PREVALENCE OF MALOCCLUSION IN JIMMA SAINT PETER AND PAUL CATHOLIC KINDERGARTEN TO SECONDARY SCHOOL AMONG GRADE 5 TO 8 STUDENTS IN JIMMA TOWN, SOUTH WESTERN ETHIOPIA

BY:-

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A RESEARCH PAPER TO BE SUBMITTED TO THE DEPARTMENT OF DENTISTRY, COLLEGE OF PUBLIC HEALTH AND MEDICAL SCIENCES AND STUDENTS RESEARCH PROGRAM JIMMA UNIVERSITY IN PARTIAL FULFILLMENT FOR THE REQUIREMENTS OF DEGREE OF DOCTOR OF DENTAL MEDICINE

JUN, 2013

JIMMA, ETHIOPIA

JIMMA UNIVERSITY COLLAGE OF PUBLIC HEALTH AND MEDICAL SCIENCE DEPARTMENT OF DENTISTRY

PREVALENCE OF MALOCCLUSION IN JIMMA STS PETER AND PAUL CATHOLIC KG TO SECONDARY SCHOOL AMONG GRADE 5 TO 8 STUDENTS IN JIMMA TOWN, SOUTH WESTERN ETHIOPIA

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JUN, 2013

JLMMA, ETHIOPIA

ACKNOWLEDGEMENT

First of all I would like to give my heart full thanks to my advisor Dr. Surafel Adula (DMD), for giving me his constructive ideas and thought and also valuable comments throughout my paper development.

My acknowledgements also goes to all staffs of health science library of Jimma University and Sts Peter and Paul Catholic school staffs, that helped me in accessing all the necessary documents and information by dedicating their golden time.

ABSTRACT

BACKGROUND: Malocclusion is a problem of all age group and mostly it causes psychological stress and social discrimination in young people. It is caused by a lot of etiological factors that are classified in different way. From this generally, congenital and environmental factors of classification was now a day accepted. The prevalence of this problem varies from population to population regardless of race, ethnicity and culture. If left untreated, may leads to impairment in the quality of life, psychological stress and esthetical problem in young children.

OBJECTIVE: To assess prevalence of malocclusion in Jimma Sts Peter and Paul Catholic School children among grade 5 to 8 students.

METHODS: A cross-sectional study was conducted from April 22 up to April 26, 2013 with a systematic random sampling technique. The sample was selected from a total of 305 students. The data was collected using interview guide structured questioners and from clinical examination. The obtained data was coded, compiled and analyzed by manual and scientific (calculator and computer) ways.

RESULT AND DISCUSSION: The clinical examination was carried out by two dental interns in children's class room. The data on Angles classification was analyzed manually and by SPSS. Fast Angle classification revealed 55.05% had normal occlusion, class I malocclusion was observed in 53.06%, class II 38.78%, class II div 1 73.68%, class II div 2 26.32% and class III 8.16% of children.

Anterior cross bite was observed in 18.37% of the subjects, posterior cross bite in 2.04%, anterior and posterior cross bite in simultaneously in 4.08%. Teeth crowding was observed in 61.22% and open bite in 14.29%.

CONCLUSSION: Class I malocclusion was the most prevalent but class III malocclusion was the least prevalent. The presence of malocclusion was higher than normal occlusion among examined individuals with bad oral habits.

RECOMMENDATION: Jimma Sts Peter and Paul Catholic School staffs should teach about oral health in mass media of school program.

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LIST OF ABBREVIATIONS

- **KG -** Kindergarten
- **Sts -** Stains
- **JUSH –** Jimma University Specialized Hospital

CHAPTER ONE

1 INTRODUCTION

1.1 BACKGROUND

Malocclusion is misalignment of one's teeth or between upper dental arch and lower dental arch is incorrect. First modern orthodontist was Edward L. Angle who defined malocclusion as not normal occlusion of teeth (1).

