

Republic of Iraq
Ministry of Higher Education
And Scientific Research
University of Baghdad
College of Dentistry



Prevalence of orthodontic malocclusions among dental students and their attitude toward treatment

A Project Submitted to
The College of Dentistry, University of Baghdad, Department of orthodontic
In Partial Fulfillment for the Bachelor of Dental Surgery

By
Shahad Ahmed Falih

Supervised by:
Prof. Reem Atta Rafeeq
B.D.S, M.SC.

April, 2023

Certification of the Supervisor

I certify that this project entitled "**Prevalence of orthodontic malocclusions among dental students and their attitude toward treatment** "

was prepared by the fifth-year student **Shahad Ahmed Falih** Under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor's name **Prof. Reem Atta Rafeeq**

Date

Dedication

To those who gave their life for me and support me all the time, my father and my mother

To my lovely brothers and sisters

To my friends who have always been with me in all moment I will never forget their love, advice and constant support for me, thank you for being with me.

Acknowledgement

Before all, praise to **Allah** the Almighty for inspiring and giving me strength, willingness and patience to do my project.

My sincere appreciation to dean of the College Of Dentistry/University of Baghdad, for his support to the graduate students

My deep appreciation and thankfulness to, Head of the Orthodontic Dentistry Department, and all professors and seniors in the department for their cooperation.

Special thank to my supervisor **prof. Dr. Reem Atta Rafeeq** ,for her continues advice, support and care.

Table of the contents

No	Subjects	Page number
	Certification of the supervisor	I
	Dedication	II
	Acknowledgement	III
	Table of contents	IV
	List of figures	VI
	List of tables	VIII
	List of abbreviations	VIII
	Introduction	1
	Aim of the study	2
Chapter One: Review of Literature		
1.1	Orthodontics	3
1.2	Malocclusion	3
1.2.1	Classification of etiological factor in malocclusion	3
1.2.2	Angle's classification and canine classification of malocclusions	6
1.3	Types of malocclusions	7

1.3.1	Crowding of teeth	7
1.3.2	Spacing of teeth	8
1.3.3	Cross bite	9
1.3.4	Open bite	10
1.3.5	Supernumerary teeth	11
1.3.6	Missing teeth	12
1.3.7	Impacted teeth	12
1.3.8	Midline discrepancy	13
1.3.9	Dental anomalies	13
Chapter Tow: Materials and Methods		
2.1	Inclusion criteria	15
2.2	Material and method	15
2.2.1	Material	15
2.2.2	method	16
Chapter Three: Result		18
3.1	Prevalence of malocclusion according to angle's classification and gender	18
3.2	Prevalence of malocclusions according to the type of malocclusion and gender	18

3.3	Attitude of the dental students toward orthodontic treatment	20
Chapter Four: Discussion		
	Discussion	21
Chapter Five: Conclusions and Suggestions		
5.1	Conclusions	23
5.2	Suggestions	23
	Reference	24

List of figures

Figure No.	Title	Page No.
1.1	Angle Class I occlusion	6
1.2	Angle Class II malocclusion	6
1.3	Angle Class III occlusion	7
1.4	Crowding of maxillary and mandibular incisors	8
1.5	Spacing between the maxillary central incisors, i.e. a median diastema.	8
1.6	Anterior cross bite	9

1.7	Mandibular lingual cross bite	10
1.8	Mandibular buccal cross bite	10
1.9	Anterior open bite	11
1.10	Posterior open bite	11
1.11	Erupted mesiodens causing poor aesthetics.	11
1.12	Panoramic of a patient congenitally missing an upper right second premolar and both lower second premolars.	12
1.13	Occlusal View of two impacted canines and a resorbing supernumerary tooth located in the midline of the palate	12
1.14	Malalignment with crowding midline shift	13
1.15	Talon cusp in relation with permanent maxillary right lateral Incisor	13
1.16	Left lateral view showing peg lateral incisor	14
2.1	Case sheet	17

List of tables

Table No.	Title	Page No.
3.1	Prevalence of malocclusion according to angle's classification and gender	18
3.2	Prevalence of malocclusions according to the type of malocclusion and gender	19
3.3	Causes of rejecting the orthodontic treatment	20

List of Abbreviations

Symbol	Title
QoL	Quality of Life
BBD	Babu Banarasi Das

Introduction

Malocclusion is seen to be associated with adverse physical, psychological, and social effects including longevity of dentition and oral health and therefore adversely affects the quality of life (QoL) (**Staley and Reske, 2011**).

