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

Complications and adverse side effects of wearing orthodontic appliances

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

By:

Riemann Haidar khalil

Supervised by:

Prof. Dr. Reem Atta Rafeeq
B.D.S., M.Sc.

May, 2023

Certification of the Supervisor

I certify that this project entitled "**Complications and adverse side effects of wearing orthodontic appliances"** was prepared by the fifth-year student **Riemann Haidar Khalil** 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. Dr. Reem Atta Rafeeq**

Date:

Dedication

To the kindest and most beautiful hearts in my life (my mother and my father) who gave me all the support and care in my life and they dedicate all their time for me and all the knowledge and passion they gave me to be the person who I am. To my supported siblings (my sisters and my brothers) who encouraged me all the times. To our seniors and doctors for sharing their time and knowledge with us for the last 5 years.

Acknowledgement

First and for most, I would like to say, ‘‘thank you’’ ALLAH Almighty for inspiring me with strength and patience to undertake and finally complete this work.

My deepest gratitude and sincere appreciation to my supervisor, **Prof. Dr Reem Atta Rafeeq** for his advice, support and guidance throughout the work.

My sincere appreciation and thankfulness to **Prof. Dr. Dheaa H. AL-Groosh,** Head of the Orthodontic Dentistry Department, and all professors and seniors in the department for their pleasant cooperation.

My sincere appreciation goes to **Prof. Dr. Raghad Al-Hashimi,** Dean of the College of Dentistry for providing the opportunity to pursue my study.

Table of contents

List of figures

List of Tables

List of Abbreviations

Symbol	Title
QoL	Quality of Life
NSAIDs	Non-Steroidal Anti-Inflammatory Drugs
WSLs	White Spot Lesions
GE	Gingival Enlargement
EARR	External Apical Root Resorption
OIIRR	Orthodontacally Induced Inflammatory Root Resorption
TMD	Tempro-Mandibular Disorder
NO.	Number
%	Percentage

Introduction

Orthodontics: is a Greek word that literally means ‘to straighten teeth’. Orthodontics: is that branch of dentistry concerned with facial growth, with development of the dentition and occlusion, and with the diagnosis, interception, and treatment of occlusal anomalies .The stipulate for orthodontic treatment has been rising, which places a trouble on many global healthcare properties. Therefore, in order to classify and prioritize treatment, many occlusal indices have been developed based on the harshness of the malocclusion and the unpleasant effects it has on oral health. Orthodontics has had significant reality in the career of dentistry as its inception as a specialty in 1901. It engages the diagnosis, anticipation, and treatment of dental and facial abnormality, which frequently result in ‘malocclusion’. After orthodontic treatment, the individual should have an enhanced bite, a in good health mouth, and an gorgeous smile that can be kept for a lifetime. Currently we are in the 21st century, orthodontics has become extremely admired amongst various range of age groups **(Awad and Abuffan, 2018).**

Orthodontic therapy is used to solve numerous oral problems, but the use of fixed oral devices can also impact negatively the oral cavity, if the treatment is not steadily under control (**Manuelli *et al.*, 2019**).

Orthodontic treatment need is classified according to the severity of malocclusion. Mal-relationship between the upper and lower arches, in any of the planes, spaces between the teeth or anomalies in tooth position beyond normal limits known as malocclusion. It affects periodontal health, increase dental caries prevalence, temporomandibular joint problems. Accordingly, it is imperative to determine the prevalence of malocclusion and its occurrence and distribution in a community. **(Awad and Abuffan, 2018).**

Aim of the study

The aim of this study was to analyze the main complications and adverse side effects of wearing orthodontic appliances (fixed, removable and myofunctional), their determinants of discomfort and the effect they have on the quality of life, using questionnaire in the form of an interview.

Chapter One: Review of literature

Greater understanding of patients' expectations of the orthodontic treatment process and how it affects their day-to-day living or quality of life (QoL) is important in many ways. Their expectations of treatment, often unfounded, may discourage them from seeking care. In addition, unrealistic understanding of orthodontic treatment processes and sequelae can influence compliance with treatment. Furthermore, understanding patients' expectations of treatment can help inform "informed consent" as well as help patients develop coping methods to deal with treatment sequela **(zhang *et al.*, 2007)**.

1.1 Types of orthodontic appliances

1.1.1 Fixed appliance

It is appliance that Bonding of orthodontic brackets to teeth is important to enable effective and efficient treatment. The problem is bracket failure during treatment which increases operator chairside time and lengthens treatment time. A prolonged treatment is likely to increase the oral health risks of orthodontic treatment with fixed appliances one of which is irreversible enamel decalcification **(Mandall, 1996).**

1.1.2 Removable appliance

The contemporary uses of removable appliances are considerably more limited than in the past. It is possible to achieve adequate occlusal improvement with these appliances providing that suitable cases are chosen. Specific indications for their appropriate use on their own in the mixed dentition are presented. Removable can also be used as an adjunct to more complex treatments, to enhance the effect of fixed appliances, headgear or in preparation for functional appliances. Removable

appliances work by simple tipping movements of the crowns of the teeth about a fulcrum close to the middle of the tooth **(Littlewood *et al.*, 2001)**.