Today malocclusion occurs in majority of the population. It is neither a normal nor unhealthy condition. It is an appreciable deviation from the ideal occlusion that may be considered esthetically unsatisfactory thus implying a condition of imbalance in the relative size and position of teeth, facial bones, and soft tissue (lip, cheek, and tongue). It is important not to equate the possession of malocclusion with the need for treatment instead it should be judged according to dental health, esthetic or functional criteria namely, chewing, speech, breathing and swallowing (2).

Malocclusion represents a relevant public health problem because of their high prevalence and the resulting esthetic and functional impairments, leading to a negative impact on the quality of life and high treatment cost for patient. In majority of people today, malocclusion may be considered as a dental variant. The impact of which is primarily on the social and psychological well being rather than susceptibility to dental diseases and loss of function. In recent year's orthodontic treatment shifted to enhancement of social and psychological well beings through improvements in appearance (3).

There was a lot of difficulty to classify types of malocclusion in the past before professionals argued by Angles classification of malocclusion which was based on first molar relation of the arches. And also before classification of types of malocclusion knowledge about etiological factor must be required. According a book of orthodontics, by profit WR, contemporary orthodontics, classified as genetic, congenital and environmental factors (4).

Currently, malocclusions are third in the ranking of priorities among the problem of dental public health worldwide, surpassed only by dental caries and periodontal diseases. However with the reduction of caries in children and adolescents in the recent decades this condition has received more attention (5).

The high prevalence of malocclusion impels that public health effort are required, as such condition affect negatively the individuals quality of life, particularly in the case of children and adolescents who are sensitive about their appearance (8).

1.2 STATEMENT OF THE PROBLEM

Well aligned teeth not only contribute to the health of the oral cavity and stomatognatic system, but also influence the personality of individuals. Malocclusion compromises the health of oral tissue and also can lead to psychological and social problem. In most people with malocclusion, it is personal dissatisfaction, history of teasing and psychological stress which leads to loss of quality of life. An attractive smile, enhance self confidence which can make positive difference at school, at work and in community (2).

Malocclusion by itself has been caused by a lot of factors with also influence of contributing factors that account their beginning from way of delivery of child to completion of overall growth and development of human being. For example, force full forceps delivery, cleft lip and palate, dietary problem etc and there is genetic inheritance that made the problem complex (3).

Among a lot of factors, bad oral habit is one of the most common causes of malocclusion. But effect of habit is based on duration and frequency. A typical clinical feature of persistent finger biting habit includes a certain open bite as well as an increased over jet, that are the result of the labial inclination of upper incisors (6).

Beyond etiological factors, there are other contributing factors for occurrence of malocclusion. For this lack of awareness about the problem and lack of health seeking behavior of community will raise the prevalence. The severity or impact of the problem didn't felt understood by most individuals until they begin to worry about their esthetic and the psychological stress they face due to social impact (7).

Malocclusion is definitely more prevalent than normal occlusion in all population regardless of the stage of occlusal development. The predominance of malocclusion is explained by its multi factorial etiology, genetic factors and several environmental factors that, contribute to the occurrence of the different types of malocclusion (9).

This proposed research proposal will determine the prevalence of malocclusion in Jimma Sts Peter and Paul Catholic School and to address the major etiological factors that cause the problem and other contributing factors.

CHAPTER TWO

2.1 LITERATURE REVIEW

The need for information regarding the prevalence of malocclusion in males and females and in different age and ethnic group has provided many studies in this respect.

A study in Norway on 2349 children aged 7-8 years old reported the prevalence of malocclusion as follows; Normal occlusion 41.3%, class I 30%, class II 21.3%, and class III 7.3% (3).

A study in Denmark on 1700 children and adolescent aged 9-18 years old reported the prevalence of malocclusion as follows; normal occlusion 14%, class I 50% class II 24% and class III 4% (10).

According to Newman, Franled TM, to avoid the effect of malocclusion preventive orthodontics and creating awareness for the community about early health seeking behavior was effective, due to most orthodontic treatment needs high cost. While the orthodontic services are on a rise today, the demand is far greater than the supply. This presented complex problem in the distribution of public resources (11).