The presence of malocclusion or mal-alignment provides a less appealing effect on the smile and the face. Lower levels of self-confidence and self-esteem have been observed in individuals suffering from malocclusion(**Alqahtan et al,2020**). Malocclusion can manifest in a wide range and variations from simple rotation of a tooth, its slight malposition in the arch or a little diastema between teeth, to more severe forms of crowding, spacing, superior protrusion, retrusion or in combinations of several traits of tooth malpositions and abnormal relations. Dental malalignments may be limited to or extended on to one or more tooth, within one arch, both the arches and/or in improper relations of tooth and teeth of upper and lower arches. The deviations in tooth or teeth positions may be local or consequence of architectural deviations of the underlying dentoalveolar structures, skeletal bases of maxilla and mandible and/or craniofacial structures. The imbalance in harmony of face and occlusion is reflected through soft tissue drape which follows skeletal and dental architecture (**Staley and Reske, 2011**).

Aim of the study

This study aims to assess the prevalence of malocclusions among dental students and why they didn't seek for orthodontic treatment.

Chapter One: Review of literature

1.1 Orthodontics

Orthodontics is the branch of dentistry concerned with facial growth, Development of the dentition and occlusion, and the diagnosis, interception, and treatment of occlusal anomalies (**Mitchell and Littlewood, 2019**).

1.2 Malocclusion

Malocclusion is a developmental condition where there is a deflection from the normal relation or alignment of the teeth to other teeth in the same arch and/or to the teeth in the opposing arch (**Boukhazani, 2020**).

1.2.1 Classification of etiological factor in malocclusion .

A number of classifications of etiologic factors of malocclusion have been put forward:

- **White and Gardiner's Classification (Sivaraj, 2013)**

A. Dental base abnormalities

1. Anteroposterior malrelationship.
2. Vertical malrelationship.
3. Lateral malrelationship.
4. Disproportion of size between teeth and basal bone.
5. Congenital abnormalities.

B. Pre eruption abnormalities:

1. Abnormalities in position of developing tooth germ.
2. Missing teeth.
3. Supernumerary teeth and teeth in abnormal form.
4. Prolonged retention of deciduous tooth.

5. Large labial frenum.

6. Traumatic injury.

C. Post eruption abnormalities:

1. Muscular

a. Active muscle force—swallowing.

b. Rest position of musculature.

c. Sucking habits.

d. Abnormalities in path of closure.

2. Premature loss of deciduous teeth.

3. Extraction of permanent teeth.

• **Graber's Classification (Vijayalakshmi, 2020)**

Graber classifies causes of malocclusion as general and local factors.

General Factors: (**Vijayalakshmi, 2020**)

1. Hereditary.

2. Congenital.

3. Environmental.

a. Prenatal (Trauma, maternal diet, German measles, maternal metabolism).

b. Postnatal (Birth injury, cerebral palsy, TMJ injury).

4. Predisposing metabolic climate and disease.

a. Endocrine imbalance.

b. Metabolic disturbances.

c. Infectious diseases.

5. Dietary problems (Nutritional deficiency).

6. Abnormal pressure habits and functional aberrations:

- a. Abnormal suckling.
- b. Thumb and finger sucking.
- c. Tongue thrust and tongue sucking.
- d. Lip and nail biting.
- e. Speech defects.
- f. Abnormal swallowing habits.
- g. Respiratory abnormalities.
- h. Tonsils and adenoids.
- i. Psychogenic tics and bruxism.