1.1.3 Myofunctional appliance

These appliances are used in mixed dentition period for myofunctional correction and tooth eruption guidance and they can align the teeth due to their more flexible structure compared to other functional appliances **(Gökçe and Kaya, 2016).**

1.2 Complications

Orthodontic treatment is a complex medical intervention carried out over an extended period. During this time, risks may turn into complications. It is necessary to identify the risks that are associated with the orthodontic intervention to be applied, as there are numerous complications possibly linked to that treatment. The occurrence of these complications depends on the orthodontic technique, medical knowledge in this field, patient's general and oral health, and oral hygiene habits. These must be considered even from the start because it might influence the treatment objectives, phases, and goals **(Tiro, 2017).** Like any medical therapy, orthodontic treatment exposes the patient to certain risks. From an ethical standpoint, the clinician must understand how these risks relate to each patient to ensure that they will receive a net benefit from treatment. Failure to properly identify and manage the risks of orthodontic treatment cannot only give rise to patient dissatisfaction but also to litigation. The risks of orthodontic treatment include periodontal damage, pain, root resorption, temporomandibular disorder, caries, speech problems and enamel damage **(Wishney, 2017)**.

1.2.1 Difficulty during eating

All intraoral appliances used by orthodontists produce changes in oral functions because they act as a foreign body. The appliance occupies a space within the oral cavity, reducing the intraoral vertical dimension, limiting tongue movement. Therefore, appliance users will have to adapt to them, especially after the first month

of use. Orthodontic fixed appliances also affect dietary habits. Patients usually need to change their diet, especially what they eat and how they prepare the food **(Saad *et al.*, 2022)**.

1.2.2 Speech impairment

Speech difficulty is one of the major complications. Apart from the original speech problems caused by malocclusion, orthodontic appliances can also lead to speech disturbances because they are a foreign body in the oral cavity. Specifically, orthodontic appliances often fit against the palate and the surface of the teeth, which affects the movement of the tongue and the space of the oral cavity, resulting in the distortion of some specific sounds **(Chen *et al.*, 2018).** Speech sound production is a complicated and precise process involving different articulators' planning, coordination, and movement. Those articulators are the jaw, lips, teeth, tongue, palate, cheeks, and larynx. Placement of fixed labial appliances has effects on speech sound production especially /s/, /f/, /v/, /t/, /r/, /n/, and /l/ phonemes. Any dental appliance (orthodontic or prosthetic) can cause errors in articulation of linguodental, labiodental, or linguoalveoler consonants. However, speech is a learned process, and the articulators have a remarkable capacity for adaptation. Thus, even when severe anatomical limitations are present, normal speech can be observed **(Saad *et al.*, 2022).**

1.2.3 Poor oral hygiene

Recently, research has also investigated various biomarkers to monitor biological changes in tooth movement before and during treatment and has focused on the role and weight of numerous variables, such as oral hygiene levels and food habits related to the onset of dental and periodontal diseases during orthodontic treatment **(Contaldo *et al.*, 2021)** . Orthodontics has the potential to cause significant damage to hard and soft tissues. The most important aspect of orthodontic care is to have an extremely high standard of oral hygiene before and during orthodontic

treatment. Before any active orthodontic treatment is considered it is essential that the oral hygiene is of a high standard and that all carious lesions have been dealt with **(Travess *et al.*, 2004)**.

1.2.4 Pain

The most common and problematic sequela of orthodontic treatment is pain and discomfort. The intensity of orthodontic pain is comparable to the greatest intensity of general pain felt with a wasp sting or an ankle sprain . Between 87% and 95% of adolescents experience pain during fixed orthodontic treatment, especially during the first 24 h. Moreover, 39–49% experience pain during every step of the treatment or after appliance removal. Therefore, pain is a major deterrent to orthodontic treatment, a factor that reduces patient compliance during treatment, and a reason that patients discontinue treatment or miss appointments. Pain and discomfort were defined as feelings of pressure, tension, soreness of the teeth, and/or any other oral pains or feelings of disturbance. Pain and discomfort in the tongue, cheeks, teeth, and gingivae, while brushing the teeth, and while chewing various foods (sticky, tough, firm, soft, or fibrous) were recorded **(Rakhshan,H and Rakhshan,V, 2015)**. At present there is no universal recommendation on the use of analgesics in pain reduction. Nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen and acetaminophen are commonly recommended **(Xiaoting *et al.*, 2010)**.

1.2.5 Halitosis

Halitosis is defined as an unpleasant mouth breath arising from pathological, non-pathological, physiological or systemic conditions. Halitosis is common, and up to 50% of the population is reported to be affected to various degrees. Individuals with halitosis do not always notice the symptoms by themselves, which might result in an underestimation of its prevalence. Several oral etiological factors for halitosis, such as tongue coating, specific microbes, poor oral hygiene, diseases such as

gingivitis and periodontitis, along with smoking, have been identified. When a fixed orthodontic appliance is inserted, the area of plaque accumulation and the amount of generated proteins from gingival crevicular fluid and saliva will increase, which elevates the amount of available nutrients for the supra- and subgingival microorganisms, thus increasing the risk for halitosis **(Abdulraheem *et al.*, 2019)** .

