restoration that overcomes the limitations of a conventional resin bonded fixed partial denture is the cantilevered FPD. Because of its root length and crown dimensions, the canine is an ideal abutment for such a restoration. As compared with the resin-bonded FPD, the success of this restoration does not depend on the amount of proclination or mobility of the abutment teeth. If the facial esthetics of the canine abutment do not need to be altered, the most conservative cantilevered restoration uses a partial coverage preparation **(Stumpel and Haechler, 2001).**

. If the canine requires a change in the facial contour to enhance the esthetics, then a conventional full-coverage preparation can be done to support the cantilevered lateral pontic **(Figure 1.6.1.2)**. The key to the long-term success of a cantilevered bridge restoration is managing the occlusion on the pontic. All contact in excursive movements must be removed from the cantilever. If eccentric contact remains on the pontic, the potential risks include loosening of the restoration, migration of the abutment, and fracture **(Small, 2004)**.

Figure 1.6.1.2: Bilateral agenesis of the maxillary lateral incisors in a 19-year-old woman. The patient had resinbonded FPDs replacing both lateral incisors **(Kokich et al., 2005).**

1.6.1.3 Conventional Full-Coverage Fixed Bridge

The least conservative of all tooth-supported restorations is a conventional full- coverage fixed partial denture. This restoration is generally considered the treatment of choice only when replacing an existing full-coverage bridge or the adjacent teeth require restoration for structural reasons such as caries or fracture **(Bishop *et al.*, 2007)**. However, because of the amount of tooth preparation required for a conventional bridge restoration, it is not the ideal treatment for replacement of missing lateral incisors in young patients **(Kokich *et al.*, 2011)**.

1.6.2 Implant approach

With lateral incisor agenesis and available space, implants are usually the treatment of choice. Implants are a favorable option because no adjacent tooth is prepared for restorations, and implants have a success rate of 90% over 10 years **(Bernard *et al.*, 2004)**. Pre-implant orthodontics must leave adequate room for the implant between the adjacent roots as well as sufficient crown space. This can be achieved by using the golden proportion, the contralateral lateral incisor, a Bolton analysis, or a diagnostic wax-setup **(Kokich, 2004)**. Generally, the lateral incisor site should be 5-7mm. Space between the roots of the adjacent teeth and the implant can be no less 0.75mm, with 1.5-2mm space between the adjacent crowns and implant head **(Thilander, 2008)**. Implants must be placed after growth cessation due to the continuing vertical growth of the jaws. If growth has not stopped, this can lead to infraocclusion of the implant with an unesthetic gingival architecture **(Armbruster *et al.*, 2005)**. After orthodontics, the adjacent roots must be maintained out of the edentulous site, and the alveolar ridge may need bone grafting in the future if the ridge narrows. The lateral incisor space will also need a temporary pontic, which is often built into a retainer or a RMB. If the implant is placed too labially, the thin buccal bone can resorb and the gingiva can appear gray in color. Poor soft tissue management can also lead to loss of papillary esthetics; the papilla distal to the lateral incisor implant can be particularly difficult to Full in the embrasure space **(Bishop *et al.*, 2007)**.

1.6.3 Orthodontic space closure-canine substitution

Closing the space created by maxillary lateral incisor agenesis orthodontically is called canine substitution. This is a frequent option when the molar relationship is Class II **(Sabri, 1999)**. As the canine is brought into the lateral site, certain orthodontic movements are essential for an acceptable esthetic result. The canine will first be protracted and then extruded to align the scalloped free gingival margin slightly more incisal than the central incisor gingival margin. Proper position of the canine root to the lingual will decrease the canine eminence. The first premolar should be rotated more mesially and buccal root torque applied to mimic a canine eminence; intrusion of the tooth may also be done to achieve a more canine-like gingival architecture **(Kinzer, 2007; Tuverson, 1970)**. Another necessary step in canine substitution is changing the canine crown shape. The incisal tip must be flattened and the mesial and distal surfaces must be reduced to make the canine 'thinner.' The pronounced canine labial ridge should be reduced for a flatter facial surface, and the lingual cingulum reduced if there are premature occlusal contacts **(Kinzer, 2007)**. Likewise, the first premolar may need to have the lingual cusp reduced for occlusion and esthetics. If the premolar was intruded for gingival architecture, the buccal cusp may need to be lengthened with restorative material. If the canine cannot be reshaped to appear like a lateral incisor, or the color is too dark and yellow **(McNeill, 1971)**, restorative treatment can be performed to create a lateral incisor's shape and color. Often the incisal corners of the canine may require direct composite build-ups to achieve the lateral incisor shape, but porcelain restorations can also be chosen for better color or durability **(Zachrisson, 1978)**. Temporary crowns are a good option to get