7. Posture.

8. Trauma and accidents.

Local Factors: (Vijayalakshmi, 2020)

- 1. Anomalies of number:
 - a. Supernumerary teeth.
 - b. Missing teeth.
- 2. Anomalies of tooth size.
- 3. Anomalies of tooth shape.
- 4. Abnormal labial frenum; mucosal barriers.
- 5. Premature loss.
- 6. Prolonged retention.
- 7. Delayed eruption of permanent teeth.
- 8. Abnormal eruptive path.
- 9. Ankylosis.
- 10. Dental caries.

1.2.2 Angle's classification and canine classification of malocclusions

Angle's classification was based upon the premise that the first permanent molars erupted into a constant position within the facial skeleton, which could be used to assess the anteroposterior relationship of the arches (**Angle, 1890**).

Angle described three groups:

- Class I or neutroccclusion — the mesiobuccal cusp of the upper first Molar occludes with the mesiobuccal groove of the lower first molar (**Angle, 1890**).



Figure 1.1: Angle Class I occlusion (Thilander et al,2018).

- Class II or distocclusion — the mesiobuccal cusp of the lower first molar occludes distal to the Class I position. This is also known as a postnormal relationship (**Angle, 1890**).



Figure 1.2: Angle Class II malocclusion (Thilander et al, 2018).

- Class III or mesiocclusion — the mesiobuccal cusp of the lower first molar occludes mesial to the Class I position. This is also known as a prenatal relationship (**Angle, 1890**).



Figure 1.3: Angle Class III malocclusion (**Thilander et al,2018**).

Canine classifications The canine relationship also provides a useful anteroposterior occlusal classification (**Cobourne and DiBiase, 2016**).

- Class I—the maxillary permanent canine should occlude directly in the embrasure between mandibular canine and first premolar (**Cobourne and DiBiase, 2016**).
- Class II—the maxillary permanent canine occludes in front of the embrasure between mandibular canine and first premolar (**Cobourne and DiBiase, 2016**).
- Class III—the maxillary permanent canine occludes behind the embrasure between mandibular canine and first premolar (**Cobourne and DiBiase, 2016**).

1.3 Types of malocclusions

1.3.1 Crowding of teeth

Crowding is one of the most frequent malocclusions. A disparity of tooth size and the volume of the alveolar ridge will result in crowding with either lingually or buccally displaced teeth or rotations of teeth.

Minor crowding of teeth is considered a normal condition; Particularly, minor crowding in the mandibular incisor region is found in almost all individuals (Thilander et al, 2018).



Figure 1.4: crowding of maxillary and mandibular incisors (Türkaslan and Ulusoy, 2009).

1.3.2 Spacing of teeth

Although spacing is considered as normal and of positive prognostic value in deciduous dentition, in permanent dentition space between the teeth is abnormal. The spacing between the teeth can be seen either at the localized area of the arch or the entire arch. Spacing between the two maxillary central incisors is termed as a median diastema. This gap is usual of normal growth pattern during the primary and mixed dentition period and is closed by the time of the Permanent maxillary canine eruption (Alam and Purnal,2018).



Figure 1.5: Spacing between the maxillary central incisors, i.e. a median diastema (Thilander et al, 2018).

1.3.3 Cross bite

A cross bite is a discrepancy in the buccolingual relationship of the upper and lower teeth (**Mitchell, 2013**).

Types of cross bite:

1. Anterior cross bite

An anterior cross bite is present when one or more of the upper incisors is in reverse overjet relative to the lower arch (**Andrade,2014**).



Figure 1.6: anterior cross bite (**Andrade,2014**).

2. Posterior cross bite (Mitchell, 2013)

Cross bite of the premolar and molar region involving one or two teeth or an entire buccal segment can be subdivided as follows:

- Unilateral buccal crossbite with no displacement.
- Unilateral buccal crossbite with displacement.
- Bilateral buccal crossbite.
- Unilateral lingual crossbite.
- Bilateral lingual crossbite (scissors bite).



Figure 1.7: mandibular lingual cross bite (Cobourne and DiBiase, 2016).



Figure 1.8: mandibular buccal cross bite (Cobourne and DiBiase, 2016).

