THE PATTERN OF CLASS I, CLASS II AND CLASS III MALOCCLUSION IN URBAN PRIMARY SCHOOL CHILDREN AGED 11 –14 YEARS

A COMMUNITY DENTISTRY RESEARCH PROPOSAL SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF BACHELOR OF DENTAL SURGERY DEGREE AT THE UNIVERSITY OF NAIROBI, 2006

Investigator: MUMENYA WAMBUGU SOIYANA
BACHELOR OF DENTAL SURGERY
LEVEL III

Internal Supervisor: Dr. MACIGO BDS, MPH,PGD-STI (Nbi)
Department of Periodontology, Community and Preventive Dentistry,
School of Dental Sciences,
University of Nairobi.

External supervisor: Prof. NG’ANGA, BDS (Nbi), MSc. (OSLO) PHD
Department of Pediatric Dentistry and Orthodontics,
School of Dental Sciences, University of Nairobi.

STUDY PERIOD: AUGUST – SEPTEMBER 2006

COST OF STUDY: KSH 6150

SOURCE OF FUNDS: SELF AND FAMILY
SCHOOL OF DENTAL SCIENCES
UNIVERSITY OF NAIROBI
TABLE OF CONTENTS

Table of contents  ii
List of Abbreviations  iii
Abstract  iv
1.0  INTRODUCTION AND LITERATURE REVIEW  1

1.1  PROBLEM STATEMENT  6
1.2  JUSTIFICATION OF THE STUDY
1.3  OBJECTIVES
1.4  RESEARCH HYPOTHESIS
1.5  VARIABLE
2.0  MATERIALS AND METHODS  7
2.1  STUDY AREA
2.2  STUDY POPULATION
2.3  STUDY DESIGN
2.4  SAMPLE SIZE
2.5  SAMPLING METHODS
2.6  INCLUSION CRITERIA
2.7  EXCLUSION CRITERIA  8
2.8  INSTRUMENTS AND TECHNIQUES  8
2.9  DATA ANALYSIS
2.10  ETHICAL CONSIDERATIONS
2.11  PERCEIVED BENEFITS  9
2.12  LOGISTICS
3.0  BUDGET  10
4.0  REFERENCES  12
5.0  APPENDICES  13
   EXAMINATION FORM  13
**LIST OF ABBREVIATIONS**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDS</td>
<td>Bachelor of Dental Sciences</td>
</tr>
<tr>
<td>MPH</td>
<td>Master of Public Health</td>
</tr>
<tr>
<td>MSc</td>
<td>Master of Science</td>
</tr>
<tr>
<td>PHD</td>
<td>Doctor of Philosophy</td>
</tr>
<tr>
<td>STI</td>
<td>Sexually Transmitted Disease</td>
</tr>
</tbody>
</table>
ABSTRACT

Background
In this country in the age group of 11-14 there is a noticeable crowding of teeth. There is therefore need to study the extent of this malocclusion. While malocclusion is a clinically unacceptable arrangement of the teeth in any plane of space or in which there are anomalies in the teeth position beyond the limit of normal occlusion. It is classified as follows according to Edward H. Angle:

- Class I malocclusion is the normal relationship of the molars but line of occlusion incorrect because of the malposed teeth, rotation or other causes.
- Class II malocclusion is the lower molar distally positioned relative to upper molar, line of occlusion not specified.
- Class III malocclusion is the lower molar mesially positioned relative to upper molar, line of occlusion not specified.