correct gingival shape before final restorations are placed **(Czochrowska, 2003)**. Even with some of these restorative options, the cost is much more affordable and the course is less invasive than an implant procedure **(Rosa, 2007)**. Research has shown that removing the enamel of the canine does not cause harm to the tooth or pulp except for a temporary sensitivity **(Zacchrison, 1975)**. Canine substitution has had no correlation with development of temporomandibular dysfunction **(Robertson, 2000).** Possibly the most common objection expressed by a layperson is the yellowish-white color of the canine when used as a lateral; most researchers recommend selective bleaching or restorative treatment **(Kinzer, 2007)**. Another problem doctors see with canine substitution treatment is the loss of the canine guidance for excursive movements in a Class I occlusion. Nordquist et al **(1975)** showed that canine substituted teeth are periodontally healthier than prosthetic lateral incisors, and no differences existed in occlusal function between canine substitution, group function, or prosthetically replaced lateral incisors with the canine in Class I. Thordarson et al **(1991)** also found that no significant long-term clinical and radiographic findings occurred to enamel reduced teeth **(Zachrisson, 1975)**.

1.7 Perception toward treatment of congenitally missing teeth

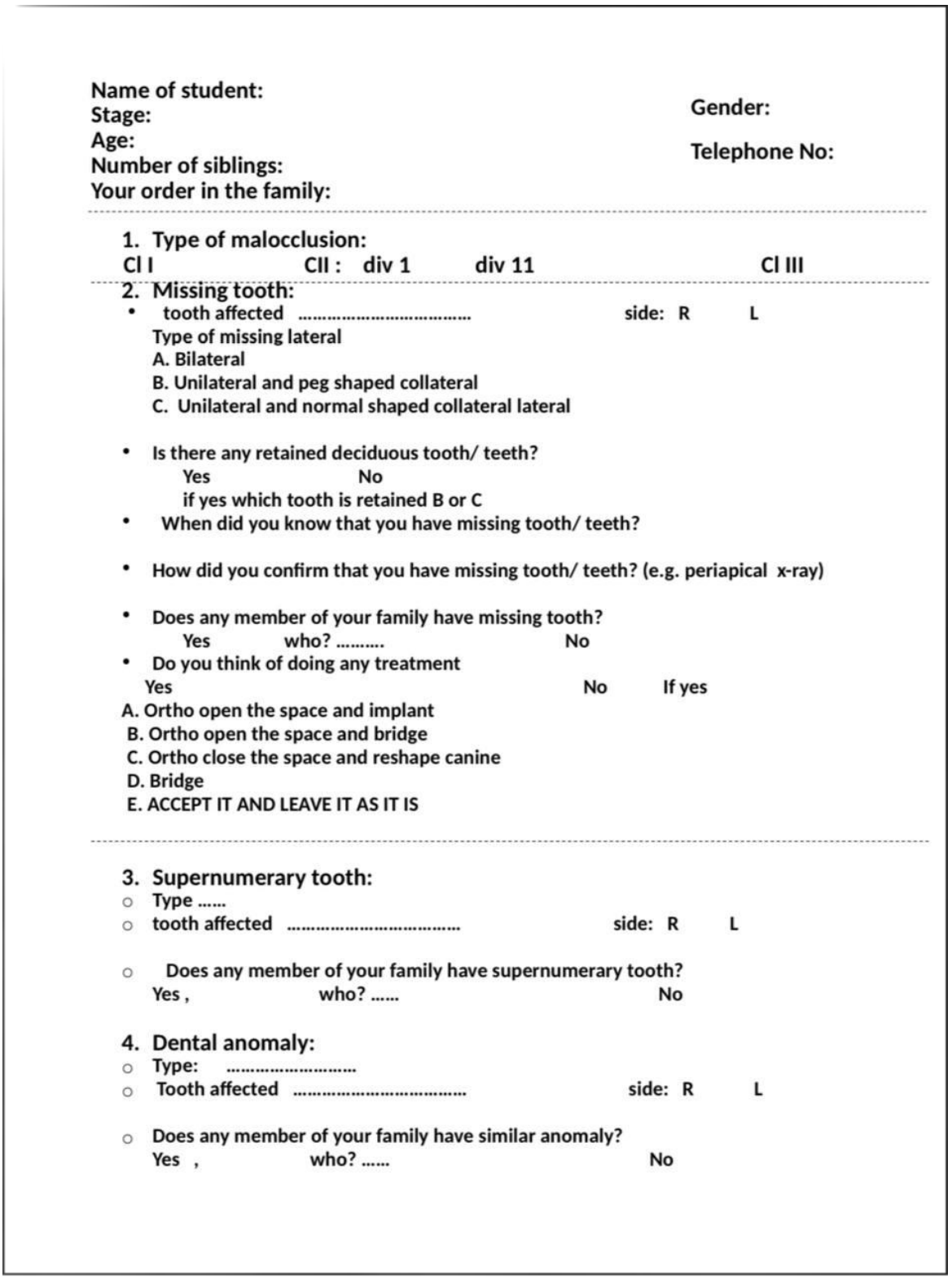
Treatment of congenitally missing lateral incisors is crucial because missing teeth adversely affect facial appearance and personal behavior **(Hobkirk *et al.*, 1994)**. Significant differences in smile perceptions were found between professionals (dentists and orthodontists) and laypeople. Presence of dental tipping and marked

