Prevalence of Malocclusion in a Sample of Sudanese University Students by the Index of Orthodontic Treatment Need Index (IOTN)

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Abstract

Objective: The aim of this study was to assess the prevalence of malocclusion in a sample of Sudanese medical students, using the index of orthodontic treatment need (IOTN).

Materials and Methods: Digital photographs of 97 university students (43 males and 54 females) which include a lateral and anterior view, using the DHC and AC charts to analyze each photograph.

Results: AC Grade 2 being the most common grade 36 (37.1%); grades 6, 7, 9 and 10 had no students that fall under their category. DHC Grade 2 being the most common grade which was 38 (39.2%); whilst the least common grade was Grade 5 which was 1 (1%). DHC Grade 2 is the highest number of students for both genders being 22 for females and 16 for the males. The least common is Grade 5 which had no females but only one male. AC Grade 2 is the most common grade for both sexes being 21 for females and 15 for males. The least common is Grade 6, 7, 9 and 10 had no students fall under their categories. Based on aesthetically impaction, one male student falls under the grade 8 AC category. Based on present or potential dental health and functional indications, 16 students fall under the grade 4 and 5 category in DHC. From these 16 students 8 females and 7 males are a grade 4 DHC, whilst one male and no females fall under the grade 5 DHC categories.

Conclusions: One male student falls under the grade 8 AC category, in a great need of orthodontic treatment. 16 students fall under the grade 4 and 5 category in DHC. There's one male and no females that fall under the grade 5 DHC category. Therefore they are eligible for orthodontic treatment. Students that are either Grade 2 AC or DHC do not need orthodontic treatment.

Keywords: Malocclusion; Index of Orthodontic Treatment Need Index (IOTN)

Introduction

Orthodontics is a Greek word that literally means 'to straighten teeth'. Orthodontics is that branch of dentistry concerned with facial growth, with development of the dentition and occlusion, and with the diagnosis, interception, and treatment of occlusal anomalies [1].

Orthodontics has had significant reality in the career of dentistry as its inception as a specialty in 1901. It engages the diagnosis, anticipation, and treatment of dental and facial abnormality, which frequently result in 'malocclusion'. After orthodontic treatment, the individual should have an enhanced bite, a in good health mouth, and an gorgeous smile that can be kept for a lifetime. Currently we are in the 21st century, orthodontics has become extremely admired amongst various range of age groups [2].

The stipulate for orthodontic treatment has been rising, which places a trouble on many global healthcare properties. Therefore, in order to classify and prioritize treatment, many occlusal indices have been developed based on the harshness of the malocclusion and the unpleasant effects it has on oral health [3].

Orthodontic treatment, distinct other treatment, depend on the clinician and on the patients' point of view [4].

In recent times, researchers and clinicians have located extra focus on patients' own discernment of oral health status and oral health care systems to recognize their needs, implementation with treatment, and eventually the supposed overall superiority of health systems [5-7].

Oral diseases, as well as malocclusion are extremely rampant in general, and the consequences can influence a variety of life feature, including function, appearance, and interpersonal relationships [5].

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Malocclusion is usually caused by a hereditary abnormality that causes the teeth of one jaw to grow to abnormal positions. In malocclusion, the teeth do not interdigitate properly and therefore, cannot perform their normal grinding or cutting action adequately. Malocclusion occasionally also results in abnormal displacement of the lower jaw in relation to the upper jaw, causing such undesirable effects as pain in the mandibular joint and deterioration of the teeth. The orthodontist can usually correct malocclusion by applying prolonged gentle pressure against the teeth with appropriate braces [8].

Malocclusion has not been thoroughly investigated because the related pain and misery are rarely acute. Yet, malocclusion yet has a great collision on both individuals and society in terms of anxiety, quality of life, and social and functional restrictions. The second most observed facial characteristic smile, which related to physical attractiveness, psychosocial research suggests that malocclusion might negatively interfere with self-satisfaction concerning appearance and, accordingly, impair social functioning [9].

Edward H Angle whose influence began to be felt about 1890, can be credited with much of the development of a concept of occlusion in the natural dentition. The Angle's classification of malocclusion in the 1890s was a vital step in the development of orthodontics as it not basically subdivided major types of malocclusion but also included the first clear simple description of normal occlusion in the natural dentition. Angle's postulate, the upper first molars were the key to occlusion and upper and lower molars should be related so that the mesiobuccal cusp of the upper molar occludes in the buccal groove of the lower molar. If the teeth were arranged on a smoothly curving line of occlusion and this molar relationship existed, then normal occlusion would result [10].

Orthodontic treatment need is classified according to the severity of malocclusion. Mal-relationship be¬tween the upper and lower arches, in any of the planes, spaces between the teeth or anomalies in tooth position beyond normal limits known as malocclusion. It affects periodontal health, increase dental caries prevalence, temporomandibular joint problems. Accordingly, it is imperative to determine the prevalence of malocclusion and its occurrence and distribution in a community. The prevalence of malocclusion varies among different population, genders and age groups [11].