OBJECTIVES
To determine the pattern of malocclusion among 11–14 year old children who attend an urban primary school, Nairobi, Kenya
To determine the sex distribution of malocclusion

SUBJECTS AND METHODS
Oral examination of 11-14 years in a school using simple diagnostic tools, recording and analyzing the data.
The study will be done in the Karen C Primary School, a public urban school located in the outskirts of the City of Nairobi along Langata Road.
All school children 11-14 yrs of age who attend Karen C Primary School between classes 6 and 8. A convenient sampling method was used. All school children that met the inclusion criteria were included.
A total of 250 children will be included in the study over a period of 2 months.
Through this study the data maybe used as a future reference in determining the prevalence of malocclusion in Kenya and used for intervention to benefit children.
INTRODUCTION AND LITERATURE REVIEW

Occlusion refers to the alignment of teeth and the way that the upper and lower teeth fit together (bite) while malocclusion is a clinically unacceptable arrangement of the teeth in any plane of space or in which there are anomalies in the teeth position beyond the limit of normal occlusion. It is classified as follows according to Edward H. Angle.

Class I malocclusion is the normal relationship of the molars but the line of occlusion incorrect because of the malposed teeth, rotations or crowding. Crowding more commonly affects the lateral incisors, canines, second premolars and third molars.

Crowding of the teeth is a common feature of most mixed dentition and is often first manifested at the stage of eruption of the permanent incisors. Crowding of the permanent incisor teeth involves the lateral incisors more frequently than central incisors. The central incisors usually erupt first and occupy space, which should be available for the lateral incisors. The lateral incisors then have to erupt in a crowded position commonly rotated, instanding or protruded. Crowding of the dental arches occasionally affects first permanent molar eruption causing impaction of the first permanent molar against the distal surface of second deciduous molar.

Class II malocclusion is where the tooth bearing part of the lower jaw is posterior to that part of the upper jaw for the teeth of the lower dental arch to be in the distal occlusion with upper dental arch. It is divided into 2 divisions:
- Division 1 – There is bilateral distal occlusion, protruding upper incisors
  - Subdivision – unilaterally distal occlusion, protruding upper incisors
- Division 2 – There is distal occlusion, retruding upper incisors
  - Subdivision – unilateral distal occlusion, retruding upper incisors

Class III malocclusion is where the tooth bearing part of the lower jaw is anterior to that part of the upper jaw for the teeth of the lower dental arch to be in the mesial occlusion with the upper to the extent that the lower first permanent molar occludes mesially with upper first permanent molar by at least more than one half a cusp. It has a subdivision and subdivision:
- Division – bilaterally mesial occlusion
  - Subdivision - unilateral mesial occlusion

The practice of orthodontics probably began with Etruscan in the 8th to 4th century BC. In their practice wires were used for closing the space left by a tooth lost in life. Today it flourishes around the world witnessed by travelers to any large city.

Edward H. Angle, whose influence began to be felt about 1890, can be credited with much of the development of the concept of occlusion in the natural dentition. His increasing interest in dental occlusion and in the treatment necessary to obtain normal occlusion led directly to his development of orthodontics as a specialty with himself as the “Father of modern orthodontics”. Although Angle’s classification is limited in that it does not incorporate vertical and transverse abnormalities, it is a universally accepted system that is reliable and repeatable and that minimizes examiner subjectivity.
The incidence of malocclusion in white Americans was studied by the US Public Health Service in the third National Health and Nutrition Examination Survey (NHANES III) between 1988 and 1991. It was estimated that 52.2% of 8-to-50-year-old subjects had Class I occlusion, as determined by an ideal 1-to-2-mm overjet. This Class I occlusion figure includes individuals with incisor crowding and dental malalignment and thus does not imply ideal Class I occlusion. Class II malocclusion (mild to severe) was found in 42.4% of subjects and Class III malocclusion (mild to severe) was found in less than 5% of subjects.

It is not fully understood whether masticatory performance is compromised in individuals with the more common forms of malocclusion (i.e. Class I and Class II). The aim of R. Emrich et al prospective investigation was to establish the relationships between masticatory performance, malocclusion (type and severity), age, body size and gender, in children and adolescents. A total of 335 individuals were examined at the average ages of 6, 9, 12 and 15 years. Each subject's occlusal status was described by Angles classification and by the Peer Assessment Ratio (PAR) index. Masticatory performance was quantified by the median particle size (MPS) and the broadness of particle distribution using artificial food.