1.3.4 Open bite

In open bite, there is no intermaxillary tooth contact, either in the front or laterally from the dental arch . To qualify as open bite, the overbite is reversed (<0 mm), and the teeth are assumed to be fully erupted (Thilander et al ,2018).

Types of open bite

- 1. Anterior open bite (AOB):** there is no vertical overlap of the incisors when the buccal segment teeth are in occlusion (Tavares and Allgayer, 2019).



Figure 1.9: Anterior open bite (Singh,2009).

2. Posterior open bite (POB): defined as failure of contact between the posterior teeth when the teeth occlude in centric occlusion (Wajid et al,2018).



Figure 1.10: Posterior open bite (Wajid et al, 2018).

1.3.5 Supernumerary teeth

The presence of extra teeth than normal termed as hypersontia or supernumerary teeth. The most common supernumerary teeth are mesiodens which appear in the midline of the maxilla (Kharbanda, 2020).



Figure 1.11: Erupted mesiodens causing poor aesthetics (Kharbanda, 2020).

1.3.6 Missing teeth

Congenitally missing teeth are by far more common than supernumerary teeth and can occur in either of the jaws .The following are some of the commonly missing teeth in decreasing order of frequency, third molars, maxillary lateral incisors, mandibular second premolars, mandibular incisors, maxillary second premolars (Sivaraj, 2013).

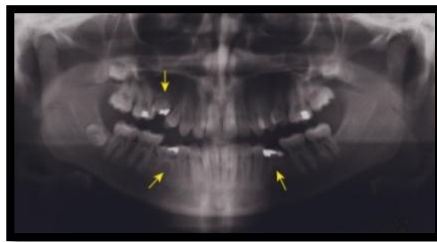


Figure 1.12: Panoramic of a patient congenitally missing an upper right second premolar and both lower second premolars. Primary second molars are retained and ankylosed (arrows) (Staley and Reske, 2011).

1.3.7 Impacted teeth

Impacted tooth is a tooth that, for some reason, has been blocked from breaking through the gum . Third molar is the most common impacted tooth followed by maxillary canine then mandibular canine (Frank, 2018).

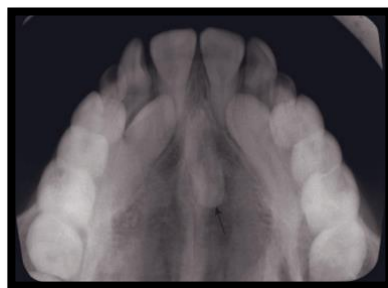


Figure 1.13: Occlusal View of two impacted canines and a resorbing supernumerary tooth located in the midline of the palate (arrow) (Staley and Reske, 2011).

1.3.8 Midline discrepancy (Midline shift)

Midline discrepancies are the common problems encountered that pose both diagnostic and treatment difficulties. Midline discrepancy may be either skeletal or dental. Sometimes functional shift of the mandible may contribute to the midline discrepancy (**Narmada et al,2015**).



Figure 1.14:Malalignment with crowding midline shift (**Singh, 2009**).

1.3.9 Dental anomalies

- **Talon cusp:** it is a developmental anomaly consisting of a vertical ridge or cusp projecting labially or lingually from an anterior permanent or primary tooth (**Radhika et al,2014**).



Figure 1.15: talon cusp in relation with permanent maxillary right lateral Incisor (**Radhika et al,2014**).

- **Peg lateral incisors** are defined as underdeveloped, tapered incisors, and are the commonest form of microdontia (**Purayil and Acharya, 2015**).



Figure 1.16: Left lateral view showing peg lateral incisor (**Purayil and Acharya, 2015**).

Chapter Two: Materials and Methods

This cross-sectional study was carried out on dental students of College of Dentistry /University of Baghdad, from February 2023 to April 2023 for assessing the prevalence of malocclusions among them and know why they didn't seek orthodontic treatment.

2.1 Inclusion criteria

- 1- Iraqi dental students .
- 2- their age range 18-26 years.
- 3- they have malocclusions and need to do orthodontic treatment.
- 4- Absence of gross facial asymmetry was excluded.
- 5- No history of orthodontic treatment.
- 6- No history of systemic disease or drug.