1.2.6 Psychosocial problem

Numerous studies, from a bio-psychosocial model, show that patient's negative emotions towards orthodontic treatment affect patient satisfaction with treatment and treatment itself. In fact, a psychological typology of patients related to anxiety levels based on their adherence to treatment **(Peñacoba *et al.*, 2014)**.

1.2.7 Enamel decalcification (white spot lesion)

White spot lesions (WSLs) have been defined as the earliest stage of demineralization on enamel surfaces that are easily discernible to the human eye. Since one of the principal objectives of orthodontic therapy is to help improve the esthetics of the patient, the occurrence of white spots not only compromises the outcome of the treatment but also predisposes the affected teeth to decay. Even though the orthodontic field has seen several advances over the last few years, this is one complication that persists. White spot lesions are very commonly seen after completion of fixed orthodontic therapy when brackets are debonded. The bonded brackets and arch wires make it difficult to maintain proper oral hygiene, which leads to prolonged accumulation of plaque. The cariogenic bacteria release several by-products such as polysaccharides from sucrose and lactic acid, which lead to a decline in pH in a highly localized environment. Once the balance between mineral deposition and loss is disrupted and tips towards demineralization, it eventually leads to the formation of white spot lesions **(Marya *et al.*, 2022)**. WSL develop in

association with brackets, bands, arch wires, ligatures and other orthodontic devices that complicate conventional oral hygiene measures, leading to prolonged plaque accumulation. This concern raises the need for assessing the saliva, oral hygiene status and caries rate before beginning of treatment and initiating preventive measures. Orthodontists must take up the active responsibility to educate patients about the importance of maintaining good dietary compliance and excellent oral hygiene regime. Clinically, formation of white spots around orthodontic attachments can occur as early as 4 weeks into treatment and their prevalence among orthodontic patients ranges from 2% to 96%. The labio-gingival area of the lateral incisors is the most common site for WSL and the maxillary posterior segments are the least common site with males affected more in comparison with females **(Srivastava *et al.*, 2013)**. As shown in the figure (1.1)

Figure 1.1: White spot lesions and cavities related to the presence of orthodontic appliance (Preoteasa *et al.*, 2012).

1.2.8 Gingival inflammation

Almost all fixed orthodontic appliance patients have increased plaque retention that results in moderate gingivitis and varying degrees of gingival enlargement (GE). During orthodontic treatment can lead to pseudo pocketing, where there is no attachment loss, but the hyperplasia results in an artificially deep"pocket" that resolves with resolution of the hyperplasia **(Eid *et al.*, 2014).** As shown in the figure (1.2)

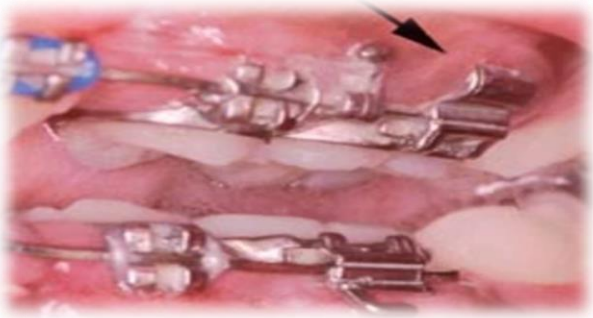

Figure 1.2: Sever gingival inflammation during fixed appliance treatment (Travess *et al.*, 2004).

1.2.9 Attachment loss

Periodontal health is an important factor that may be used to evaluate the success of orthodontic therapy. Periodontal complications are reported to be one of the most common side effects linked to orthodontics. Also, properly aligned teeth are easier to clean, and perhaps correct occlusion may promote healthier periodontium. The periodontal complications associated with orthodontic therapy mainly include gingivitis, periodontitis, gingival recession or hypertrophy, alveolar bone loss, dehiscences, fenestrations, interdental fold, and dark triangles. The reasons behind these periodontal complications involve patient factors and the technique used in the treatment. Patient factors include past periodontal condition, increased susceptibility, and poor oral hygiene. Smoking is also a known factor that affects the periodontal support. Some reports support the fact that the fixed

orthodontic treatment may result in localized gingivitis, which rarely progresses to periodontitis **(Alfuriji *et al.*, 2014)**.

1.2.10 Root resorption

External apical root resorption (EARR) is a permanent/irreversible loss of the apical part of a tooth root. It can be a physiologic or pathologic process. Root resorption is a common iatrogenic complication of orthodontic treatment, where the term of 'orthodontically induced inflammatory root resorption' (OIIRR) is used. During orthodontic treatment, mechanical forces are applied to move teeth and this results in sterile inflammatory response which is the biological basis of OIIRR **(Yassir *et al.*, 2021)**. Some degree of external root resorption is inevitably associated with fixed appliance treatment, although the extent is unpredictable. Resorption may occur on the apical and lateral surface of the roots, but radiographs only show apical resorption to a certain degree. Many cases will not show any clinically significant resorption but, microscopic changes are likely to have occurred on surfaces which are not visualized with routine radiographs. Resorption however rarely compromises the longevity of the teeth. Vertical loss of bone through periodontal disease creates a far greater loss of attachment and support than its equivalent loss around the apex of a tooth. A wide range in the degree of resorption is seen, highlighting the role of individual susceptibility over and above the risk factors identified. Currently, no case is immune from the risk of root resorption, to some degree, and patients should be warned at the outset of treatment that such a risk exists. Recognition of specific risk factors, accurate radiographs and interpretation of radiographs at the outset of treatment are important if root resorption is to be minimized. Once resorption is recognized clinically during treatment, light forces must be used, root length monitored six monthly with radiographs and treatment aims reconsidered to maximize the longevity of the dentition. The use of thyroxine to minimize root

resorption has been advocated by some authors, but this is not routinely used **(Travess *et al.*, 2004).**