Masticatory performance improved significantly with age. The 6-year-old children were less able to break down the food particles (MPS 4.20 mm²) than the 15 year olds (MPS 3.24 mm²). Analysis of covariance showed that age differences in performance are related to an increase in body size. There were statistically significant differences in masticatory performance between children with normal occlusion and those with a Class I malocclusion; no differences were found between normal occlusion and Class II malocclusion. Gender differences did not explain the variation in masticatory performance.

The anteroposterior jaw relations of two samples of children were examined to determine the prevalence of normal occlusion and of Class I, Class II, and Class III malocclusion in an urban population (Evanston-Oak Park, Ill.). One consisted of 11,036 children from 6-8 years of age, the other of 14,951 children from 12-14. The samples were mixed whites and Negroes; 7,654 of the children had been examined at both ages, making age-change determinations possible. The data revealed that 69 per cent of the 6-8-year group had been classified as normal, while 54 per cent received this designation at 12-14 years. In the categories of the Angle classification, there were 19 per cent Class I malocclusions in the 6-8-year group, 30 per cent at 12-14; 11 per cent Class II at 6-8, compared to 14 per cent at 12-14; 1 per cent Class III at both ages.
The same children examined at both stages revealed that 27 per cent of those classified as normal at the first examination had developed Class I malocclusion at the second examination, while 43 per cent of those classified as Class I malocclusion at 6-8 years was pronounced normal at 12-14 years. The prevalence of Class I, Class II, and Class III malocclusion in the sample at 12-14 years was shown to be Class I, 30 per cent; Class II, 14 per cent; and Class III, 1 per cent.5

Tausche conducted a study to determine specific factors for treatment need in the early mixed dentition period in order to obtain basic data to support early intervention7. The study was part of a larger survey of 8768 children aged between 6 and 17 years. From this sample, 1975 children aged between 6 and 8 years were used to estimate the prevalence of malocclusions using the Index of Orthodontic Treatment Need (IOTN) during the early mixed dentition period. The results showed that deep overbite and overjet, both more than 3.5 mm, were the most frequent discrepancies, affecting 46.2 and 37.5 per cent of patients, respectively. An anterior open bite was registered in 17.7 per cent, crossbite in 8.2 per cent, and a reverse overjet in 3.2 per cent. A tooth width to arch length discrepancy was recorded in 12 per cent of teeth in the upper arch and in 14.3 per cent in the lower arch. The proportion of children estimated using the Dental Health Component of the IOTN to have a great or very great treatment need (grades 4 and 5) was 26.2 per cent. The higher values of treatment need during the mixed dentition period may account for temporary changes in the dentition and for the discrepancy in overjet and overbite. These discrepancies will be compensated in part during mandibular growth and development of the dental arch. Nevertheless, the findings indicate the early development of progressive malocclusion symptoms, which are evidenced in the IOTN and concurs with the acronym ‘MOCDO’ hierarchy (missing, overjet, crossbite, displacement, overbite). This early formation of progressive symptoms inhibiting or disturbing mandibular or maxillary growth or the development of the normal dental arch, i.e. crossbite, reverse overjet and increased overjet with myofunctional disorders, should be treated at an early stage.7

