THE EFFECTS OF WEARING ORTHODONTIC APPLIANCES ON PATIENTS IN NAIROBI

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A Community Dentistry research project submitted for the partial fulfillment of the degree of Bachelor of Dental Surgery- University of Nairobi

2013
DECLARATION

I Karina Irusa hereby declare that this project is my original work and has not been done before by any other person. I affirm its authenticity to my efforts and work.

Signed……………………………………………………………………………… On this date………………………………………………………………………………

APPROVAL

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Signed……………………………………………………………………………………….. On this day………………………………………………………………………………..
DEDICATION

I dedicate this work to my Mum and Grand mum for their support; financial and emotional. Also dedicated to my friends who have been supportive and helpful, especially R.M.M. And finally to O.W.W for always being there.
ACKNOWLEDGEMENTS

I would like to acknowledge the following people for their selfless contributions to this report:

- Dr. R Mutave for her role as my supervisor and for spending her time going through and correcting my work.
- Dr. S Sharif for time spent supervising my work, constantly checking my progress and other contributions to my project.
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ABBREVIATIONS

UON –University Of Nairobi

BDS-Bachelor of Dental Surgery

MRes- Masters of Research

PDL- Periodontal ligament
SUMMARY

Background

Orthodontic appliances are devices used to correct malocclusion. Malocclusion has 72% prevalence in Kenya. Its main etiology is genetic or environmental influences that disrupt the normal development of the craniofacial skeleton. Knowledge on the effect these appliances have on the well-being of a patient is important in patient motivation for treatment and consequently increased compliance to treatment.

Objective

To establish the functional, psychological and social effect of wearing fixed and removable orthodontic appliances on patients in Nairobi.

MATERIALS AND METHODS

Study Design

A descriptive cross-sectional study.

Study Area

This study was conducted in Nairobi, Kenya. Specifically, seven private clinics in the following areas; Nairobi Central Business District, Nairobi West, Hurlingham, and the Upper Hill area were sampled.

Study Population

Male and female orthodontic patients of ages ranging from 9-35 year in good general health and written consent given.

Data collection tools

A combined structured and open-ended self-administered questionnaire was used and the data analysis was by the Windows SPSS program version 16.
Study Benefits

- The study will provide information on the social, psychological and functional effects of wearing orthodontic appliances which is currently limited.

- This will be beneficial to both the practitioner and the patient as this data can be used to enhance patient motivation before and during orthodontic treatment so as to improve compliance.

Results

A total of 160 patients participated in the study. Seventy eight (48.8%) being male while 82 (51.2%) were female. Out of 160 respondents 93.1% (149) had fixed appliances while 6.9% (11) had removable appliances. Majority of the respondents 108 (67.6%) reported that wearing braces affected their chewing. 108 out of 160 respondents (67.5%) reported that wearing braces made it difficult for them to brush their teeth. Most of the respondents 125 (78.13%) reported that wearing braces has made it more difficult to floss their teeth. 127 out of the 160 respondents (79.4%) reported that wearing braces has caused them to change their diet. 84.4% (135) of the respondents experienced pain and/or discomfort because of wearing braces. 127 (79.4) of the respondents reported that wearing braces had affected their appearance and for 73.1% of them, the change was positive.

Females were generally more affected than males and those wearing removable appliances scored higher than those wearing fixed appliances.

Discussion

Similar to other studies, pain/discomfort was the most highly felt effect of wearing orthodontic appliances.
The effects on flossing, brushing, diet and self-consciousness were worse on patients with fixed appliances in comparison to those with removable ones. This may be attributable to the fact that patients wearing removable appliances can easily remove them before eating or oral hygiene procedures.

The females scored significantly higher than the males on the following effects; chewing, brushing, flossing, diet changes, pain/discomfort and self-consciousness. The difficulty in performing daily oral hygiene procedures could be due to females being keener on keeping their teeth very clean so minor imperfections would mean more to them. The pain/discomfort may be attributable to females being more sensitive to discomfort in comparison to males. Females are generally more self-aware/conscious so having braces would most likely increase this.

**Conclusion**

From this study it can be concluded that wearing orthodontic appliances does have several functional, social and psychological effects on patients.

Despite these difficulties, most patients find that the appliances are beneficial since they improve their appearance.

**Recommendation**

The following are my recommendations after carrying out this study;

- Prescription of analgesics for the first few days after insertion of an appliance to improve the patient’s comfort.

- Dentists should also recommend special types of tooth brushes to help in oral hygiene maintenance for patients wearing orthodontic appliances.

- Patients should also be advised on the use of interdental brushes as a form of interdental cleaning so as to prevent interproximal caries.
CHAPTER 1: INTRODUCTION AND LITERATURE REVIEW

1.1 INTRODUCTION
The word orthodontics is derived from the Greek words 'orthos' meaning straight or proper and 'odous' meaning tooth (1). It is a specialty of dentistry that is concerned with the study and treatment of malocclusion among other dentofacial anomalies. Malocclusion is a broad range of dentofacial malformations which refers to physical deviations from ideal occlusal relationships and functioning. An orthodontic appliance is a device that is used to correct malocclusion and these may be removable or fixed.

The etiology of malocclusion may be

- Hereditary
- Environmental

There is a relationship between heredity and dental as well as skeletal variables. Genetics also influence an individual’s arch form. Environmental factors include habits such as thumb-sucking. Such habits should be stopped in early childhood to prevent occurrence of malocclusion. Malocclusion can either be;

- Skeletal: where there is a variation at the level of bone. This can be excessive or insufficient growth of the mandible, maxilla or both. (class I, II, and III)
- Dental: malocclusion due to variations of the teeth which can be as a result of varying tooth size, shape or position
- Malocclusion due to variations in the relationship between individual teeth.