The severity and degree of root resorption associated with orthodontic treatment are multifactorial, involving host and environmental factors. The review shows that root resorption is significantly correlated with treatment duration, fixed appliance treatment, tooth structure, individual susceptibility, type of orthodontic tooth movement. Severe root resorption during orthodontic treatment (more than ¼ of the root length, >5 mm) occurs very rarely, just in 1-5 % of patients **(Lopatiene and Dumbravaite, 2008).** As shown in the figure (1.3)

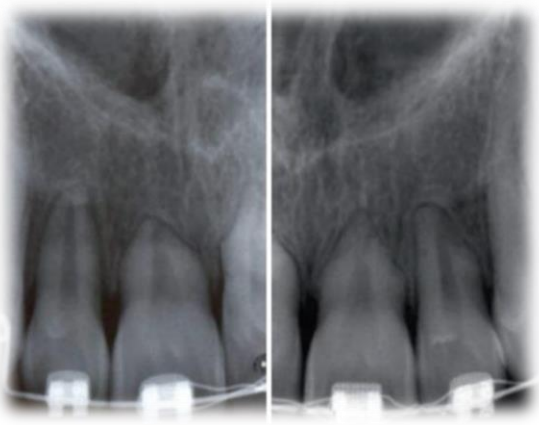

Figure 1.3: periapical radiographs showing root resorption of upper incisors (Preoteasa *et al.*, 2012).

1.2.11 Pulp damage and loss of tooth vitality

Some degree of pulpitis is expected with orthodontic tooth movement which is usually reversible or transient. Rarely lead to loss of vitality, but there may be an increase in pulpitis in previously traumatized teeth with fixed appliances. Light forces are advocated with traumatized teeth as well as baseline monitoring of vitality which should be repeated three monthly **(Kudagi, 2021)**. The risk factors for loss of pulp vitality include a history of trauma associated with the teeth. Pre-treatment periapical radiographs of previously traumatized teeth are essential for comparative

purposes. Additionally, the use of heavy uncontrolled, continuous forces by the orthodontist or round tripping of the teeth may lead to loss of pulp vitality. Therefore, orthodontist should use optimal light forces during their treatment **(Talic, 2011).**

1.2.12 Damage to intraoral soft tissue (ulcer)

Traumatic ulceration is a soft tissue lesion of the mouth caused by acute or chronic physical, mechanical, thermal, or chemical trauma. Clinically, the lesion is an ulcer covered by a yellowish-white fibrin purulent layer and surrounded by erythematous areas and hyperkeratotic tissue. Fixed orthodontic appliances consist of brackets, wires, bands, tubes, hooks, and other elements that can rub against the mucosa. Irritation caused by orthodontic appliances is called traumatic ulceration **(OSSA *et al,* 2022)**. Orthodontic brackets tended to cause mucosal erosions and desquamations whereas arch wires caused ulcerations **(Kumari *et al.*, 2022).** As shown in the figure (1.4)

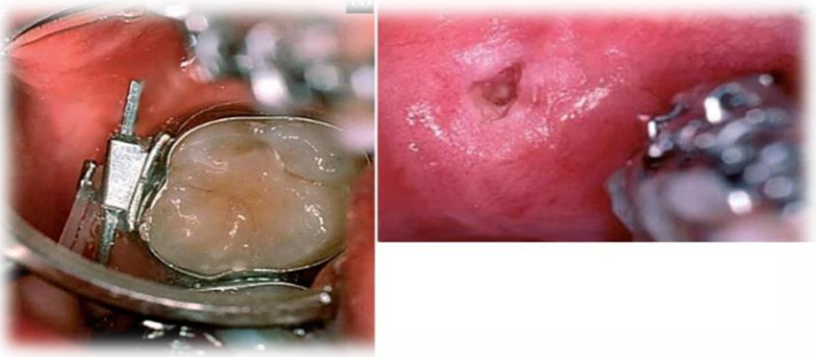

Figure 1.4: trauma to the cheek from an unusually long distal length of arch wire resulting in an ulcer (Travess *et al.*, 2004).