A study in United State on children aged 6.5-12.5 years old, found the prevalence of malocclusion as follows; normal occlusion 16.6% class I 60.1% class II 22.8% and class III 1% (14).

A study done in Bangalore, India among school children aged 8-12 years found that, about 71% of the subject had malocclusion. Class I malocclusion constituted the major proportion of malocclusion which was found in 62% of the studied population. Crowding incisors was found to be the most common findings in subjects with class I malocclusion (16).

A study in Brazilian among 4-6 years old children result demonstrate the presence of malocclusion in 75.8%. Oral habits were related by 34.8%, open bite was most present malocclusion among studied population and bad oral habits was decisive etiological factors (20).

Another study in Brazil on prevalence of malocclusion in children aged 7-12 years showed that, among the types of malocclusion, 55.25% of the children had class I molar relationship, 38% class II and 6.75% class III. The analysis of incisor relationship revealed 17.6% of open bite, followed by 13.28% of deep bite and 5.05% of anterior cross bite, 13.3% of children had a posterior cross bite. The analysis of relationship between arches found that 31.88% of the children had diastema, 31.59% crowding, and 4.65% tooth loss (9).

According to a study done in Luthinia on 1681 school children aged 7-15 years old, the prevalence of malocclusion among these school children is 84.6%. The most common malocclusion was dental crowding. The upper dental arch crowding was registered for 44.1% and lower for 40.3% of all school children. The class I molar relation was detected in 68.4% of subjects, class II in 27.7% and class III in 2.8% (22).

In study on 851 school children aged 9-15 years in Lebanese, the result shows that, 59.5% of the sample had malocclusion. 35.5% of which were of dental origin and 24% had skeletal discrepancies (19% class II and 5% class III malocclusion) (23).

A number of studies indicated on increased incidence of malocclusion in individuals with persistent sucking habits when compared with children with no history of habits. According to Bousden, the proportion of rising skeletal class II was higher among digit suckers (40%) than non suckers (29%). In addition, there was a significant increase in the incidence (62%) of skeletal class II relationship in children were digit sucking persisted until eight years of age (25).

A study on 919 Kenyan teenagers aged 13-15 years old reported that prevalence of malocclusion was as high as 72%. In this study crowding, increased over jet and open bite were found 19%, 10% and 8% respectively (24).

An epidemiological study with 493 Nigerian children of different socio-economical group emphasized the need for treating closed tooth (18.9) carious session (14.8) oral habit (7.3) cross bite (10.3) late primary tooth loss (6.9) and carious primary tooth loss (4.3) (18).

In Ethiopia, research was not done in the past on prevalence of malocclusion.

2.2 SIGNIFICANCE OF THE STUDY

Even though malocclusion is widely distributed in our country Ethiopia, only a little scientific attention has been given for this problem. Therefore this submitted paper was aimed for providing an epidemological data about the magnitude and severity of the problem in the area where this research was intended to undertaken. It also can be used as a base line data for future studies on the impact of malocclusion. Since there is no research under taken in the area before.

CHAPTER THREE

3. OBJECTIVE

3.1 GENERAL OBJECTIVE

To assess the prevalence of malocclusion in Jimma Sts Peter and Paul Catholic KG to Secondary School among grade 5 to 8 students in Jimma Town.

3.2 SPECIFIC OBJECTIVES

- To determine normal occlusion and malocclusion among grade 5 to 8 students by gender.
- To determine the association of age and educational level with malocclusion in Jimma Sts Peter and Paul Catholic School among grade 5 to 8 students.
- To determine the association of bad oral habits with malocclusion in Jimma Sts Peter and Paul Catholic School among grade 5 to 8 students.

CHAPTER FOUR

4. Methodology

4.1 Study area and Study period

This study was conducted in Jimma Sts Peter and Paul Catholic KG to secondary School which was 365km from Addis Ababa. This area has a climate of woinadega.

This study was conducted from April 22 up to April 26, 2013

4.2 Study design

Across sectional study was conducted in Jimma Sts Peter and Paul Catholic KG to Secondary School children among grade 5 to 8 students in Jimma Town, Oromia regional state.