There are various types of orthodontic appliances;

- Removable appliances; These are appliances that can be inserted and removed by the patient. The design and wear of these appliances differ. They can be worn for 12-24
hours a day and are usually followed by a retentive phase. Are highly dependent on the patient's cooperation

- Fixed appliances; These are permanently bonded onto the tooth and can not therefore be removed by the patient. They are not highly dependent on patient compliance but oral hygiene maintenance is paramount.

- Head gear. This is an apparatus for interconnection between an intraoral orthodontic appliance and a neck/head engageable strap. It can be used in bite correction or as an anchor device for the teeth during orthodontic treatment. The type of head gear depends on the patient's facial pattern and what the orthodontist is trying to achieve.

- Non-compliance appliances. These attach to the orthodontic appliances and are active 24 hours a day.

- Maxillary expanders. Can either be slow-expanders or rapid-expanders. They are used mostly in growing children and often in combination with surgery to loosen the jaw for expansion

Orthodontic appliances work by creating mild, functional stress which results in tooth or soft tissue movement

A number of studies in recent years have confirmed that severe malocclusion is likely to be a social handicap. (9) Well-aligned teeth and a pleasing smile carry positive status at all social levels and ages, whereas irregular or protruding teeth carry negative status.

Children anticipating orthodontic treatment expect an improvement in their social and psychological well-being and see an improvement in function as a secondary advantage of treatment. (9)

Appearance can and does make a difference in teachers’ expectations and therefore in student progress in school, in employability, and in competition for a mate. (9) There is no doubt that social responses conditioned by the appearance of the face and teeth can severely affect an individual's whole adaptation to life. (9)
Since most orthodontic patients seek treatment because they are unhappy with their appearance, it has not occurred to many that the treatment process may also have a negative effect on the patient's self-esteem as well as daily function. Orthodontic treatment can be the cause of discomfort, not only in terms of pain but socially as well. The appliances are placed in the aesthetic zone of the body and are easily noticed during social interactions. Children may experience ridicule from their peers. Adolescent and adult patients may become more self-conscious affecting their quality of life as a whole (4)

A patient’s attitude towards treatment and the ease of adaptation to treatment plays a major role in the compliance to treatment. The success of orthodontic treatment is highly dependent on patient cooperation and compliance, failure of which can lead to permanent damage to the dentition and compromised results of treatment. Therefore patient counseling on the challenges expected during treatment as well as patient motivation can significantly improve attitude and consequently compliance.

Currently, most research has focused on the physical discomfort of treatment, the effects on speech and mastication.

Few studies have looked at the psychosocial effects which in my opinion are of equal if not more importance. The studies done have not been conducted in a Kenyan population.

The aim of this study is to analyze the effects of orthodontic appliances in 3-dimensions i.e. looking at the functional, social and psychological effect in a Kenyan population.
1.2 LITERATURE REVIEW

The prevalence of malocclusion in Kenya is 72% with the predominant anteroposterior relationship of the dental arches being neutral occlusion (93%). Specific malocclusion traits were highest for crowding (19%), rotations (19%), posterior cross bite (10%), maxillary over jet (10%), and anterior open bite (8%) (2).

Orthodontic appliances are devices that are used to correct malocclusion and can either be fixed or removable. Their mechanism of action is by the application of mild force that eventually translates into functional tooth movement. The aim of orthodontic treatment is to improve both aesthetics as well as function. Orthodontic treatment can start from as early as 9 years.

Orthodontic appliances date back to centuries ago. According to the American Association of Orthodontics, archeologists have discovered mummified ancients with crude metal bands wrapped around individual teeth (3). Cat gut was also used to close gaps. Over the years, several developments have been made with Fauchard being referred to as ‘the father of orthodontics’ due to his significant work of putting malocclusion on the map. Norman Kingsley is also an important name in the history of orthodontics. He wrote his first article on orthodontics and in 1880 his book was published. J.N Farrar (3) also wrote two volumes of an orthodontic text book. He was very good at designing orthodontic appliances and he was the first to suggest the use of mild force at timed intervals to move teeth. Most of the advances made in orthodontics were made in the 19th and 20th centuries with the invention of the lingual system and esthetic braces made from single crystal sapphire and ceramics. With technological advances; digital imaging may take over, making orthodontic treatment more precise.

Pain can be defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage or described in terms of such damage. Orthodontic treatment is associated with some degree of pain or discomfort. The mechanism by which this occurs is by maintenance of pressure upon a tooth for 3-5 seconds causing the fluid in the periodontal
ligament to be rapidly expressed, and the tooth displaces within the PDL space, compressing the ligament itself against adjacent bone. This pressure is exerted by orthodontic appliances.

A study was done by Hans et al (1992) on the pain and discomfort during orthodontic treatment. The study also evaluated its effects on compliance. The progress of adaptation after inserting the new appliance was followed and a comparison made between the type of appliance and the degree of pain experienced. A similar comparison was made between pain sensations and attitude towards treatment and hence its effect on compliance. 84 patients undergoing orthodontic treatment were assessed 7 days, 14 days, 6 weeks, 3 months and 6 months after appliance insertion using questionnaires and rating scales. The study concluded that pain and discomfort occurred during the first 3-5 days after insertion. Patients wearing fixed appliances experienced more pain than those wearing removable ones. Patients who had a higher personal perception of the severity of their malocclusion adapted faster and felt less pain. They found that the patient’s acceptance of treatment was dependent on the amount of initial pain and discomfort (6).