1.2.13 Temporomandibular joint (TMJ) problem

The true role of orthodontic therapy on the etiology of TMD, however, is still uncertain. From the clinical prospective, a thorough examination of the stomatognathic system is always necessary in order to detect possible TMD signs

and symptoms prior to the beginning of the orthodontic therapy. Caution should be exercised when planning, performing and finalizing orthodontics, especially in patients who with history of signs and symptoms of TMD. The clinician must always eliminate patient's pain and dysfunction before initiating any type of orthodontic mechanics. Muscle incoordination, unstable disc-condyle relationship and bone alterations are usual TMD conditions that can interfere with the presenting occlusal relationship **(Conti *et al.*, 2007)**. The current literature evidence indicates that orthodontic treatment performed during adolescence generally does not increase or decrease the odds of developing TMD later in life. It has been found that is no elevated risk of TMD associated with any particular type of orthodontic mechanics or with extraction protocols **(Meeran, 2013).**

Chapter Tow: Materials and Methods

This cross-sectional questionnaire-based study was carried out at the orthodontic department clinics, Collage of Dentistry University of Baghdad, from February 2023 to April 2023. This study was carried out with objective of assessing the complications and adverse side effects of wearing orthodontic appliances (fixed, removable, myofunctional) on orthodontic patients.

2.1 Inclusion criteria

Iraqi orthodontic patients age range 5-31 years, males and females who attended to orthodontic clinic without any systemic disease and had not receive previous orthodontic treatment. Data were obtained by interview questionnaires.

2.2 Methods

The complications list that we asked for the patients are: discomfort, difficulty during eating, speech impairment, poor oral hygiene, difficulty in sleeping, difficulty in performing school tasks, pain, tooth mobility, halitosis, impaired taste, gingival bleeding, difficulty in mouth opening, gingival recession, scratches and ulcers, gum infection, enamel demineralization (white spot lesion), difficulty enjoining contact with others, difficulty in smiling/laughing.

We ask the orthodontic patients questions as the case sheets illustrated below to collect the information.

Complications of orthodontic appliances:-

Patient name:

Age: Gender:

Type of orthodontic appliance: fixed☐ removable ☐ Myofunctional☐

1. Do you suffer from discomfort while wearing the orthodontic appliances?

   Absent ☐ Present☐

2. Do you suffer from difficulty in eating ?

   Absent☐ Present ☐

3. Do you suffer from speech impairment?

   Absent ☐ Present☐

4. Do you suffer from poor oral hygiene?

   Absent ☐ Present☐

5. Do you suffer from difficulty in sleeping?

   Absent ☐ Present ☐

6. Do you suffer from difficulty in performing school tasks?

   Absent☐ Present☐

7. Do you suffer from pain?

   Absent ☐ Present ☐

8. Do you suffer from tooth mobility?

   Absent ☐ present ☐

9. Do you suffer from halitosis ?

   Absent ☐ Present ☐

10. Do you suffer from impaired taste?

    Absent ☐ Present ☐

11. Do you suffer from gingival bleeding?

    Absent ☐ Present ☐

12. Do you suffer from difficulty in mouth opening?

    Absent ☐ Present ☐

13. Do you suffer from gingival recession?

    Absent☐ Present ☐

14. Do you suffer from scratches and ulcers?

    Absent ☐ Present ☐

15. Do you suffer from Gum infection?

    Absent ☐ Present ☐

16. Do you suffer from Enamel deminralization (white spot lesion)?

    Absesnt ☐ Present ☐

17. Do you suffer from difficulty enjoining contact with oters?

    Absent ☐ Present ☐

18. Do you suffer from difficulty smiling/laughing?

    Absent ☐ Present ☐

Figure 2.1 case sheets

Figure 2.2: fixed appliance

Figure 2.3: removable appliance

Figure 2.4: orthopedic appliance

Chapter Three: Results

The study included 100 Iraqi patients wearing different orthodontic appliances (fixed, removable, myofunctional), 60 patients wearing fixed orthodontic appliance (60%), 30 patients wearing removable appliance (30%), 10 patients wearing myofunctional appliance (10%).

3.1Complications of wearing orthodontic appliances according to the gender

The study included 38 males (38%) and 62 females (62%). males; 6 myofunctional (15.8%), 15 removable (39.5%) and 17 fixed (44.7%). females; 4 myofunctional (6.4%), 15 removable (24.2%) and 43 fixed (69.4%). (**Table 3.1**).

Table 3.1 Complications of wearing orthodontic appliances according to the gender.

	Male		**Female**	
COMPLICATIONS	**NO.**	**%**	**No.**	**%**
Discomfort	16	42	23	37
Difficulty during eating	12	31.5	29	46.7
Speech impairment	14	36.8	19	30.6
Poor oral hygiene	1	2.6	5	8
Difficulty in sleeping	6	15.7	9	14.5
Difficulty in performing school tasks	8	21	6	9.6

Pain	11	28.9	36	58
Tooth mobility	0	0	2	3.2
Halitosis	9	23.6	12	19.3
Impaired taste	0	0	0	0
Gingival bleeding	12	31.5	27	43.5
Difficulty in mouth opening	2	5.2	9	14.5
Gingival recession	0	0	1	1.6
Ulcer	16	42.1	38	61.2
Gum infection	9	23.6	17	27.4
White spot lesion	4	10.5	4	6.4
Difficulty enjoining contact with others	17	44.7	19	30.6
Difficulty smiling/laughing	16	42.1	21	33.8

3.2 Complications of wearing fixed orthodontic appliances

The study included 60 patients wearing fixed appliance (60%). 17 males (28.3%) and 43 female (71.7%). The impact of fixed appliances are listed in table (3.2).

Table 3.2 Complications of wearing fixed orthodontic appliances.