Studies from Lebanon showed that 40.3% of the Lebanese schoolchildren surveyed had normal occlusion8. When the findings were compared with similar studies in Britain, India, America, Sweden and Egypt8 it was found that the British had the highest percentage with normal occlusion (67.3%) followed by white Americans (51%) the Lebanese (40.3%), Indians (34.5%), Egyptians (34.3%) and Swedish (10%) The prevalence of class I malocclusion in the Lebanese sample was 35.5% and this was higher in females. The Swedish had the highest incidence of Class I malocclusion followed by the Indians, the Lebanese, the Egyptians, white Americans and then the British. Angle's Class II malocclusion was found in 19% of the total sample (16.9% division 1 and 2.2% division 2). The prevalence of Class II, division 1 in males was much higher than females. However, the prevalence in Class II, division 2 was higher in females.
When these findings were compared with other ethnic groups, Egyptians had the highest prevalence of class II malocclusion (21%), followed by Lebanese (19.1%), British (16.1%), white Americans (16%), Indians (9.6%) and Swedish (3%). Angle's class III malocclusion was found in only about 5% of the Lebanese sample studied. In descending order, the prevalence of class III malocclusion was highest in Egyptians (10.6%), followed by Scots (8%) white Americans (7%), Lebanese (5.1%), Swedish (4%), Indians (2.9%) and British (2.9%).

The survey found that 59.7% of the Lebanese children between 9 years and 15 years of age had a certain degree of malocclusion; 35.5% had local irregularities with a relatively normal jaw relationship, the remaining 24.2% had some jaw disharmony in addition to local irregularities.

Extensive cephalometric studies have been carried out to determine the heritability of certain craniofacial parameters in Class II division 1 malocclusions. These investigations have shown that, in the Class II malocclusion patient, the mandible is significantly more retruded than in Class I patients, with the body of the mandible smaller and overall mandibular length reduced. These studies also showed a higher correlation between the patient and his immediate family than data from random pairings of unrelated siblings, thus supporting the concept of polygenic inheritance for Class II division 1 malocclusions.

Environmental factors were also claimed to contribute to the etiology of Class II division 1 malocclusions. Soft tissues can exert an influence on the position or inclination of upper and lower incisors and the need to achieve lip/tongue contact for an anterior oral seal during swallowing can encourage the lower lip to retrocline the lower incisors and the protruding tongue to procline the uppers, influencing the severity of the overjet. Likewise, digit-sucking habits can produce a Class II division 1 incisal relationship, even if the underlying skeletal base relationship is Class I. Lip incompetence also encourages upper incisor proclination by virtue of the imbalance in labial and lingual pressures on the teeth.

A study done on the prevalence of malocclusion in 13-15 year old children in Nairobi, Kenya by Ng’ang’a et al., examined 919 children and found a prevalence of malocclusion of 72%. Traits of prevalence seen were 19% crowding, 9% rotation, 0% posterior crossbite, 10% maxillary overjet and frontal openbite of 8%. While V. Ayuko (1983) study had a prevalence of malocclusion among secondary school children as 60% with 55% having Angles class I molar relationship, 19% with class II and 26% with class III.
MANAGEMENT OF MALOCCLUSION

CLASS I MALOCCLUSION

Maxillary – mandibular dental protrusion teeth – May require removal of teeth for correction.  

Maxillary – mandibular dental retraction teeth – May be treated with expansion rather than removing teeth.  

CLASS II MALOCCLUSION

Correct retrognathic mandible and profile, and normalize Class II dental malocclusion with combination of comprehensive orthodontic treatment and orthognathic surgery.  

CLASS III MALOCCLUSION

The objective of early orthodontic treatment is to create an environment in which a more favorable dentofacial development can occur. The goals of early Class III treatment may include the following:

1. To prevent progressive irreversible soft tissue or bony changes. Class III malocclusion is often accompanied with an anterior crossbite. Uncorrected anterior cross-bite may lead to abnormal wear of the lower incisors, dental compensation of mandibular incisors, leading to thinning of the labial alveolar plate and/or gingival recession.
2. To improve skeletal discrepancies and provide a more favorable environment for future growth. Excessive mandibular growth is often accompanied by dental compensation of the mandibular incisors. Early orthopedic treatment using facemask or chin cup therapy improves the skeletal relationships, which in turn minimize excessive dental compensation such as over closure of the mandible and retroclination of the mandibular incisors.
3. To improve occlusal function. Class III malocclusion with an anterior crossbite is often accompanied by a functional shift. Early orthopedic treatment may help in eliminating centric occlusion/centric relation (CO/CR) discrepancies and avoid adverse growth potential.
4. To simplify phase II comprehensive treatment. In mild and moderate Class III patients, early orthodontic or orthopedic treatment may eliminate the necessity for orthognathic surgery treatment. Even if surgery is eventually needed, early correction of the transverse dimension and maximizing the growth potential of the maxilla may minimize the extent of the surgical procedures.
5. To provide more pleasing facial esthetics, thus improving the psychosocial development of a child. Studies have shown that treatment with facemask and/or chin cap improves lip posture and facial appearance. 