A similar study by Fern et al (1997) at the university of Glasgow, UK showed that ‘tightness’ and sensitivity scored highest among other effects like comfort, convenience and self-consciousness. The comparison between fixed and removable appliances was made with the discomfort being slightly worse in the patients with fixed appliances (4).

A study done by Oliver G et al (1985) in Britain which included both patients and their parents was done to establish their attitudes towards active orthodontic treatment. It was carried out in two centers. A questionnaire was used which enquired about: pre-treatment appearance, reactions to the proposed treatment, perceived benefits of treatment and values based upon treatment. In conclusion, both patients and parents were content with the treatment received. Pain and aesthetics were found to be the main discouraging features (11).

Orthodontic appliances may also affect a patient’s psychosocial well-being. The fact that orthodontic appliances are worn on a very visible part of the body makes them easily visible during inter-personal interactions. This may lead to shyness, self-consciousness and social awkwardness.
A study was done by Fern et al at the university of Glasgow on 52 Caucasian patients who began orthodontic treatment at the University of Glasgow between 1993(May) and 1994(February). It included patients receiving either two-arch fixed appliances or upper removable appliances. The results showed that there was a degree of embarrassment caused by wearing orthodontic appliances. However there was no statistically significant difference between the social embarrassment caused by fixed and removable appliances. There are patient who refused to use the appliances on grounds of appearance (4)

Another study done by Hans et al (1992) was done in Germany to investigate the social discomfort during orthodontic treatment. A longitudinal study was done to establish the relationship between the type of appliance worn and functional and social discomfort experienced. The study sample consisted of 84 patients who were undergoing treatment and their complaints during the first 7 days of treatment and rated them retrospectively 14 days, 3 months and 6 months after appliance insertion. The study exhibited a relationship between lack of confidence in public and compliance. In summary this study highlighted the importance of positive patient attitude to treatment and the need to begin orthodontic treatment early. (6)

A study was done by Albino et al (1994) to investigate the psychosocial effect of wearing orthodontic appliances. A randomized control group design was used with 93 participants, all between ages 11 and 14. All had mild to moderate malocclusion. They were randomly assigned to receive orthodontic treatment immediately or after serving as delayed controls. The participants underwent a series of psychosocial evaluations before treatment, during treatment and 1 year after completion of treatment. In summary a patient’s self-esteem and social goals were not affected by treatment (10)

Orthodontic appliances have been associated with disturbance on several functions such as mastication, speech, excessive salivation, swallowing, and oral hygiene. This is evidenced by the following studies;

A study was done by Eduardo et al (2008) on the impacts of orthodontic appliances on daily performances (eating, speaking, cleaning the mouth, relaxing, smiling, emotion, studying and social contact,). The study population was a total of 1657 students of 15 -16 years who were randomly selected from those attending all secondary schools in Bauru, Sao Paulo, Brazil. The
study sample included only those wearing orthodontic appliances (357). Data collection was via face-to-face structured interviews which collected information about impacts of orthodontic appliances on daily life using the 'Oral Impact on Daily Performance’. A comparison was made between the type of orthodontic appliance and the impact. 90% of the patients reported impacts on one daily function, commonly eating and speaking. The prevalence and not the intensity of effects varied with type of orthodontic appliances. The impacts were higher in patients wearing fixed appliances rather than removable ones. (7)

A longitudinal study by Hans et al (1992) Germany aimed to establish the relationship between the type of appliance worn and functional and social discomfort experienced. The frequent functional complaints included; impaired speech, impaired swallowing and feeling of oral constraint (6)

A study on the impact of fixed orthodontic appliances on daily life was done by Mandall et al (2006). The study sample was 66 patients whose orthodontic appliances had just been placed and another 28 patients whose appliances were in place for about 6 months. The 'impact of fixed appliances' questionnaire was used. It was developed after interviewing patients with fixed appliances and pretesting on 10 patients. The questionnaire touched on 9 sub-scales: aesthetics, functional limitation, dietary, oral hygiene, maintenance, physical, social, time constraints and travel costs. The results of the study showed that none of the scores reduced over time except aesthetics and age was the predominant variable influencing the impact of fixed appliances. Younger children were seen to be less affected. The study concluded that it was unlikely that the impact of fixed appliances decreased with time. It also concluded that the impact of treatment was less in younger children so it is recommended that treatment is started early. This study did not however include removable orthodontic appliances. Only age was considered as a variable. Gender and type of appliance would have been important variables to include.(5)

The aim of my study is to fill all the missing gaps from the above studies by including a wider range of participants, including adults and including gender as a variable.
CHAPTER 2: PROBLEM STATEMENT, JUSTIFICATION, OBJECTIVES AND VARIABLES

2.1 Problem Statement

The effects of wearing orthodontic appliances play a significant role in patient compliance to treatment and even search for treatment.

Although these challenges associated with orthodontic treatment may persist, patient counseling prior to commencement of treatment is essential in improving the patient's attitude towards treatment and hence compliance. In order to solve a problem, it is necessary to understand its origin. This can only be done by investigating the effects associated with use of orthodontic appliances.

2.2 Justification of study

There is scanty information if any on the effect of wearing orthodontic appliances on Kenyan patients. The primary purpose of this study is to establish the effects of orthodontic treatment on patients and the effect on compliance to treatment. Failure of compliance can lead to permanent damage of the dentition as well as compromised results of treatment. This study will benefit both the patients and dental practitioners.

2.3 General and specific objectives

General
To establish the functional, psychological and social effect of wearing fixed and removable orthodontic appliances on patients in Nairobi.