Complications	**No.**	**%**
Discomfort	27	45
Difficulty during eating	34	56.6
Speech impairment	13	21.6
Poor oral hygiene	5	8.3
Difficulty in sleeping	7	11.6
Difficulty in performing school tasks	8	13.3
Pain	35	58.3
Tooth mobility	2	3.3
Halitosis	9	15
Impaired taste	0	0

Gingival bleeding	32	53.3
Difficulty in mouth opening	1	1.6
Gingival recession	1	1.6
Ulcer	42	70
Gum infection	24	40
White spot lesion	6	10
Difficulty enjoining contact with others	15	25
Difficulty smiling/laughing	19	31.6

3.3 complications of wearing removable orthodontic appliances

The study included 30 patients wearing removable appliance (30%). 15 males (50%) and 15 female (50%). The effects of removable appliances are illustrated in table (3.3).

Table 3.3 complications of wearing removable orthodontic appliances.

Complications	No.	%
Discomfort	11	36.6
Difficulty during eating	5	16.6
Speech impairment	16	53.3
Poor oral hygiene	1	3.3
Difficulty in sleeping	5	16.6
Difficulty in performing school tasks	4	13.3
Pain	11	36.6
Tooth mobility	0	0
Halitosis	11	36.6
Impaired taste	0	0
Gingival bleeding	7	23.3
Difficulty in mouth opening	0	0

Gingival recession	0	0
Ulcer	11	36.6
Gum infection	12	40
White spot lesion	12	40
Difficulty enjoining contact with others	14	46.6
Difficulty smiling/laughing	14	46.6

3.4 Complications of wearing myofunctional orthodontic appliances

The study included 10 patients wearing myofunctional appliance (10%). 6 males (60%) and 4 females (40%). The adverse effects associated with wearing myofunctional appliance showed in table (3.4).

Table 3.4 complications of wearing myofunctional orthodontic appliances.

Complications	**No.**	**%**
Discomfort	1	10
Difficulty during eating	2	20
Speech impairment	4	40
Poor oral hygiene	0	0
Difficulty in sleeping	3	30

Difficulty in performing school tasks	2	20
Pain	1	10
Tooth mobility	0	0
Halitosis	1	10
Impaired taste	0	0
Gingival bleeding	0	0
Difficulty in mouth opening	3	30
Gingival recession	0	0
Ulcer	1	10
Gum infection	0	0
White spot lesion	0	0
Difficulty enjoining contact with others	4	40
Difficulty smiling/laughing	4	40

Chapter Four: Discussion

It is generally accepted that the main benefit of orthodontic treatment relates to improvements in oral function and oro-facial aesthetics and thus to improved oral health related quality of life, orthodontic patients realize that the first impression is greatly influenced by appearance in spite of orthodontic treatment is associated with improvement of the quality of life, although to achieve it the patient must experience side effects; orthodontic appliances cause different complications.

The result of current survey showed that (90%) of participants experienced complications and side effects associated with the use of orthodontic appliances, which had a negative influence on their quality of life, disagree to other study done by **Marques (2014).** assessed the impact of fixed orthodontic appliance on 272 orthodontic patients, classified the patients to two category according to age 9-14 years and 15-18 years. Found that difficulty during eating with age 9-14 years 11 (6.6%) and with age 15-18 years 23 (21.9%), speech impairment with age 9-14 years 12 (7.5%) and with age 15-18 years 22 (19.6%), poor oral hygiene 12 (7%) – 22 (21.8%), difficulty in sleeping 24 (11.7%) – 10 (15.2%), difficulty in performing school tasks 33 (14.3%) – 1 (2.4%), pain 29 (14.5%) – 5 (6.9%), tooth mobility 23 (9.2%) – 11 (52.4%), halitosis 23 (9.2%) – 11 (47.8%), impaired taste 27 (10.3%) – 7 (70%), gingival bleeding 19 (7.9%) – 15 (45.5%), gingival recession 34 (12.6%) – 0, mouth opening 34 (12.6%) – 0. In our survey difficulty during eating mentioned by 34 patients (56.6%) , speech impairment mentioned by 13 patients (21.6%), poor oral hygiene mentioned by 5 patients (8.3%), difficulty in sleeping mentioned by 7 patients (11.6%), difficulty in performing school tasks mentioned by 8 patients (13.3%), pain mentioned by 35 patients (58.3%), tooth mobility mentioned by 2 patients (3.3%), halitosis mentioned by 9 patients (15%), impaired taste mentioned by 0 patient (0%), gingival bleeding mentioned by 32 patients (53.3%), difficulty in

mouth opening mentioned by 1 patient (1.6%), gingival recession mentioned by 1 patient (1.6%), ulcer mentioned by 42 patients (70%), gum infection mentioned by 24 patients (40%), white spot lesion mentioned by 6 patients (10%), difficulty enjoining contact with others mentioned by 15 patients (25%), difficulty in smiling/laughing mentioned by 19 patients (31.6%). So the result disagree with **Marques (2014)** study.