diastema in the arch were disharmonious aspects less tolerated in a smile by all categories of evaluators. Simulations associated with space closure orthodontic treatment were ranked as the most attractive smile and significantly ranked higher by dental professionals than patients and laypeople **(Rosa *et al.,* 2013)**. Most general practitioners (62.7%) preferred to replace missing lateral incisors with an implant-retained crown, followed by 15.3% who preferred cantilever bridges, fifty six percent of general practitioners preferred removable partial dentures, followed by (17.2%) who preferred to carry out no treatment **(Abdulrahman *et al.,* 2019)**. And found (66.6%) prefer treatment by space closure while in man (33.3%) (**(Ibraheem, 2018).**

2.Chapter two: Materials and methods

A cross-sectional study was carried out between January 2023 to April 2023 at College of Dentistry/ Baghdad university. According to study protocol, the total sample size was planned to be 600 students; 500 dental students and 100 medical students. The 500 students were 100 students from each stage. Inclusion criteria were all students had to be adults (above 18 years old) with no history of permanent teeth extraction, or cleft lip and/or palate, orthognathic surgery or craniofacial anomalies. The study was based on clinical examination of the sample for congenital missing permanent teeth, except for third molars, among dental and medical students. All the participants were examined by the author. The clinical examination was carried out in orthodontics clinic/ College of Dentistry/ University of Baghdad, using disposable dental mirrors, disposable probe, medical masks and disposable gloves. Patients name, age, gender, number of missing teeth, side (right or left), type of malocclusion, presence of other dental anomalies or supernumerary tooth/ teeth, planned treatment of missing tooth/teeth, were all recorded in prepared printed form **(Figure 2.1)**. Then all the data were transferred to an Microsoft Excel sheet.

Statistical Analysis: The data collected from the samples were analyzed by calculating the summation and percentage of the collected data.



Name of student:
Stage:
Age:
Number of siblings:
Your order in the family:

Gender:

Telephone No:

1. Type of malocclusion:
   Cl I CII : div 1 div 11 Cl III
2. Missing tooth:
   - tooth affected ..... side: R L

   Type of missing lateral
   A. Bilateral
   B. Unilateral and peg shaped collateral
   C. Unilateral and normal shaped collateral lateral

   - Is there any retained deciduous tooth/ teeth?
     Yes No
     if yes which tooth is retained B or C
   - When did you know that you have missing tooth/ teeth?
   - How did you confirm that you have missing tooth/ teeth? (e.g. periapical x-ray)
   - Does any member of your family have missing tooth?
     Yes who? ..... No
   - Do you think of doing any treatment
     Yes No If yes

   A. Ortho open the space and implant
   B. Ortho open the space and bridge
   C. Ortho close the space and reshape canine
   D. Bridge
   E. ACCEPT IT AND LEAVE IT AS IT IS