Specific

- To establish the functional effects of wearing fixed and removable orthodontic appliances on patients
- To determine the psychological effects of wearing fixed and removable orthodontic appliances on patients
- To determine the social effects of wearing fixed and removable orthodontic appliances on patients
- To compare the effects of wearing orthodontic appliances on patients with fixed and those with removable appliances
- To compare the effects of wearing orthodontic appliances on patients of different age groups

2.4 Variables

Dependent: Social embarrassment, Speech difficulties, Difficulties in swallowing, Pain/discomfort, Low self esteem

Independent: Type of appliance, Age group, Gender,
CHAPTER 3 : RESEARCH METHODOLOGY

3.1- Study area

This study was conducted in Nairobi, Kenya at;

- A private clinic in Nairobi situated on Muhoho Road, 1st floor, Tamaj building
- A private clinic in Hurlingham (Dr. Walah)
- Two private clinics in the central business district (Molars dental clinic; Electricity house, 3rd floor and Dr. Rosaline Thara Muruakithi; Tembo Co-op house 5th floor, room 5)
- Three private clinics in the Upper Hill area; Upper Hill Medical Centre and Nelson Awori building

3.2- Study Population

The study sample consisted of both male and female orthodontic patients of ages ranging from 7-47 years. They were in general good health and written consent given. The study population excluded patients who didn’t wear orthodontic appliances, those who declined to participate and illiterate patients.

3.3- Study design

Study design was a descriptive cross sectional study.

3.4- Sample size and sampling method

\[ Z^2 \frac{P(1-P)}{C^2} \]

\[ Z = z \text{ value} \]

\[ P = \text{prevalence of discomfort reported with use of orthodontic appliances} \]
C=1-confidence level

\[ 1.96^2 \frac{0.87(1-0.87)}{(1-0.95)^2} = 174 \]

For a sample population less than 10,000: \( nf = \frac{n}{1 + n/N} \)

\( nf \) = desired sample size for a population less than 10,000

\( n \) = sample size derived from a population greater than 10,000

\( N \) = estimated size of population with characteristic of interest under investigation

\[ \frac{174}{1 + 174/2200} = 160 \]

3.5-Data collection instruments and techniques

A combined structured and open-ended questionnaire touching on the social, psychological and functional effects wearing orthodontic appliance was used with responses to a statement in three scales based on severity. This was expected to reflect how severely; on a scale of 1-3 a patient experiences a certain effect. E.g. my braces affect my swallowing 'not at all' 'a bit' or 'a lot'. The validity of the questionnaire was ensured by pre-testing. The questionnaire was self-administered for patients over 13 years and administered for the younger patients.

3.6-Inclusion Criteria

- All consenting orthodontic patients
- Patients of ages ranging from 10-35 years.
- Patients in general good health

3.7-Exclusion Criteria

- patients who don’t wear orthodontic appliances
• Patients who declined to participate
• Illiterate patients.

3.8-Problems Encountered

Problems encountered included;

• Difficulty in reaching the sample size due to the few number of orthodontic patients in several clinics in a day. I was hence forced to expand my study area from the original plan
• Loss of some filled questionnaires in some clinics

3.9-Data Analysis

Data analysis was done using Statistical Package for the Social Sciences (Version 16)

3.9-Perceived Benefits

• The study will provide information on the social, psychological and functional effects of wearing orthodontic appliances.
• This will be beneficial to both the practitioner and the patient as this data can be used to enhance patient motivation before and during orthodontic treatment so as to improve compliance.

3.10-Ethical Considerations

Approval to carry out this study research was sought from and granted by the Kenyatta National Hospital Ethics and Research Committee (Reference number UP374/07/2013). Permission from the relevant authorities at the private dental clinics was sought. Informed consent was obtained from the participants who were assured of anonymity and confidentiality. The participants were informed on their liberty to withdraw from the study at any point if they wished.
CHAPTER FOUR; RESULTS

4.1 SOCIODEMOGRAPHIC CHARACTERISTICS

4.1.1 Age and Gender of respondents

A total of 160 patients participated in the study. 78 (48.8%) being male while 82 (51.2%) were female. The age of the respondents ranged from 7 to 47 years with a mean age of 17. The median age was 16 years. The mean age for the males was 16 while that for females was 18. Majority, 103 (64.4%) was within the age range of 10-19 years. The smallest age group represented was 0-9 which made up 2% of the total number of participants.

![Figure 1](image)

*Figure 1*

1=0-9 years
2=10-19 years
3= 20 and above years
4.2 DISTRIBUTION OF TYPE OF APPLIANCE WORN AMONG THE RESPONDENTS

Out of 160 respondents 93.1%(149) had fixed appliances while 6.9% (11) had removable appliances.

Figure 2
4.3 DURATION OF WEAR OF ORTHODONTIC APPLIANCE

76.9% of the participants had worn their appliances for more than a month. 8.8% had worn their appliances for only 1-4 weeks while 2.5% had worn them for less than 7 days.
4.4 RECOMMENDATION FOR WEAR OF ORTHODONTIC APPLIANCES

48.1% of the respondents decided to wear orthodontic appliances due to recommendation by their dentists. 23.1% by family members and 28.1% decided on their own. One individual decided to undergo orthodontic treatment due to a documentary on television.

<table>
<thead>
<tr>
<th>Person who recommended</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>self</td>
<td>45</td>
<td>28.1</td>
</tr>
<tr>
<td>family</td>
<td>37</td>
<td>23.1</td>
</tr>
<tr>
<td>dentist</td>
<td>77</td>
<td>48.1</td>
</tr>
<tr>
<td>others</td>
<td>1</td>
<td>.6</td>
</tr>
<tr>
<td>Total</td>
<td>160</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*Table 1*
4.5 EFFECT OF WEARING BRACES ON CHEWING

Majority of the respondents 108(67.6\%) reported that wearing braces affected their chewing. 32.4\% were not affected at all.
4.6 EFFECT OF WEARING BRACES ON BRUSHING THE TEETH

108 out of 160 respondents (67.5%) reported that wearing braces made it difficult for them to brush their teeth. 32.5% reported that their brushing not at all affected by wearing braces.