The main aim of this study is to investigate pattern of malocclusion in urban school children in an attempt to define target population for orthodontic services in the future which may help health planners. The data available in urban areas is not sufficient and needs to be updated.
PROBLEM STATEMENT
Crowding and malalignment of teeth is common in the community but skeletal remains suggest that all members might tend towards a class III or less commonly class II. In Kenya there has been increased demand for dental and facial esthetics due to western influence and the media. Recent data on patterns of Class I, Class II, and Class III malocclusion in Kenya is very scarce. Planning intervention malocclusion requires a clear understanding of the pattern of malocclusion in our community.

JUSTIFICATION OF THE STUDY
Untreated malocclusion may lead to mandibular dysfunction and severe psychological problems to the child in the future. In recent years there has been increase in number of young and adult patients seeking orthodontic treatment in dental school, private and public dental centers. As a result of increased epidemiological research projects being taken in different areas one can determine the magnitude of the problem. This study will help provide oral health planners in Kenya with data on prevalence of among malocclusion urban school children in an attempt to define target population for orthodontic services in the future. The study will also be used in partial fulfillment of BDS degree.

OBJECTIVES
Main Objective:
1. To determine the pattern of malocclusion among 11–14 year old children who attend an urban primary school, Nairobi, Kenya.

Specific objective
1. To determine the prevalence of Class I, Class II and Class III malocclusion in school children aged 11-14 in an Urban Primary School.
2. To determine the sex distribution malocclusion in school children aged 11–14 in an Urban Primary School.
3. To determine the pattern of overbite and overjet in school children aged 11-14 in an Urban Primary School.
4. To determine the pattern of crowding in school children aged 11-14 in an Urban Primary School.

HYPOTHESIS:
Prevalence of malocclusion among 11–14 yr old school children is 55%.

VARIABLES:
1. Age
2. Sex
3. Class I malocclusion
4. Class II malocclusion division 1
5. Class II malocclusion division 2
6. Class III malocclusion
7. Overjet
8. Overbite
9. Crowding
MATERIALS AND METHODS

STUDY AREA:
The study will be carried out in the Karen C Primary School located 6 km from the Nairobi city centre. It is located along Langata Road and has a population of 800 students.

STUDY POPULATION:
All children 11 – 14 yrs of age who attend Karen C Primary School. These age group will be expected in class 6 to 8.

STUDY DESIGN
This will be a descriptive cross – sectional study using school based study groups.

SAMPLE SIZE
The sample size was calculated using an estimated prevalence of malocclusion of 55% and with a confidence level of 95%. The formula used was:-

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

\( C = 100 \) - Confidence Level = 100 - 95 = 5
\( Z \) – Value = 1.96
\( P \) – Prevalence of malocclusion = 55%
\( N \): Sample size

\[
N = \frac{1.96^2 \times 0.55 (1-0.6)}{0.0025} \\
= \frac{3.84 \times 0.55 (0.4)}{0.0025} \\
= \frac{3.84 \times 0.22}{0.0025} \\
= 337.9 \\
= 338
\]

SAMPLING METHOD:
All the children who will be 11-14 years old will be examined. The age group 11 – 14 years are usually expected to be in class 6 – 8. There are 120 children in class 8, 110 children in class 7 and 130 children in class 6. The total number of children is 360.