3. Supernumerary tooth:
   - Type .....
   - tooth affected ..... side: R L
   - Does any member of your family have supernumerary tooth?
     Yes , who? ..... No
4. Dental anomaly:
   - Type: .....
   - Tooth affected ..... side: R L
   - Does any member of your family have similar anomaly?
     Yes , who? ..... No

Figure 2.1. Case sheet formation

3.Chapter Three: Results

3.1 Sample size

The sample of this study consists of 600 participants, 497 dental student and 103 medical students from college of dentistry and college of medicine at University of Baghdad. The dental students were 100 students from each of the three grades: 1, 4 and 5. 99 students from grade 2, 98 from grade 3. The medical students' group was 103 students. The age of the sample was range from 18 to 28 years old.

3.2 Gender distribution of the participants

The sample of this study consisted of 215 (35.8%) males and 385 (64.2%) females. 179 (29.8%) males and 318 (53%) were females dental students. While the medical students' group consisted of 36 (6%) males and 67 (11.2%) of females.

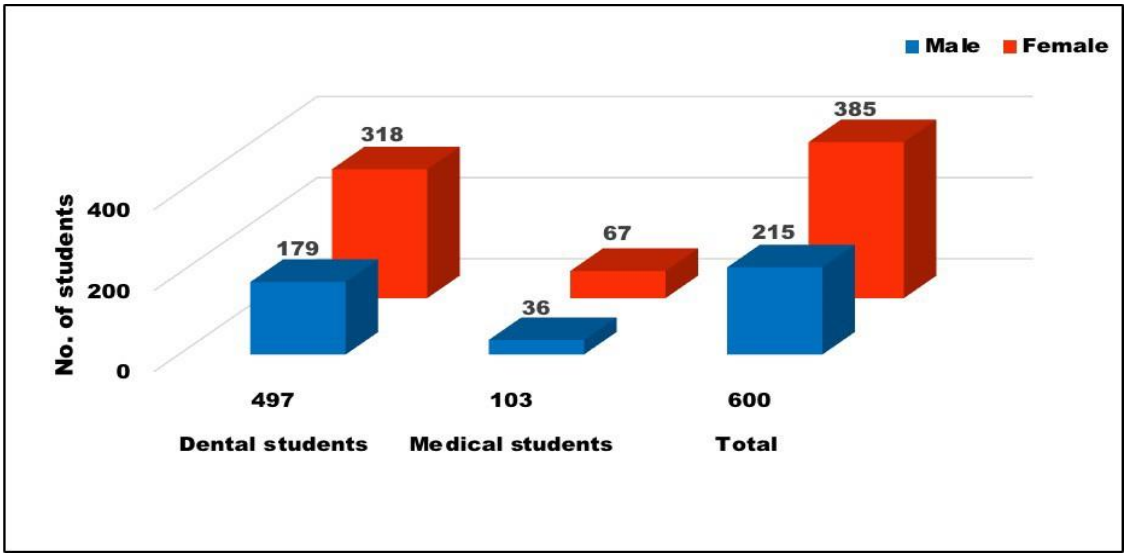


Figure 3.2. Gender distribution of the participants.

3.3 Prevalence of missing teeth

3.3.1 Prevalence of missing teeth in the total sample side- wise

The prevalence of missing teeth in the total sample was 7.5%. It was 3.5% for upper lateral incisors which was the highest prevalence, followed by the lower second premolars 1.17%. The lowest figure was the lower 1st premolar, 1st molar and upper 2nd molar it was 0.2%. Interestingly we found that (13) (2.1%) students had missing R&L upper lateral incisor, and (26) (4.3%) students had missing R&L permanent teeth. The results of this study showed that missing teeth in left side were more than right sides.

Table 3.3.1 Prevalence of missing teeth in the total sample side-wise

Missing tooth	R	L	R &L	Total	%
Upper lateral incisor	3	5	**13**	21	**3.50**
Upper 1st premolar	0	0	1	1	0.97
Lower 1st premolar	0	0	1	1	0.20
Upper 2nd premolar	0	0	4	4	0.67
Lower second premolar	0	1	6	7	**1.17**
Lower 1st molar	0	1	0	1	0.20
Lower second molar	0	2	1	3	0.60
Upper second molar	1	0	0	1	0.20
Total	**4**	**9**	**26**	**39**	**7.51**

3.3.2 Prevalence of congenitally missing teeth in both gender

The prevalence of CMT was higher in females than males, in female it was 5%, while in male the figure was 2% of total of participants.