Figure 5
4.7 EFFECT OF WEARING BRACES ON FLOSSING

Most of the respondents 125(78.13%) reported that wearing braces has made it more difficult to floss their teeth.
4.8 EFFECTS OF BRACES ON THE DIET

127 out of the 160 respondents (79.4%) reported that wearing braces has caused them to change their diet. 21.6% of the respondents have not had their diet affected by braces.

*Figure 7*
4.9 PAIN AND DISCOMFORT CAUSED BY BRACES

84.4% (135) of the respondents experienced pain and/or discomfort because of wearing braces. Out of these 81.8% experienced pain/discomfort that was worst 24 hours after their appliances were adjusted, 15.9% had the worst discomfort/pain during the first seven days after their appliances were adjusted while 2.3% experienced pain/discomfort all the time.

Figure 8
4.10 CHANGE IN APPEARANCE CAUSED BY WEARING BRACES

127 (79.4) of the respondents reported that wearing braces had affected their appearance. Despite the other effects 73.1% of the respondents reported that this change was positive as it had improved the quality of their smiles. Only 6.2% reported the change in appearance as being negative. The rest of the respondents did not give a response.
4.11 THE RELATION BETWEEN AGE AND THE EFFECTS OF WEARING BRACES

There is a weak positive correlation that is statistically significant between difficulty in flossing and wearing orthodontic appliances.

There is a weak negative correlation that is statistically significant between difficulty in studying/working and wearing an orthodontic appliance.

A weak negative correlation exists between difficulty in swallowing and wearing of an orthodontic appliance. This is statistically significant.

There is a weak positive correlation between wearing orthodontic appliances and pain/discomfort that is statistically significant.

<table>
<thead>
<tr>
<th>EFFECT OF BRACES</th>
<th>PARTICIPANTS AFFECTED (a bit/ a lot)</th>
<th>PARTICIPANTS NOT AFFECTED (not at all)</th>
<th>P- VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

23
<table>
<thead>
<tr>
<th>Table 2</th>
<th>Difficulty when flossing</th>
<th>78.13%</th>
<th>21.77%</th>
<th>0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Difficulty when working or studying</td>
<td>9%</td>
<td>91%</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Difficulty when swallowing</td>
<td>8.6%</td>
<td>91.4%</td>
<td>0.01</td>
</tr>
<tr>
<td></td>
<td>Pain/discomfort/tightness</td>
<td>84.4%</td>
<td>15.6%</td>
<td>0.019</td>
</tr>
</tbody>
</table>

4.12 COMPARISON BETWEEN GENDER AND THE EFFECTS OF WEARING BRACES

Gender had a statistically significant effect on the following effects; brushing, flossing, diet, pain/discomfort, self-consciousness

73.1% of females and 61.5% of males reported difficulty of brushing their teeth due to orthodontic appliances

82.9% of females and 68% of males reported that wearing braces affected how easy it was for them to floss their teeth.

84.1% of females and 74.4% of males experienced a change in diet due to wearing orthodontic appliances.

90.2% of females experienced pain/discomfort while wearing braces while 78.2% of the males reported having experienced the same

64.6% of females reported that wearing braces made them self-conscious. On the other hand 38.4% of males felt self-conscious due to wearing braces.
### Table 3

#### 4.13 COMPARISON BETWEEN THE TYPE OF APPLIANCE AND THE EFFECTS

The effects that showed a difference that was statistically significant include; difficulty in flossing, difficulty in brushing the teeth, change in diet, pain/discomfort and self-consciousness.

90.9% of the respondents who wear removable appliances experienced no difficulty while flossing their teeth. On the contrary, 80.5% of the respondents with fixed appliances experienced difficulty while flossing their teeth.

80.5% of the patients with fixed appliances reported that wearing the appliances had caused them to change their diet. 63.6% of those with removable appliances reported the same.

90.9% of the respondents wearing removable appliances reported that they experienced difficulty when brushing their teeth while 71.8% of fixed appliance wearers experienced difficulty when brushing their teeth.

<table>
<thead>
<tr>
<th>EFFECT OF WEARING BRACES</th>
<th>FEMALES AFFECTED(alot/ a bit)</th>
<th>MALES AFFECTED(a lot/ a bit)</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty when brushing</td>
<td>73.1%</td>
<td>61.5%</td>
<td>0.02</td>
</tr>
<tr>
<td>Difficulty when flossing</td>
<td>82.9%</td>
<td>68.0%</td>
<td>0.014</td>
</tr>
<tr>
<td>Change in diet</td>
<td>84.1%</td>
<td>74.4%</td>
<td>0.029</td>
</tr>
<tr>
<td>Pain/discomfort/tightness</td>
<td>90.2%</td>
<td>78.2%</td>
<td>0.028</td>
</tr>
<tr>
<td>Self consciousness</td>
<td>64.6%</td>
<td>38.4%</td>
<td>0.014</td>
</tr>
</tbody>
</table>
### Table 4

4.14 COMPARISON BETWEEN THE EFFECTS OF WEARING BRACES IN DIFFERENT AGE-GROUPS

The effects that showed a statistically significant relation with age are; difficulty in chewing, brushing, flossing, relaxing studying, swallowing and sleeping, change in diet, pain/discomfort and loss of confidence. The age-groups used were 0-9, 10-19 and 20 and above years.

100% of the respondents aged 0-9 years had difficulty in chewing, while 59.2% of those aged 10-19 years and 81.2% of those aged 20 and above reported the same.