*Any student don't have the criteria mentioned above is excluded.

2.2 Material and Methods

2.2.1 Material

The following materials were used during dental examination

- Mouth mirror for clinical investigation.
- Medical gloves.
- Portable torch-light.
- Case sheet to register the information obtained.
- Ordinary chair bench for examination.

2.2.2 Method

The dental student was selected from the College of Dentistry/University of Baghdad students, all were subjected to clinical dental examination. Each student was seated on an armed chair whose height is suitable for examination. In the case that the light is not sufficient enough, a portable torch-light is used to enable the examiner continue his examination. An examination was designed to meet the aims of this study mentioned previously.

Malocclusions include the following: angle's classification, canine , crowding, spacing, open bite (anterior/ posterior and unilateral / bilateral) , cross bite (anterior/ posterior and unilateral / bilateral), rotated teeth, missing teeth, impacted teeth, malposed canine, midline shift, supernumerary teeth and tooth anomalies.

Student Name: _____ .

Age : _____ .

Gender : _____ .

Angle's Classification : R — L — / Canine Classification : R — L — .

Cross bite : Anterior —+—

Posterior —+—

Unilateral —+—

bilateral —+—

Open bite : Anterior —+—

Posterior —+—

Unilateral —+—

bilateral —+—

Crowding : —+—

Spacing : —+—

Rotated teeth : —+—

malposed canine: —+—

Missing teeth : —+—

Super numerary teeth : —+—

Impacted teeth : —+—

anomalies : Type —+—

Midline shift : —+—

Why you didn't do orthodontic treatment ?

2.1: Case sheet

Chapter Three: Results

3.1: Prevalence of malocclusion according to angle's classification and gender.

This study included 100 Iraqi dental students, 43 males and 57 females, 90 students are CI (90%), 8 CII (8%), 2 CIII (2%).

Table 3.1: Prevalence of malocclusion according to angle's classification and gender.

Angle's classification	Male	Female	Total percentage
CI	40	50	90%
CII	2	6	8%
CIII	1	1	2%

According to Table 3.1, the prevalence of CI and CII malocclusions are more in females than males while the prevalence of CIII is equal in females and males.

3.2: Prevalence of malocclusions according to the type of malocclusion and gender.

The prevalence of crowding is found in 20 females (35.08%) and 25 males (58.1%), spacing is found 13 females (22.8%) and 8 males (18.6%), anterior open bite found in 3 female(5.2%) and 1 male (2.3%), posterior open bite is not found in both of them (0%), anterior cross bite is found in 2 females (3.5%) and 1 male (2.3%), unilateral Posterior cross bite is found in 1 female (1.8%) and 0 male (0%) while bilateral cross bite is found in 2 females (3.5%) and 1 male

(2.3%), rotated teeth are found in 11 females (19.2%) and 4 males (9.3%), missing teeth are not found in both of them (0%), impacted tooth (canine) is found in 1 female (1.8%) and 0 male (0%), malposed canine is not found in both of them (0%), peg shape lateral incisor is found in 0 female (0%) and 2 males (4.7%), midline shift is found at 3 females (5.2%) and 1 male (2.3%), talon cusp is found in 1 female (1.8%) and 0 male (0%), supernumerary teeth are not found in both of them (0%).

Table 3.2: Prevalence of malocclusions according to the type of malocclusion and gender.