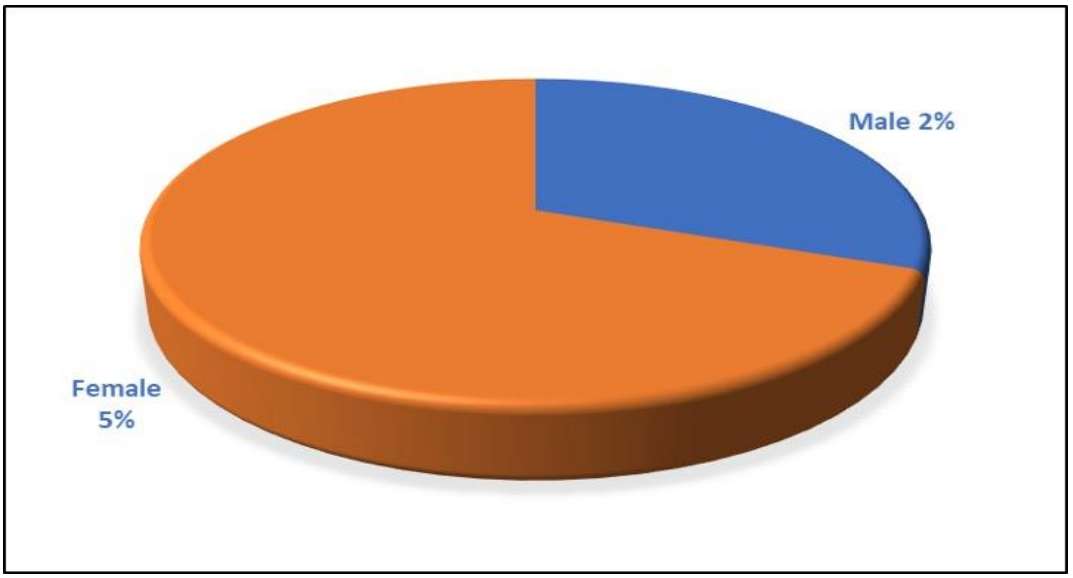


Figure 3.3.2. Prevalence of congenitally missing teeth in both genders

3.3.3. Prevalence of missing teeth among dental and medical students

In this study, the prevalence of missing permanent teeth in both dental and medical students are similar in both groups, it was around 6.5%. The prevalence of missing lateral incisors was 3.4% and 3.8% for dental and medical students respectively, **(Figure 3.3.3.)**