100% of the respondents who were 0-9 years old did not have any difficulty when brushing. 69% of the 10-19 year olds and 69.9% of those 20 years old and above reported the same.

Of the 0-9 year old respondents, 100% did not experience any difficulties while flossing. 76% of those aged 10-19 and 79.2% of those ages 20 years and above reported difficulty while flossing.

100% of 0-9 year olds have difficulty relaxing with braces on. 23.1% of 10-19 year olds and 24.5% of respondents 20 years old and above reported the same.

<table>
<thead>
<tr>
<th>EFFECT OF WEARING BRACES</th>
<th>FIXED APPLIANCES</th>
<th>REMOVABLE APPLIANCES</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty when flossing</td>
<td>80.5%</td>
<td>9.1%</td>
<td>0.00</td>
</tr>
<tr>
<td>Change in diet</td>
<td>80.5%</td>
<td>63.6%</td>
<td>0.01</td>
</tr>
<tr>
<td>Difficulty when brushing</td>
<td>71.8%</td>
<td>90.9%</td>
<td>0.00</td>
</tr>
</tbody>
</table>
75% of the respondents who are 0-9 years old experienced difficulty in sleeping due to wearing braces. Only 3.9% of 10-19 year olds and 5.7% of those 20 years old and above experienced the same.

100% of the respondents who were 0-9 years old reported that wearing braces did not change their diet at all. It however changed the diet of 82.5% the 10-19 year olds and 79.3% of the respondents who were 20 years old and above.

75% of the respondents aged 0-9 years had trouble studying due to wearing braces while only 8.7% of the 10-19 year olds and 1.9% of those 20 years old and above had their studying/work affected.

Wearing braces made swallowing difficult for 75% of the 0-9 year olds. Of the 10-19 year olds, only 7.7% were affected. None of the respondents who were 20 years and above had difficulties swallowing.

Pain was reported in 100% of 0-9 year olds, 74.6% of the 10-19 year olds and 96.2% of those 20 years old and above.

75% of those who were 0-9 years of age were less confident due to braces. 19.4% of the 10-19 year olds were less confident while 22.6% of those 20 years and above reported the same.

<table>
<thead>
<tr>
<th>EFFECT OF WEARING BRACES</th>
<th>0-9 YEARS</th>
<th>10-19 YEARS</th>
<th>20 AND ABOVE YEARS</th>
<th>P-VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty in chewing</td>
<td>100%</td>
<td>59.2%</td>
<td>81.2%</td>
<td>0.012</td>
</tr>
<tr>
<td>Difficulty when brushing</td>
<td>0%</td>
<td>69%</td>
<td>69.9%</td>
<td>0.032</td>
</tr>
<tr>
<td>Condition</td>
<td>0%</td>
<td>76%</td>
<td>79.2%</td>
<td>0.003</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>------</td>
<td>------</td>
<td>-------</td>
<td>-------</td>
</tr>
<tr>
<td>Difficulty when flossing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difficulty relaxing</td>
<td>100%</td>
<td>23.1%</td>
<td>24.5%</td>
<td>0.011</td>
</tr>
<tr>
<td>Difficulty sleeping</td>
<td>75%</td>
<td>3.9%</td>
<td>5.7%</td>
<td>0.000</td>
</tr>
<tr>
<td>Change in diet</td>
<td>0%</td>
<td>82.5%</td>
<td>79.3%</td>
<td>0.005</td>
</tr>
<tr>
<td>Difficulty while working/studying</td>
<td>75%</td>
<td>8.7%</td>
<td>1.9%</td>
<td>0.000</td>
</tr>
<tr>
<td>Difficulty in swallowing</td>
<td>75%</td>
<td>7.7%</td>
<td>0%</td>
<td>0.001</td>
</tr>
<tr>
<td>Pain/discomfort/tightness</td>
<td>100%</td>
<td>74.6%</td>
<td>96.2%</td>
<td>0.015</td>
</tr>
<tr>
<td>Less confidence</td>
<td>75%</td>
<td>19.4%</td>
<td>22.6%</td>
<td>0.03</td>
</tr>
</tbody>
</table>

*Table 5*
CHAPTER 5: DISCUSSION, CONCLUSION AND RECOMMENDATION

5.1 DISCUSSION

From the responses given most of the respondents 84.4% experienced pain/discomfort while wearing the orthodontic appliances, with 67.5% experiencing worst pain during the first 24 hours after adjustment. Other effect that were commonly experienced were change in diet(79.4%), difficulty when flossing (75.6%), difficulty when brushing (73.75%) and a change in appearance (79.4). Most of the respondents (73.1%) felt that the change in their appearance was positive.

A study done by Hans et al on the pain, discomfort or tightness during orthodontic treatment found that pain and discomfort occurred during the first 3-5 days after insertion which varies slightly from my findings. Another study by Fern et al in the UK in 1997 showed that tightness and sensitivity scored highest among other effects. This is similar to my study findings.
79.4% of respondents felt their appearance had changed and they were happy with it. This is similar to a study carried out by Olivier Gal (1985) in Britain which found that both patients and their parents were content with the appearance.

Of the daily functions, diet, tooth brushing and flossing were the most affected. This contrary to other studies eg a study carried out by Eduardo et al showed that of the functional effects eating and speaking were most affected.

The effects on flossing, brushing, diet and self-consciousness were worse on patients with fixed appliances in comparison to those with removable ones. This may be attributable to the fact that patients wearing removable appliances can easily remove them before eating or oral hygiene procedures.