Type of malocclusions	Male No. (%)	Female No. (%)
Crowding	25 (58.1%)	20 (35%)
Spacing	8 (18.6)	13 (22.8%)
Anterior open bite	1 (2.3%)	3 (5.2%)
Posterior open bite	0 (0%)	0 (0%)
Anterior cross bite	1(2.3%)	2 (3.5%)
Unilateral posterior cross bite	0 (0%)	1 (1.8%)
Bilateral posterior cross bite	1 (2.3%)	2 (3.5%)
Rotated teeth	4 (9.3%)	11 (19.2%)
Missing teeth	0 (0%)	0 (0%)
Impacted teeth	0 0(%)	1 (1.8%)

Supernumerary teeth	0 (0%)	0 (0%)
Malposed canine	0 (0%)	0 (0%)
Midline shift	1 (2.3%)	3 (5.2%)
Peg shape lateral incisor	2 (4.7%)	0 (0%)
Talon cusp	0 (0%)	1 (1.8%)

1.3 Attitude of the dental students toward orthodontic treatment.

According to this study, 56 % of students didn't seek orthodontic treatment due to economical causes while 18% of them accept their teeth appearance (not important), 9% of them had bad experience for some patient and 17% of them fear from the pain.

Table 3.3: Causes of rejecting the orthodontic treatment.

Causes of rejecting the orthodontic treatment	%
Economy	56%
Accept their appearance (not important)	18%
Heard bad experience	9%
Fear of pain	17%

Chapter Four: Discussion

Three studies in Saudi Arabia, which have been done for the prevalence of malocclusion; are comparable to our study. The first study observes that 52.8% has Angle's Class I malocclusion, 31.8% has Class II, and 15.4% has Class III (**Gudipaneni et al, 2018**).

The third study has 57% Class I malocclusion, 17% Class II malocclusion; and 14% has Class III malocclusion (**Alogaibi et al, 2020**).

All the previous three studies in Saudi Arabia show more prevalence of CI malocclusion followed by CII malocclusion then CIII malocclusion which is agree with our study.

There was study consisted of 1000 students (580 female and 420 male) studying in the Faculty of Dentistry, Fayoum University, Fayoum government, Egypt. The age ranged from 18 to 23 years old. The results of the study revealed that 30.1% of the sample had normal occlusion and 69.9% had malocclusion. Class I malocclusion was found in 33.1% of the subjects , followed by Class II malocclusion in 20.2% and finally Class III malocclusion in 16.6% of sample. According to the result Angle malocclusion was found to be in 69.9% of sample. Class I malocclusion was of highest percentage followed by Class II malocclusion and finally Class III malocclusion which has agreement with our study (**Adel and Feky, 2019**).

Another study has been done in Dhaka, Bangladesh in 2013, seems to be in an agreement to our study; with significant association between malocclusion, and gender. As well as the most common malocclusion is Class I followed by Class II and Class III, and with the highest frequency of females (**Rahman et al, 2013**).

A study conducted at College of Dentistry in Basra city, Iraq, shows similarities to our study. According to their statistical analysis, class I Malocclusion was the most prevalent type (55%) followed by class II (39%) and Class III malocclusion (**Mohammed et al, 2019**).

Another local study done in Orthodontic department at the khanzad Polyclinic teaching center / Erbil city, Iraq showed resemblance in malocclusion patterns results, with Class I malocclusion was found in 72.5%, class II was found in 19.5%, and class III malocclusion 8.0% of all examined patients (**Hasan and Kolemen, 2019**).

Regarding to the attitude of the dental students toward orthodontic treatment, closed ended questionnaire type of survey was conducted among the 301 subjects (165 male and 136 female) between age group of 18-25yrs from various colleges of BBD University, Lucknow who had a need for Orthodontic treatment but had not undergone it. According to this study the most common cause for refusal of Orthodontic treatment was fear of extraction (68.4%) , which is not agree with our study. Pain and discomfort during tooth movement (45.5%) was also seemed a reason for refusal of Orthodontic treatment by many subjects , which has resemblance with our study (**khan et al, 2017**).

According to study conducted from 208 person in Baghdad, Mosul, and Babylon. The result show that there are (7 %) of persons not seek the orthodontics because of the difficulties that accompany the orthodontic from pain and difficulty in eating, which has disagreement to our study . 29% of them unable to bear the cost of treatment (economy) which is the most common cause, this agree to our study .5% of persons refused treatment because they heard bad experiences for some patients which is less common cause and resemble our study (**Abdul and haider, 2022**).