In current survey the complications with removable appliance were difficulty during eating mentioned by 5 patients (16.6%) , speech impairment mentioned by 16 patients (53.3%), poor oral hygiene mentioned by 1 patient (3.3%), difficulty in sleeping mentioned by 5 patients (16.6%), difficulty in performing school tasks mentioned by 4 patients (13.3%), pain mentioned by 11 patients (36.6%), tooth mobility mentioned by 0 patient (0%), halitosis mentioned by 11 patients (36.6%), impaired taste mentioned by 0 patient (0%), gingival bleeding mentioned by 7 patients (23.3%), difficulty in mouth opening mentioned by 0 patient (0%), gingival recession mentioned by 0 patient (0%), ulcer mentioned by 11 patients (36.6%), gum infection mentioned by 12 patients (40%), white spot lesion mentioned by 12 patients (40%), difficulty enjoining contact with others mentioned by 14 patients (46.6%), difficulty in smiling/laughing mentioned by 14 patients (46.6%). So the result disagree with **(Al-Moghrabi, 2017)** study**.**

The response rate in present study for complications with myofunctional appliance were difficulty during eating mentioned by 2 patients (20%) , speech impairment mentioned by 4 patients (40%), poor oral hygiene mentioned by 0 patient (0%), difficulty in sleeping mentioned by 3 patients (30%), difficulty in performing school tasks mentioned by 2 patients (20%), pain mentioned by 1 patients (10%), tooth mobility mentioned by 0 patient (0%), halitosis mentioned by 1 patient (10%), impaired taste mentioned by 0 patient (0%), gingival bleeding

mentioned by 0 patient (0%), difficulty in mouth opening mentioned by 3 patients (30%), gingival recession mentioned by 0 patient (0%), ulcer mentioned by 1 patients (10%), gum infection mentioned by 0 patient (0%), white spot lesion mentioned by 0 patient (0%), difficulty enjoining contact with others mentioned by 4 patients (40%), difficulty in smiling/laughing mentioned by 4 patients (40%). So the result disagree with **(koletsi, 2018)** study**.**

Chapter Five: Conclusions and Suggestions

5.1 Conclusions

1. The complications associated with the use of the orthodontic appliances had a negative impact on the quality of life of orthodontic patients.

2. The most common complications mentioned by the orthodontic patients were difficulty during eating, pain, gingival bleeding, ulcer, gum infection, difficulty enjoining contact with others and difficulty in smiling/laughing.

3. The risks of orthodontic treatment vary between individuals and treatment plans. Good clinical practice, careful patient selection and information on a patient's responsibility are essential to minimize complications.

4. It is important to inform patients about the possible complications they may experience during orthodontic treatment, as well as to clarify that most of the complications are temporary, or that they will adapt to them and no longer perceive them as a burden.

5.2 Suggestions

1. Psychosocial impacts of fixed orthodontic treatment on adult patients.

2. Satisfaction of orthodontic patients during and after orthodontic treatment.

3. Complications and side effects during and after orthodontic treatment.

References

A

- **Abdulraheem, S., Paulsson, L., Petrén, S. and Sonesson, M., (2019).** Do fixed orthodontic appliances cause halitosis? A systematic review. *BMC oral health*, *19*(1), pp.1-8.

- **Alfuriji, S., Alhazmi, N., Alhamlan, N., Al-Ehaideb, A., Alruwaithi, M., Alkatheeri, N. and Geevarghese, A., (2014).** The effect of orthodontic therapy on periodontal health: a review of the literature. *International Journal of Dentistry*, *2014*.

- **Al-Moghrabi, D., Salazar, F.C., Pandis, N. and Fleming, P.S., (2017).** Compliance with removable orthodontic appliances and adjuncts: a systematic review and meta-analysis. *American Journal of Orthodontics and Dentofacial Orthopedics*, *152*(1), pp.17-32.

- **Awad, R.A. and Abuaffan, A.H., (2018).** Prevalence of malocclusion in a sample of sudanese university students by the index of orthodontic treatment need index (IOTN).

C

- **Chen, J., Wan, J. and You, L., (2018).** Speech and orthodontic appliances: a systematic literature review. *European journal of orthodontics*, *40*(1), pp.29-36.

- **Contaldo, M., Lucchese, A., Lajolo, C., Rupe, C., Di Stasio, D., Romano, A., Petruzzi, M. and Serpico, R., (2021).** The oral microbiota changes in orthodontic patients and effects on oral health: An overview. *Journal of Clinical Medicine*, *10*(4), p.780.

- **Conti, A.C.D.C.F., Oltramari, P.V.P., Navarro, R.D.L. and Almeida, M.R.D., (2007).** Examination of temporomandibular disorders in the orthodontic patient: a clinical guide. *Journal of Applied Oral Science*, *15*(1), pp.77-82.

E

- **Eid, H.A., Assiri, H.A.M., Kandyala, R., Togoo, R.A. and Turakhia, V.S., (2014).** Gingival enlargement in different age groups during fixed Orthodontic treatment. *Journal of International Oral Health*, *6*(1), p.1.

G

- **Gökçe, B. and Kaya, B., (2016).** Current approaches in myofunctional orthodontics. *Journal of Musculoskeletal Disorders and Treatment*, *2*, p.022.