As opposed to the study by Fern et al in 1997 which showed that pain was experienced more in patients with fixed appliances, this study shows pain in 100% of the respondents with removable appliances and 83.2% of those with fixed. This may be due to the small number of respondents with removable appliances hence a statistical error.

Females were generally more affected by wearing orthodontic appliances than males. The females scored significantly higher than the males on the following effects; chewing, brushing, flossing, diet changes, pain/discomfort and self-consciousness. Other studies had not used gender as a factor for comparison. The difficulty in performing daily oral hygiene procedures could be due to females being keener on keeping their teeth very clean so minor imperfections would mean more to them. The pain/discomfort may be attributable to females being more sensitive to discomfort in comparison to males. Females are generally more self-aware/conscious so having braces would most likely increase this.

There was an increase in pain and discomfort with age indicating that younger ones were less affected. This is similar to a study by Mandall et al in 2006 which found that younger children were less affected by wearing orthodontic appliance. It is hence important to start treatment at an early age.

Respondents aged 0-9 years generally scored higher than age groups in several effects (difficulty in chewing, relaxing, sleeping, studying, swallowing, pain/discomfort, loss of confidence and
diet change) except difficulty in brushing and flossing. These high scores could be due to all the respondents in this group having removable appliances and can easily remove them when they want to clean their teeth. There are also only 4 respondents which is not representative.

5.2 CONCLUSION

From this study it can be concluded that wearing orthodontic appliances does have several functional, social and psychological effects on patients

Despite these difficulties, most patients find that the appliances are beneficial since they improve their appearance
5.3 RECOMMENDATIONS

The following are my recommendations after carrying out this study;

- Prescription of analgesics for the first few days after insertion of an appliance to improve the patient’s comfort

- Dentists should also recommend special types of tooth brushes to help in oral hygiene maintenance for patients wearing orthodontic appliances.

- Patients should also be advised on the use of interdental brushes as a form of interdental cleaning to avoid occurrence of interproximal caries
APPENDICES

APPENDIX I: REFERENCES


APPENDIX II: INFORMED CONSENT FORMS

APPENDIX II(a): INFORMED CONSENT FORM FOR ADULTS

This informed consent form is for adults participating in the research titled "The effects of wearing orthodontic appliances on patients in Nairobi", that will be carried out by Irusa Karina Fiona, a 3rd year dentistry student at the University Of Nairobi,

This Informed Consent Form has two parts:

- Information Sheet (to share information about the study with you)
- Certificate of Consent (for signatures if you agree that your child may participate)
Part I: Information Sheet for participants

The purpose of the research is to find out the different kinds of discomfort experienced while wearing braces. This includes pain, social embarrassment as well as difficulty during performing day to day activities. The information gotten from this research will help to find out what kind of negative effects of the braces would discourage patients from complying with treatment hence finding ways to motivate them before and during treatment or alternatively find more concrete solutions which will eliminate all these ‘discomforts’

The information will be gotten through questionnaires.

I will be distributing the questionnaires to several patients who wear braces and I have chosen you because you wear braces and live in Nairobi.

You do not have to agree to participate. You can choose to say no and any services that you and your family receive at this centre will not change.
Your will fill out a questionnaire which will be provided by myself/ Dr. Muendo/Dr. Muruakithi and collected by myself/ Dr. Muendo/Dr. Muruakithi. This takes about 20 minutes.

If you do not wish to answer some of the questions included in the questionnaire, you may skip them and move on to the next question. The information recorded is confidential. The questionnaires will be destroyed after 3 months. Any information about you will have a number on it instead of your name.

We are asking you to share with us some very personal and confidential information, and you may feel uncomfortable talking about some of the topics. You must know that you do not have to answer any question or take part in the research if you don’t wish to do so, and that is also fine. You do not have to give us any reason for not responding to any question, or for refusing to take part in the research.

There will be no immediate and direct benefit to you, but your participation is likely to help us find out more about the effects of wearing braces on patients and we hope that these will help the local clinics and hospitals to meet those needs better in the future.

You will not be provided with any payment to take part in the research.

At the end of the study, we will be sharing what we have learnt with the participants and with the community.

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact me on 0720494617.

This proposal has been reviewed and approved by Kenyatta National Hospital Ethics and Research Committee which is a committee whose task it is to make sure that research participants are protected from harm.
Part II: Certificate of Consent for participant

I have read the foregoing information. I have had the opportunity to ask questions about it and any questions I have been asked have been answered to my satisfaction. I consent voluntarily to be a participant in this study.

Name of Participant__________________

Signature of Participant ___________________

Date _____________________

Day/month/year

Statement by researcher

I have to the best of my ability made sure that the participant understands that he/she will be given a questionnaire on the ‘effects of wearing braces’

Irusa Karina Fiona........................................ On........................................
This informed consent form is for parents of girls and boys under the age of 18 years participating in the research titled: "The effects of wearing orthodontic appliances on patients in Nairobi”, that will be carried out by Irusa Karina Fiona, a 3rd year Bachelor of Dental Surgery student at the University Of Nairobi,

This Informed Consent Form has two parts:

- Information Sheet (to share information about the study with you)

- Certificate of Consent (for signatures if you agree that your child may participate)
Part I: Information Sheet for parents/guardians of participants

I am Karina Irusa, a 3rd year dentistry student at The University Of Nairobi. I am doing some research which might help your dentists do more to help children and teenagers adapt better to their braces. In my research I will give questionnaires to many children teenagers, both girls and boys, and ask them a number of questions. Whenever researchers study children, we talk to the parents and ask them for their permission. After you have heard more about the study, and if you agree, then the next thing I will do is ask your daughter/son for their agreement as well. Both of you have to agree independently before I can begin.