Chapter Five: Conclusions and Suggestions

5.1 Conclusion

- The malocclusion is a complex and multifactorial condition that extends beyond the physical contact of the biting surface of teeth.
- The malocclusions are more in females than males.
- males have more prevalence of crowding than females while spacing is more in females than males .
- The most common malocclusion is crowding followed spacing then rotated teeth.
- Anterior open bites are more in the female than males.
- Posterior cross bites are more in females than males.
- Peg lateral incisor found in the males only.
- Most of student didn't seek orthodontic treatment due to economical issues.

5.2 suggestions

- The physical, social, and psychological effects of Malocclusion need to be investigated further to understand the importance of malocclusion on people's life.
- The effect on malocclusion on the smile and face can be investigated
- Station of dental students with there malocclusion and the effect on their confidence can be investigated.

References

(A)

- Alqahtan, Azizkhan, Alyawer, Alanazi, Alzahrani, Alhazmi, Bsher, Zahran, Aljahdali, Alqwizany, Tayeb, Kashghar(2020) Diagnosis and management of malocclusion, journal Annals of Dental Specialty .
- Andrade (2014) Treatment of anterior cross bite and its influence on gingival recession, Dental Press Journal of Orthodontics.
- Adel and El Feky (2019) Prevalence of Malocclusion using Angle classification within The Dental Students of Fayoum University, Egypt (A Survey Study).
- Abdul and Haider (2022) Orthodontic Treatment challenges (survey study).
- Angle (1890)

(B)

- Boukhazani (2020) The Use of Bite Force in Malocclusions Interception, Research Journal of Applied Medical Sciences.

(C)

- Cobourne and DiBiase (2016) Handbook of Orthodontics.

(F)

- Frank (2018) Identifying and treating impacted teeth, Saudi Journal of Oral and Dental Research.

(G)

- Gudipaneni, Aldahmeshi, Patil, Alam (2018) The prevalence Of malocclusion and the need for Orthodontic treatment among Adolescents in the northern border Region of Saudi Arabia: An Epidemiological study. BMC Oral Health.

(H)

- Hasan , Kolemen (2019) Pattern of Dental Malocclusion in Orthodontic Patients in Erbil City, Kurdistan Region-Iraq, A Retrospective Study. Annual Research & Review in Biology.

(K)

- Khan, Khanna, Verma, Maurya, Srivastava (2017) Why Patient Refuses Orthodontic Treatment.

(M)

- Mitchell (2013) An Introduction to Orthodontics.
- Mitchell and Littlewood (2019) An Introduction to Orthodontics.
- Mohammed, Hashim, Al-Abbasi (2019) Evaluation of Malocclusion Pattern among Orthodontic Patients in Basrah City, Iraq. Indian Journal of Forensic Medicine & Toxicology.

(N)

- Narmada, Kumar, Raja (2015) Management of mid-line discrepancies, Journal of Indian Academy of Dental Specialist Researcher.

(P)

- Purayil and Acharya (2015) Management of type II dens invaginatus and peg laterals with spacing of maxillary anteriors ,journal of dental Research and Review.

(R)

- Rahman, Jahan and Hossain(2013) Pattern of malocclusion in Patients seeking orthodontic treatment At Dhaka Dental College and Hospital. Ban J Orthod and Dentofac Orthop.
- Singh(2009) Jaypee Gold Standard Mini Atlas Series Orthodontics.
- Sivaraj (2013) Essentials of Orthodontics.
- Staley and Reske (2011) Essentials of Orthodontics diagnosis and treatment.

(T)

- Tavares, Allgayer (2019) Open bite in adult patients, Dental Press Journal of Orthodontics.
- Thilander,Bjerklin and Bondemark (2018) Essential Orthodontics.
- Türkaslan and Ulusoy (2009) Esthetic rehabilitation of crowded maxillary anterior teeth utilizing ceramic veneers: a case report.

(V)

- Vijayalakshmi (2020) Textbook of Orthodontics.

(W)

- Wajid, Chandra, Kulshrestha, Singh, Rastogi , Umale (2018) Open bite malocclusion, Journal of Oral Health and Craniofacial Science.