K

- **Koletsi, D., Makou, M. and Pandis, N., (2018).** Effect of orthodontic management and orofacial muscle training protocols on the correction of myofunctional and myoskeletal problems in developing dentition. A systematic review and meta-analysis. *Orthodontics & craniofacial research*, *21*(4), pp.202-215.

- **Kudagi, V.S., (2021).** Adverse effects of orthodontic treatment: A review. *IJADS*, *7*(4), pp.304-305.

- **Kumari, S., Sangamesh, B., Khare, V., Sharma, S. and Renuka, B., (2022).** The Incidence of Oral Ulcers, Lacerations, Bracket Bond Failure and Perceived Pain during Fixed Orthodontic Mechanotherapy.

L

- **Littlewood, S.J., Tait, A.G., Mandall, N.A. and Lewis, D.H., (2001).** The role of removable appliances in contemporary orthodontics. *British Dental Journal*, *191*(6), pp.304-310.

- **Lopatiene, K. and Dumbravaite, A., (2008).** Risk factors of root resorption after orthodontic treatment. *Stomatologija*, *10*(3), pp.89-95.

M

- **Mandall, N.A., Hickman, J., Macfarlane, T.V., Mattick, R.C., Millett, D.T., Worthington, H.V. and Cochrane Oral Health Group, (1996).** Adhesives for fixed orthodontic brackets. *Cochrane Database of Systematic Reviews*, *2018*(5).

- **Manuelli, M., Marcolina, M., Nardi, N., Bertossi, D., De Santis, D., Ricciardi, G., Luciano, U., Nocini, R., Mainardi, A., Lissoni, A. and Abati, S., (2019).** Oral mucosal complications in orthodontic treatment. *Minerva stomatologica*, *68*(2), pp.84-88.

- **Marya, A., Venugopal, A., Karobari, M.I. and Rokaya, D., (2022).** White spot lesions: a serious but often ignored complication of orthodontic treatment. *The Open Dentistry Journal*, *16*(1).

- **Meeran, N.A., (2013).** Iatrogenic possibilities of orthodontic treatment and modalities of prevention. *Journal of Orthodontic Science*, *2*(3), p.73.

- **Marques, L.S., Paiva, S.M., Vieira-Andrade, R.G., Pereira, L.J. and Ramos-Jorge, M.L., (2014).** Discomfort associated with fixed orthodontic appliances: determinant factors and influence on quality of life. *Dental Press Journal of Orthodontics*, *19*, pp.102-107.

O

- **OSSA, Y.F., ULFAH, K. and SITINJAK, R.R., (2022).** Treatment of traumatic ulcer induced by fixed orthodontic appliance: a case report. *Journal of Syiah Kuala Dentistry Society*, *7*(1), pp.69-72.

P

- **Peñacoba, C., González, M.J., Santos, N. and Romero, M., (2014).** Psychosocial predictors of affect in adult patients undergoing orthodontic treatment. *European journal of orthodontics*, *36*(1), pp.93-98.

- **Preoteasa, C.T., Ionescu, E. and Preoteasa, E., (2012).** Risks and complications associated with orthodontic treatment. *Orthodontics-basic aspects and clinical considerations*, *2012*, pp.403-428.

R

- **Rakhshan, H. and Rakhshan, V., (2015).** Pain and discomfort perceived during the initial stage of active fixed orthodontic treatment. *The Saudi dental journal*, *27*(2), pp.81-87.

S

- **Saad, E., Amer, A.M., Hammad, S. and Abou-Elsaad, T., (2022).** Effects of Fixed Labial Orthodontic Appliances on Oral Functions in Arabic Speaking Children. *Egyptian Journal of Ear, Nose, Throat and Allied Sciences*, *23*(23), pp.1-9.

- **Srivastava, K., Tikku, T., Khanna, R. and Sachan, K., (2013).** Risk factors and management of white spot lesions in orthodontics. *Journal of orthodontic science*, *2*(2), p.43.

T

- **Talic, N.F., (2011).** Adverse effects of orthodontic treatment: a clinical perspective. *The Saudi dental journal*, *23*(2), pp.55-59.

- **Tiro, A., (2017).** Orthodontic treatment-related risks and complications: part I dental complications. *South European Journal of Orthodontics and Dentofacial Research*, *4*(2), pp.43-47.

- **Travess, H., Roberts-Harry, D. and Sandy, J., (2004).** Orthodontics. Part 6: Risks in orthodontic treatment. *British dental journal*, *196*(2), pp.71-77.

W

- **Wishney, M., (2017).** Potential risks of orthodontic therapy: a critical review and conceptual framework. *Australian dental journal*, *62*, pp.86-96.

X

- **Xiaoting, L.I., Yin, T. and Yangxi, C., (2010).** Interventions for pain during fixed orthodontic appliance therapy: a systematic review. *The Angle Orthodontist*, *80*(5), pp.925-932.

Y

- **Yassir, Y.A., McIntyre, G.T. and Bearn, D.R., (2021).** Orthodontic treatment and root resorption: an overview of systematic reviews. *European Journal of Orthodontics*, *43*(4), pp.442-456.

Z

- **Zhang, M., McGrath, C. and Hägg, U., (2007).** Patients' expectations and experiences of fixed orthodontic appliance therapy: impact on quality of life. *The Angle Orthodontist*, *77*(2), pp.318-322.