The purpose of this research is to find out the different kinds of discomfort experienced by your children while wearing their braces. This includes pain, social embarrassment as well as difficulty during performing day to day activities. The information gotten from this research will help to find out what kind of negative effects of the braces would discourage your children from complying with treatment hence finding ways to motivate the children before and during treatment or alternatively find more concrete solutions which will eliminate all these ‘discomforts’

The information will be gotten through questionnaires.

I will be distributing the questionnaires to several children and teenagers who wear braces and I have chosen your child because he/she wears braces and lives in Nairobi.

You do not have to agree that your daughter/son participates. You can choose to say no and any services that you and your family receive at this centre will not change.

Your daughter/son will fill out a questionnaire which will be provided and collected by myself/ Dr. Muendo/Dr. Muruakithi

If your daughter/son does not wish to answer some of the questions included in the questionnaire, she/he may skip them and move on to the next question. The information
recorded is confidential. The questionnaires will be destroyed after 3 months. Any information about your child will have a number on it instead of his/her name

A questionnaire will be given to your child. This takes about 20 minutes.

We are asking your son/daughter to share with us some personal information, and he/she may feel uncomfortable talking about some of the topics. You must know that he/she does not have to answer any question or take part in the discussion/interview/survey if he/she doesn’t wish to do so, and that is also fine. He/she does not have to give us any reason for not responding to any question, or for refusing to take part in the interview"

Your daughter/son may choose to tell you about the interview and the questionnaire but she/he does not have to do this. We will not be sharing with you neither the questions we ask nor the responses given to us by your child.)

Your child's participation is likely to help us find out more about the effects of wearing braces on teenagers and children. We hope that these will help the local clinics and hospitals to meet those needs better in the future.

Your daughter/son will not be provided with any payment to take part in the research.

At the end of the study, we will be sharing what we have learnt with the participants and with the community

If you have any questions you may ask them now or later, even after the study has started. If you wish to ask questions later, you may contact me on 0720494617

This proposal has been reviewed and approved by Kenyatta National Hospital Ethics and Research Committee which is a committee whose task it is to make sure that research participants are protected from any harm.
PART II: Certificate of Consent for parents/guardians of participants

I have been asked to give consent for my daughter/son to participate in this research study which will involve her completing a questionnaire. I have read the foregoing information. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily for my child to participate as a participant in this study.

Name of Parent or Guardian __________________

Signature of Parent of Guardian___________________

Date ________________________
   ___ Day/month/year

Statement by the researcher/person taking consent

I have to the best of my ability made sure that the person understands that his/her child will be provided with a questionnaire on the effects associate with wearing braces.

I confirm that the parent was given an opportunity to ask questions about the study, and all the questions asked by him/her have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and the consent has been given freely and voluntarily.

Irusa Karina Fiona……………………………………On

………………………………………………
APPENDIX III: QUESTIONNAIRE FOR THE STUDY ON THE EFFECTS OF WEARING ORTHODONTIC APPLIANCES ON PATIENTS IN NAIROBI

THE EFFECTS OF WEARING BRACES QUESTIONNAIRE

Age..........................................................

Gender      Male...... female......

Type of braces

• Removable

• Fixed

1. How long have you worn the braces?

• Up to 7 days

• 1-4 weeks

• More than 1 month

• Other.................................

2. Who recommended wearing braces to you?

• Self

• A family member
A dentist

Other………………………….

3. Do the braces affect your chewing?

(a) Not at all

(b) A bit

(c) A lot

4. Do the braces affect how you speak?

(a) Not at all

(b) A bit

(c) A lot

5. Do the braces make it hard for you to brush your teeth?

(a) Not at all

(b) A bit

(c) A lot

6. Do the braces make it hard to floss your teeth?

(a) Not at all
7. Do you find it hard to relax with the braces on?

(a) Not at all

(b) A bit

(c) A lot

8. Do the braces disturb your sleeping?

(a) Not at all

(b) A bit

(c) A lot

If (b) or (c) what do you do to help you sleep better

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9. Has wearing braces affected your diet i.e. the kind of food you eat?
10. Is it uncomfortable to smile with the braces?

(a) Not at all

(b) A bit

(c) A lot

11. Do the braces affect your work or studying?

(a) Not at all

(b) A bit

(c) A lot

If (b) or (c), explain how

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........................................................................................................................................
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........................................................................................................................................
........................................................................................................................................
........................................................................................................................................
12. Do the braces make swallowing difficult?
   (a) Not at all
   (b) A bit
   (c) A lot

13. Do the braces make breathing difficult?
   (a) Not at all
   (b) A bit
   (c) A lot

14. Do you experience any pain, discomfort or tightness when wearing the braces?
   (a) Not at all
   (b) A bit
   (c) A lot

   If (b) or (c), when is the pain/discomfort/tightness worst?
   (a) All the time
   (b) During the first 24 hours after my braces are 'tightened'
   (c) During the first 7 days after my braces are tightened
15. Do you feel that the braces have changed your appearance?

(a) Not at all

(b) A bit

(c) A lot

Is this change positive or negative?

..............................................................................................................................................................
..............................................................................................................................................................
..............................................................................................................................................................
..............................................................................................................................................................
..............................................................................................................................................................

16. Are you embarrassed about the braces?

(a) Not at all

(b) A bit

(c) A lot

17. Do the braces make you self-conscious?

(a) Not at all

(b) A bit

(c) A lot
18. Has wearing braces made you less confident?

(a) Not at all

(b) A bit

(c) A lot

19. Has wearing braces affected your social life? (friendship)?

(a) Not at all

(b) A bit

(c) A lot

If (b) or (c) how?

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20. Has wearing braces affected your social life? (Dating)?

(a) Not at all

(b) A bit

(c) A lot