4.3 Population

4.3.1 Source population

All students of Jimma Sts Peter and Paul Catholic KG to Secondary School attending their education in 2013.

4.3.2 Study population

A total of 305 students from Jimma Sts Peter and Paul Catholic School from grade 5 to 8 were taken. Among this 138 are males and 167 are females.

4.4 Sampling technique

Students from grade 5 to 8 were included in sample size which was selected by systematic random sampling technique according to their role numbers.

Sample size and sample technique

Sample size

$$n = \frac{NZ^2pq}{d^2(N-1) + z^2pq}$$

Where Z = 1.96 precise at 95%

N = Total number of students

p = prevalence rate of malocclusion (50%)

n = sample size

q = 1-p

d = marginal error

$$n = \frac{305(1.96) \times 90.5)\ (0.5)}{(0.05)(305-1) + (1.96)\ (0.5)\ (0.5)}$$

$$= \frac{305(1.96) \times (0.5)}{0.17 + 0.96}$$

= 170.26 = 170

But, N < 10,000 so it should be modified

$$Nf. = \frac{n}{1 + \frac{n}{N}} = \frac{170}{1 + \frac{170}{305}}$$

= 109.18 = 109

K = N / n = 305/109 = 2.8

4.5 Variables

Independent	Dependent
Age	Degree of prevalence of Malocclusion like
Sex	Class I, II, III
	Open bite
Level of education	over jet
	Cross bite
	Crowding

4.6 Data collection and analysis

Data was collected by recording the required information on the prepared questioners regarding their socio-demographic characteristics, oral hygiene and bad oral habits of the subject and using dental examination instruments such as spatulas examination gloves and other.

For this data collection process two dental interns were involved. Finally the collected data was analyzed by using computer and was tested statistically to assess the significance of association.

4.7 Data collection method and instruments

Pen	Wooden spatula
Pencil	Gloves
Paper	Questioners
Mirror	

4.8 Ethical consideration

Before data collection process an official letter was written from Jimma University student's research project to Jimma Sts Peter and Paul Catholic School for permission. Moreover, verbal consent was obtained from the students before the interview.

The significance of the study was clearly informed to the respondents and the sample was collected from only those who were voluntary. The individual was questioned politely during examination. The confidentiality of information was insured for the respondent.

4.9 Data quality assurance

Data was checked for completeness and consistency on data collection format before the actual study. For this pre-test was done on around 10 attendances. Those collected data with incomplete information was not included in the analysis.

4.10 Operational definition

Malocclusion: an improper relationship between teeth in opposite jaw and/ or mal-alignment of teeth in the same arch.

Open bite: results when the upper and lower incisor teeth do not touch when biting down.

Cross bite: when the upper teeth bite inside the lower teeth (toward the tongue).

Normal occlusion: involves occlusal contact alignment of teeth and should include not only arrangement of anatomically acceptable values but also physiological adaptablity.

Class I: the mandibular dental arch is in normal mesio-distal relation to maxillary arch with mesiobuccaal cusp of maxillary first molar occluding in the buccal groove of mandibular first molar.

Class II: mandibular dental arch is posterior to maxillary dental arch in one or both dental arch as determined by relationship of permanent first molar.

Div-1 bilateral distal retrusion with narrow maxillary arch and protruding maxillary incisor, increased over jet

Div-2 bilateral distal retrusion with normal or square shaped maxillary arch, retruded maxillary central, an excessive over bite

Class III: mandibular dental arch is anterior to maxillary dental arch on one or both dental segment as determined by relationship of permanent first molar.

CHAPTER FIVE

RESULT

The mean age of the population was 14 years old and the sex ratio (M/F) was 0.88. Oromo was the dominant ethnic population (54) 49.54% and Orthodox accounted (47) 43.12% of the total sample population.