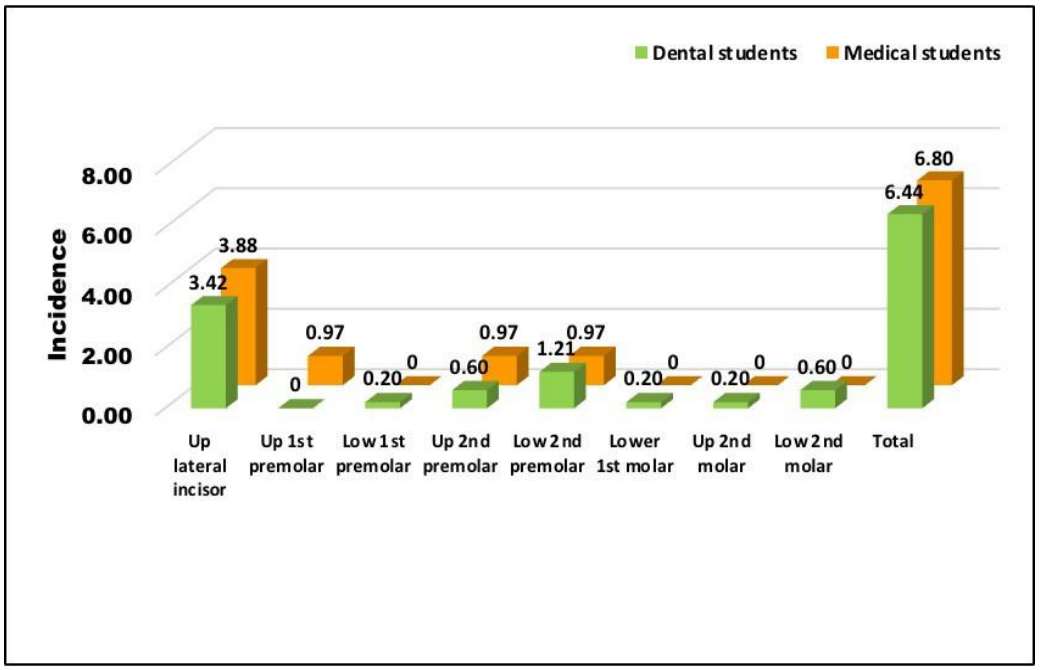


Figure 3.3.3. Prevalence of missing teeth in dental and medical students.

Figure (3.3.4) shows that missing permanent teeth in females were nearly double the figures in males in the total sample and both medical and dental students.

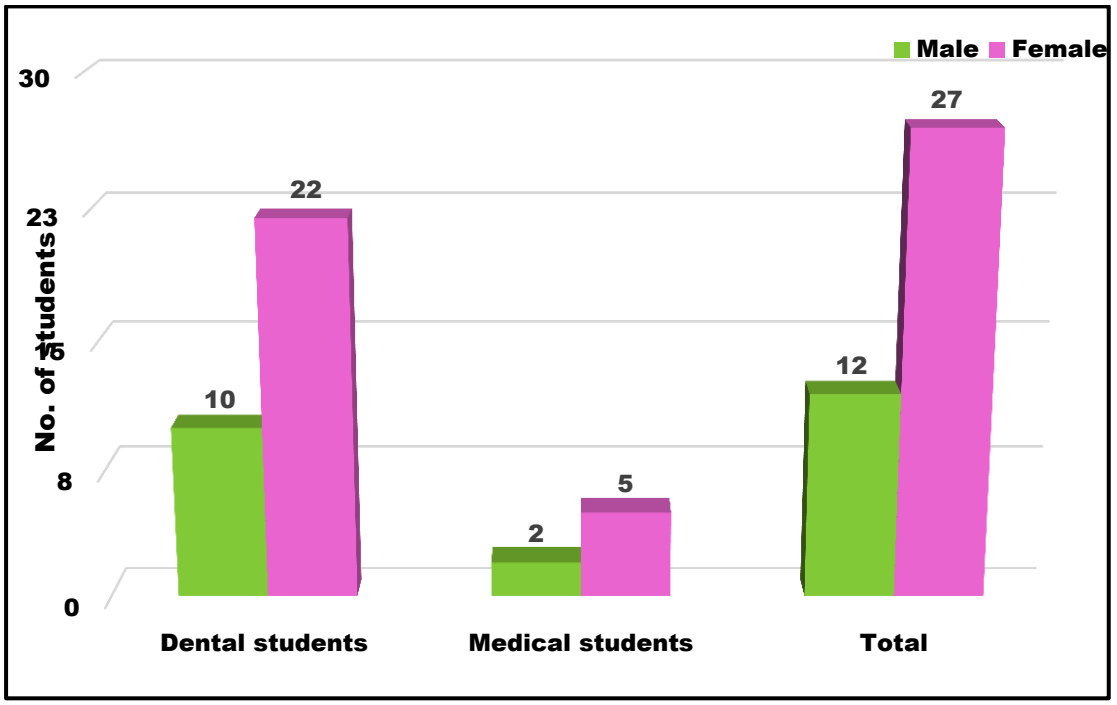


Figure 3.3.4. Gender distribution of missing teeth in medical and dental students

3.4 Perception toward the treatment of missing lateral incisors

(Table3.4) shows that 57% of students prefer no treatment of missing lateral incisor, while (42%) prefer treatment. Seven (33%) of females prefer no treatment and 5 (23%) prefer treatment. The trend was similar in males, 5 (23%) prefer no treatment and 4 (19%) prefer treatment.

(Table 3.4): Patients' perception toward treatments of missing lateral incisors

Perception toward treatments	Total	%	Females	%	Males	%
Prefer no treatment	12	57.14	7	33.33	5	23.81
Prefer treatment	9	42.86	5	23.81	4	19.05

All males preferred canine substitutions. Unlike males, 4 females out of 5 preferred implant replacements of missing lateral incisors.

(**Table 3.5):** Perception toward treatment modalities for missing lateral incisors.