INCLUSION CRITERIA:
1. All children between 11 – 14 years in Karen C Primary School.
2. Where consent was obtained from parents and school administrators of the child.
EXCLUSION CRITERIA:
1. Parents who do not consent to the study.
2. Children outside the specified age bracket.

DATA COLLECTION, INSTRUMENTS AND TECHNIQUES
At least 338 school children will be examined under natural light indoors by the investigator using mouth mirrors and graduated periodontal probes with results recorded in an examination form (Appendix 1).

Variables to be examined will include Class I malocclusion which is based on Angle’s first molar relationship with teeth in occlusion such that the mesiobuccal cusp of the upper 1st permanent molar occludes with the mesiobuccal groove of the lower 1st permanent molar. It may be associated with crowding of the upper jaw, lower jaw and both jaws. It is recorded as tick or blank.

Class II malocclusion occurs when lower dental arch is more posterior, Division 1 occurs with protruding incisors and Division 2 occurs with retracting upper incisors. This is recorded as tick or blank.

Class III malocclusion occurs when the lower dental arch is more anterior to the upper dental arch than in class I malocclusion.

Overjet is the horizontal overlap of the lower by the upper incisors. It will be recorded as greater than (> 3mm, using a graduated periodontal probe.

Overbite is the increased vertical overlap of the lower incisors by the upper incisors overlap. It will be recorded as greater than (> 30%.

The facial profile is the view of the face from the upright position when viewed from the lateral position. It will be recorded as convex, concave or straight profile.

MINIMIZING ERRORS
The examiners will be trained and calibrated on various forms of malocclusion to minimize errors.

DATA ANALYSIS
The results obtained will be analyzed using a computer package; statistical package for social sciences with assistance from a statistician. The measures to be computed include percentage, means, standard deviations, ranges and proportions.

The data will then be presented in form of tables, bar graph and pie chart.

ETHICAL CONSIDERATIONS
Authority to conduct the study will be obtained from the Kenyatta National Hospital / University of Nairobi Ethics and Standards Committee. A letter of consent by the director of City Council Primary schools will be obtained. The purpose of the study will be explained to each child and school administration, a parents note for consent will be obtained and examination will be a voluntary process. The children will be at liberty at any stage to refuse to be part of the study. All the information gathered during the course of the study will be treated with utmost confidentiality. Parents whose children require intervention will be informed.
PERCEIVED BENEFITS
The results maybe used as a future reference in determining the prevalence of malocclusion in Kenya and may help in planning of intervention by city health authorities. Publishing the results for personal advancement.
The results will be submitted in partial fulfillment of the Bachelor of Dental Surgery degree course in the University of Nairobi.

LOGISTICS
1. Lack of adequate time to carry out research thoroughly due a busy academic year.
2. Lack of adequate finances.
### BUDGET