Table-1 Frequency distribution of respondent by their socio demographic variable, among grade 5 to 8 students of Sts Peter And Paul Catholic School, Jima town, April 2013

Characteristics		No	%
Age (years)	10-12	14	12.84
	12-14	30	27.52
	14-16	38	34.86
	>16	27	24.77
	Total	109	99.99
Sex	Female	58	53.21
	Male	51	46.79
	Total	109	100
Ethnicity	Oromo	54	49.54
	Amhara	38	34.86
	Tigre	5	4.59
	Other	12	11.01
	Total	109	100
Religion	Orthodox	47	43.12
	Protestant	31	28.44
	Muslim	18	16.51
	Other	13	11.93
	Total	109	100

In assessment of the occlusion status of study population class I malocclusion was the dominant 26(53.06%) of which the majority were males 17(65.38%) and class III malocclusion was the least 4(8.16%). Beyond this, normal occlusion was account for 60(55.04%) of study population.

Table - 2 Distribution of normal occlusion and malocclusion by gender in Jimma Sts Peter and Paul Catholic School among grade 5 to 8 students, Jimma April 2013.

Occlusion classification	Male		Female		Total
	No	%	No	%	
Normal occlusion	23	38.33	37	61.67	60(55.04)
Class I	17	65.38	9	34.62	26(53.06)
Class II					
Class II div-1	6	42.86	8	57.14	14(73.68)
Class II div-2	3	60	2	40	5(26.32)
Class III	2	50	2	50	4(8.16)

Association of malocclusion with age, sex and educational level was assessed and it was statistically insignificant (P >0.005).

Table – 3 Distribution of occlusion malocclusion by their Age, Sex and Educational level in Jimma Sts Peter and Paul Catholic School among grade 5 to 8 students, Jimma April 2013

		No of observation	Without malocclusion	With malocclusion	
Age group	10-12	14	9(64.29)	5(35.71)	
	12-14	30	16(53.33)	14(46.66)	$X^2 = 0.63$
	14-16	38	21(55.26)	17(44.74)	df = 3
	>16	27	14(51.85)	13(48.15)	P = 0.889
Sex	Male	51	23(45.29)	28(54.91)	$X^2 = 3.86$
	Female	58	37(63.79)	21(36.23)	df = 1
					P = 0.05
Grade	5^{th}	22	14	8	
	6^{th}	28	16	12	$X^2 = 1.27$
	7^{th}	32	17	15	df = 3
	8^{th}	27	13	14	P = 0.736

In determining other types of malocclusion, tooth crowding was dominant and which was more common in male 16(57.14). Anterior and posterior cross bite was the least common 2 (4.08%).

Table – 4 Distribution of other types of malocclusion in Jimma Sts Peter and Paul Catholic School among grade 5 to 8 students, Jimma, April 2013

Type	Males	Females	Total
Anterior cross bite	5 (17.86)	4 (19.050	9 (18.37)
Posterior cross bite	1 (3.57)	0	1 (2.04)
Anterior and posterior cross bite	1 (3.57)	1 (4.76)	2 (4.08)
Tooth crowding	16 (57.14)	14 (66.67)	30 (61.22)
Open bite	5 (17.86)	2 (9.52)	7 (14.29)

Among sample population 31(28.44%) were present with bad oral habit, among this male accounts the majority which was 19(61.29%). From total population with presence of bad oral habits 14 (45.56) were present with malocclusion.

Association of malocclusion with presence of bad oral habit was assessed and it was statistically significant.

Table – 5 Distribution of bad oral habit with sex in Sts Peter and Paul Catholic School among grade 5 to 8 students Jimma, April 2013

Sex	Bad oral habit	
	Yes	No
Male	19	32
Female	12	46
Total	31(28.44)	78(71.56)

Table – 6 Distribution of type of bad oral habit with occlusion classification in Sts Peter and Paul Catholic School among grade 5 to 8 students, Jimma, April 2013

Type of bad oral habit	Number	With malocclusion	Without malocclusion
Finger bite	12(38.71)	6(42.86)	6(35.26)
Tongue trust	8(25.81)	3(21.43)	5(29.41)
Lip biting	6(19.35)	3(21.43)	3(17.65)
Nail biting	5(16.31)	2(14.28)	3(17.65)
Total	31	14(45.16)	17(54.86)

CHAPTER SIX

DISCUSSION

The purpose of this study was to provide the oral health care planners in Ethiopia particularly in Jimma with adequate information about the prevalence of malocclusion and to give epidemiological data of better candidates for orthodontic treatment. Second, studying occlusion in young permanent teeth has advantage to give interceptive or preventive measures before growth completion. The methodology used was clinical examination based on Angle classification of malocclusion using the first permanent molar as reference point.