Modalities of treatments	Male	Female	Total
Canine substitution	**4**	0	4
Single tooth implant	0	**4**	4
Fixed bridge	0	1	1

4 Chapter Four: Discussion

4.1 Sample size

This is a cross sectional study conducted to measure the prevalence of missing lateral incisors among medical and dental students. Sample size (600 students) is acceptable. It is similar to the study of **Amin *et al*. (2017)**, and more than the study of **Al-Ajwadi (2009)** that had only 389 participants. However, it is less that the study of **Sajjad *et al*. (2016)** who had 1267 participants.

4.2 Prevalence of missing teeth

The prevalence of missing permanent teeth (7.5%) is in accordance the study of **Amin *et al*. (2017)** , and more than **Al-Mayali *et al*. (2021)** which was only 3.36%. According to this study the prevalence of missing lateral incisors was 3.5% **(Table 3.3)**, which is in accordance to the prevalence of maxillary lateral incisor agenesis in other studies, **Fujita *et al.* (2009)**,**(Swarnalatha *et al*., 2020)** and **(Al-Mayali *et al*., 2021)**.

However results disagreed with **Ibraheem (2018)** that showed the prevalence of missing upper lateral incisors was 2% (consisting of 1.5% for females and 0.5% for males) which could be due to that study was in different population. CMT varies in different populations from 1.1% to 15.88% **(Rizk, 2018)**.

It is clear that the prevalence of maxillary lateral incisors (3.5%) was higher than the lower second premolar (1.17%) (Table 3.3). This trend is similar to prevalence of missing lateral incisor in Erbil **(Mohammed *et al*., 2017)** and Sulaimani cities **(Jalal , 2015)**, however, it is different from Basra city **(Thedan, 2012)** in which the lower second premolar showed the highest prevalence rate.

The trends of missing teeth in both dental and medical students were similar (Figure 3.4 and 3.5), prevalence of missing teeth was doubled in female than males and this is agreed with **Swarnalatha *et al*. (2020), Ibraheem (2018)** and **Al-Mayali *et al*. (2021)** .

It is clear that the prevalence of bilateral missing lateral incisors (2.1%) was higher than unilateral ones, and the figure was higher in the left side (0.8%) than the right side (0.5%). This trend is in agreement with other studies **Swarnalatha *et al.* (2018)**, it was explained that the bilateral missing lateral is due to the decreased mesiodistal widths in both the maxillary and mandibular anterior segments **(Yakoob *et al*., 2011)**.

4.3 Perception toward treatment of missing lateral incisor

Interestingly, **(table 3.6)** showed that 57% of the sample did not prefer treatment of missing lateral incisors, and only 42% preferred treatment of missing lateral incisor. This is agreed with **Mously *et al*. (2020)**, and disagreed with **Abdulrahman *et al*. (2019)**. Most dentists cited aesthetics or both aesthetics and function as the main reasons for replacing lateral incisors **(Abdulrahman *et al*., 2019)**. Despite patients' attitude toward facial aesthetic in general and toward smile aesthetic specifically, it is clear that the sample of this study showed acceptance toward aesthetic of their smiles' despite of the missing tooth/ teeth as they think missing teeth do not affect their aesthetic **(Figure 4.1).**

Surprisingly, females preferred dental implant for treatment of missing lateral incisors, while males preferred canine substitution rather than implant's due to their concerns about implant failure. This study is the first study that shows gender difference in the perception toward modality of treatment of congenitally missing lateral incisors. However, this required further investigations in a larger sample size.

Figure 4.1: image of anterior teeth demonstrates missing lateral incisors for one student participated in this study.

5 Chapter Five: Conclusions and sugesstions

5.1 Conclusions

1. Prevalence of missing lateral incisors in Iraqi dental and medical students was 3.5%, and it is in agreement with previous studies.

2. Congenital missing teeth were doubled in females than males.

3. The prevalence of maxillary lateral incisors (3.5%) was higher than the lower second premolar (1.17%).

4. Most of participants prefer not to do treatment for the missing lateral incisors.

5. Females preferred dental implants for treatment of missing lateral incisors, while canine substitutions were treatment of choice for males.

5.2 Suggestions

1. Further study is necessary to assess the congenital missing teeth in a larger sample.
2. Compare patient perception of patients and dentists toward treatment of missing teeth.

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