**Proposal Development Phase**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNITS</th>
<th>UNIT COST</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ball Pens</td>
<td>10</td>
<td>Kshs. 13</td>
<td>130</td>
</tr>
<tr>
<td>2. Ream of Foolscaps</td>
<td>2</td>
<td>300</td>
<td>600</td>
</tr>
<tr>
<td>3. Internet Charges</td>
<td>3hrs</td>
<td>Kshs. 2.00/min</td>
<td>400</td>
</tr>
<tr>
<td>3. Photocopying</td>
<td>150</td>
<td>Kshs. 2.00</td>
<td>300</td>
</tr>
<tr>
<td>4. Typing and Printing</td>
<td>100</td>
<td>Kshs. 10 per page</td>
<td>1000</td>
</tr>
<tr>
<td>6. Miscellaneous expenses</td>
<td></td>
<td></td>
<td>200</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>2,630</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Data collection phase**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>UNITS</th>
<th>UNIT COST</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pens</td>
<td>10</td>
<td>Kshs. 13</td>
<td>130</td>
</tr>
<tr>
<td>2. Ream of Foolscaps</td>
<td>1</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>3. Photocopying</td>
<td>450</td>
<td>Kshs. 2.00</td>
<td>900</td>
</tr>
<tr>
<td>4. Typing and Printing</td>
<td>100</td>
<td>Kshs. 5 per page</td>
<td>500</td>
</tr>
<tr>
<td>5. Latex examination gloves</td>
<td>3</td>
<td>Kshs. 200 per box</td>
<td>600</td>
</tr>
<tr>
<td>6. Mouth mirrors and periodontal probes</td>
<td>To be supplied by dental school of dental sciences on borrowing basis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Tongue spatulas</td>
<td>3</td>
<td>Kshs. 150 per box</td>
<td>450</td>
</tr>
<tr>
<td>8. Miscellaneous expenses</td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td>9. Transport</td>
<td></td>
<td></td>
<td>500</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td><strong>3,680</strong></td>
<td></td>
</tr>
<tr>
<td>ITEM</td>
<td>UNITS</td>
<td>UNIT COST</td>
<td>TOTAL</td>
</tr>
<tr>
<td>---------------------------</td>
<td>-------</td>
<td>-------------</td>
<td>-------</td>
</tr>
<tr>
<td>1. Pens</td>
<td>5</td>
<td>Kshs. 13</td>
<td>65</td>
</tr>
<tr>
<td>2. Typing and Printing</td>
<td>40</td>
<td>Kshs. 5 per page</td>
<td>200</td>
</tr>
<tr>
<td>3. Ream of Foolscaps</td>
<td>1</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>4. Binding of Reports</td>
<td>3</td>
<td>50</td>
<td>150</td>
</tr>
<tr>
<td><strong>Subtotal</strong></td>
<td></td>
<td></td>
<td><strong>615</strong></td>
</tr>
<tr>
<td><strong>Grand Total</strong></td>
<td></td>
<td></td>
<td><strong>6895</strong></td>
</tr>
</tbody>
</table>
REFERENCES


7. Eve Tausche, Olaf Luck and Winfried Harzer *Prevalence of malocclusions in the early mixed dentition and orthodontic treatment need* The European journal of orthodontics 2004 ,26 (3) 237 - 241


THE PATTERN OF CLASS I, CLASS II, CLASS III, MALOCCLUSION IN URBAN PRIMARY SCHOOL CHILDREN AGED 11-14 YEARS

APPENDIX 1:

CLINICAL EXAMINATION FORM

Registration No. ___________________ Examiner _______________ Date _______________

NAME: __________________________ AGE(YRS): ___ SEX: ___

NAME OF SCHOOL ________________________________

1. Ever had orthodontic treatment  YES ☐ NO ☐

   If yes what type
   REMOVABLE APPLIANCE ☐
   FIXED APPLIANCE ☐

   Teeth removed for orthodontic treatment ☐

   OTHERS specify ________________________________

2. Profile analysis

   CONVEX ☐ CONCAVE ☐
   STRAIGHT: ☐

EXTRA ORAL EXAMINATION

3. Lip posture

   LIPS COMPETENT ☐
   LIPS INCOMPETENT ☐

   Other observation specify ________________________________
INTRA – ORAL EXAMINATION

4. Diagnosis of type of malocclusion

CLASS I MALOCCLUSION
CLASS II MALOCCLUSION
DIVISION 1
DIVISION 2
CLASS III MALOCCLUSION

6. OVERJET > 3\,mm
   YES ☐  NO ☐

7. OVERBITE > 30%
   YES ☐  NO ☐

8. CROWDING UPPER JAW
   YES ☐  NO ☐

If yes segment / teeth involved

   LABIAL ☐
   BUCCAL ☐

9. CROWDING OF LOWER JAW
   YES ☐  NO ☐

If yes segment / teeth involved

   LABIAL ☐
   BUCCAL ☐

10. CROWDING OF BOTH JAWS
    YES ☐  NO ☐