The rate of normal occlusion observed in the present study 60(55.05%) differed from another study reported in United States on children aged 6.5 – 12.5 years which was 16.6%. This may be due to genetic factor. However, the normal occlusion scores in Denmark children's and adolescent aged 9 – 18 years old was 14%, in Brazilian among 4 – 6 years old children result demonstrate that 24.2% of children had normal occlusion. In Africa American children it has been reported that 17.6% of children had normal occlusion while another study found a prevalence of 16.6% in white American children aged 6 – 8 years old (3 21). The result was differing in different countries. This may be due to environmental and genetic factors that modify all occlusal development.

In present study, class I malocclusion was found in 53.06% but there were no study done in our country to relate or compare the present finding. One study in Brazilian school children show that early tooth loss interferes with malocclusion classification. Tooth migration also changes the occlusion characteristics of the subject (23).

The prevalence of class I malocclusion in Jimma Sts Peter and Paul Catholic school children was 53.06%. The study which was done in USA on 6328 teenagers and children aged 6 – 8 year had highest which was 60.1% of class I followed by India 53%, Denmark 50% and Norway 30.1% (3). This discrepancy may be due to environmental and genetic factors.

Angles class II malocclusion was found in 38.78% (div–1 73.68% and div–2 26.32%). The prevalence of class II division 1 in males was higher than females and also in division 2. However, when compared with other countries like United States 24.4%, Denmark 24%, Norway 21.3%, the finding was higher (3). This may be due to local factors such as tooth migration, early tooth loss, habits and supernumerary tooth.

Angles class III malocclusion was found in about 8.16% of Jimma Sts Peter and Paul school children. Sample studied in ascending order, the prevalence of class III malocclusion in United States 1%, Denmark 4%, Norway 7.3%, and Turkish 12% (3 21). The occurrence of class III may be due to congenital defect, infection or trauma.

Other occlusal problems found were, anterior cross bite (18.37%), open bite (14.29%), posterior cross bite (2.04%), anterior and posterior cross bite (4.08%) and tooth crowding (61.22%). When this finding were compared with other countries, Nigerians most prevalent problem was crowding and from this upper arch crowding reported 44.1% and lower 40.3% in school children's and this was related with oral habits, early primary tooth loss and early carious tooth loss which accounts 7.3%, 6.9% and 4.3% respectively (18).

The other study in Brazilian was indicated the presence of malocclusion in 75.8% among this bad oral habit has relation by 34.8% (20). The present study has shown the presence of bad oral habits in 28.44% and among this 45.16% were related to presence of malocclusion.

CHAPTER SEVEN

CONCLUSION AND RECOMMENDATION

7.1 CONCLUSION

- Class I malocclusion was the most prevalent malocclusion while class III malocclusion was the least prevalent.
- Tooth crowding was the most prevalent among other types of malocclusion.
- The presence of malocclusion was higher than normal occlusion among examined individuals with bad oral habits.
- Over all, malocclusion was identified among significant number of study population.

7.2 RECOMMENDATION

- Jimma Sts Peter and Paul Catholic School staffs should teach about oral health in mass media of school program.
- The guardian or parents of the children should look after their child's teeth eruption sequence or malocclusion.
- JUSH dental health workers should teach the community about preventive orthodontic.

ANNEX -1 QUESTIONERES

Part 1 Socio-demographic

1. Age

2. Gender A. Male ☐

B. Female ☐

3. Ethnicity A. Oromo ☐

B. Amhara ☐

C. Tigre ☐

D. Others ☐

1. 4. Religion A. Muslim ☐

B. Orthodox ☐

C. Protestant ☐

D. Others ☐

5. Educational level A. Grade 5th ☐

B. Grade 6th ☐

C. Grade 7th ☐

D. Grade 8th ☐

Part -2

6. Is there any bad oral habit?

Yes ☐ No ☐

6.1 If yes which type

A. Finger sucking ☐

B .Tongue thrusting ☐

C. Lip biting ☐

D. Nail biting ☐

E. Others ☐

Part – 3 Examination of malocclusion

7. Normal occlusion ☐

8. Class I Malocclusion ☐

9. Class II

Division - 1 ☐

Division - 2 ☐

10. Class III ☐

Part – 4 other type of malocclusion

11. Anterior cross bite ☐

12. Posterior cross bite ☐

13. Anterior and posterior cross bit ☐

14. Teeth crowding ☐

15. Open bite ☐

ANNEX -2 REFERENCES

1. Angle EH. Classification of malocclusion, Dental Cosmos 1899, 41(8): 248-63, 360-73.
2. Harsan R, Rahiman AK. Occlusion, malocclusion and method of measurement. Archives of orofacia science 2007; 2: 3-9.
3. Last JM. A dictionary of epidimology, New York Oxford University press1995; 347-457.
4. Sarver DM, Proffit WR. Special consideration in Nigeria Ibadan on prevalence, Journal Mos 2005: 10
5. Garbin AJI, Perin PCP, Garbin CAS. Malocclusion prevalence comparison between the Angle classification and the dental esthetic index, Dental Press J Orthod 2010; 15(4): 94 – 102.
6. Simon PW. Diagnosis of dental anomalies, Boston Stanford campany 1962.
7. Profit WR. Contemporay Orthodontics, third edition Missoury Mosby2002; 2-21.
8. Shows Zeis HG, Robertson NRE. Prevalence of malocclusion, Br. Dent. J 1975; 138: 211-7.
9. Almeida MR, Pereize ALP, Almeida RR, Silva OG. Prevalence of malocclusion in children aged 7- 10 years. Dental press Orthod. 2011; 1694): 123-31.
10. New man M, Fraud JM. Prevalence and malocclusion in children14-18 years American Journal
11. James Mores. Dunning principles of dental public health, Dent. Cos 1925; 4: 182-183
12. Malta medical journal, Volume 19. Issue on March 2007; 19-24.
13. Kharanda Opetal. Oral habits in school going children, aprevalence study. Journal of Indian Soc period prevent Delhi 2003; 21(3): 120-4.
14. Hill PA. The prevalence and severity of malocclusion and the need for orthodontic treatment in p, 12 and 15 years old Glaspow school children, British Orthod 1992; 19: 76-87.

15. Lusvarphy L. Identificado respirador buccal, Revista de APCD 1999; 53(4): 265-74.
16. Jypees international journal of clinical pediatric dentistry, September-December 2008; 1(1): 10-12.
17. www. Ethrew @gmail.com Ethiopia health office.
18. Emanuel O. Ajuyi. Prevalence of malocclusion among school children in Benin city, Nigeria MRR- 2007 edition vol(15): 45(2)
19. Kharbamb OP. What is the prevalence of malocclusion in India? Do we know orthodontic treatment needs of our country? 1999; 32(11): 33-34.
20. Pin CM. Prevalence of malocclusion in 4 to 6 years old Brazilian children, 2009; 45(2): 45-9.
21. Journal of American dental association Feb. 2008; 9 - 12
22. Lopatein Pasilers. The prevalence of malocclusion among 7 to 15 years old Luthinian school children, Medicine (kanas) 2009; 45(2): 114-52.
23. Sehel FK. Eastern mediteranian health journal, volume 5, No 2, 1999; 337-343.
24. Kapila S. Distribution of malocclusion in Africa and Asia in some Nirobi school children, Odontos natal Top 1983; 6: 131-7.