The Index of Orthodontic Treatment Needs (IOTN) classifies malocclusions based on particular occlusal features important for dental health and aesthetics, in order to identify those in most need for treatment. It consists of, the dental health component (DHC), with 5 severity levels that records the dental health need for orthodontic treatment, and the aesthetic component (AC), which records the aesthetic need for orthodontic treatment using a ten grade standardized ranking scale of colored photographs showing various levels of dental attractiveness [12,13].

Different indices have been applied to classify the prevalence of malocclusion in different parts of the world among various populations. However, the IOTN is not only based on esthetics but also on functional due to using two components (Aesthetic Component and Dental Health Component). Aesthetic Components assesses the aesthetic impact of the malocclusion and the Dental Health Component assesses the present or potential dental health and functional indications. Due to such major and minor details that this index provides it has been chosen to be applied in this study.

This study has been neglected dearly in Sudan and it is not only a psychological hold back about esthetic but it is so much more. People with malocclusion have to overcome many potential dental health and functional disabilities when eating or drinking or simply breathing. So hopefully with this study it will make the population aware that orthodontic treatment is very much important and can be very beneficial to these suffering individuals.

Objective

The objectives of this study were to determine the prevalence of malocclusion and orthodontic treatment needed amongst medical students at University of Medial Science and Technology by using Index of Orthodontic Treatment Needed (IOTN). The Dental Health Component (DHC) and the Aesthetic Component (AC).

Materials and Methods

This study was a descriptive cross-sectional hospital based study.

In University of Medical Sciences and Technology in Khartoum state, Sudan.

The study population was the final medical students in University of Medical Science and technology (UMST). Students who have received or receiving orthodontic treatment were excluded.

The total numbers of the final year medical students are 106 from these students 97 fulfilled the inclusion criteria due to currently receiving or have received orthodontic treatment.

Data collection was carried out by taking two photographs by Sony camera (Sony Vaio) for each student anterior and lateral view. Later the photographs were analyzed according to the Dental Health component (DHC) and Aesthetic Component (AC) of patients in order to apply it to the Index of Orthodontic Treatment Needed (IOTN).
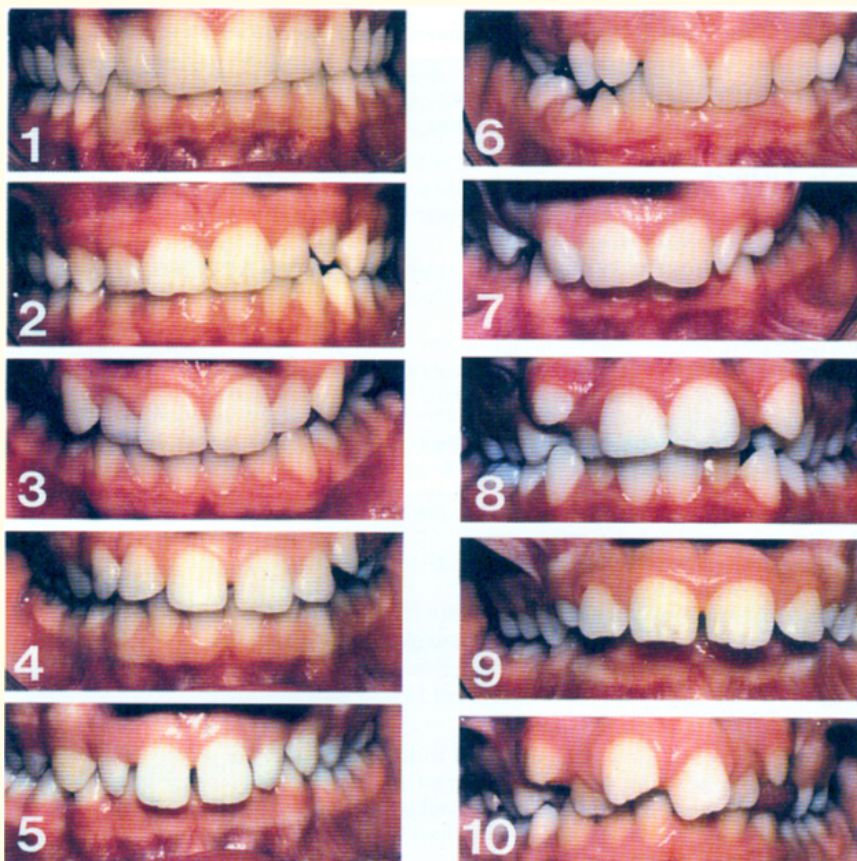
Charts for AC and DHC
Dental Health Component
The Dental Health Component (DHC) has 5 Grades:

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- **Grade 1**: is almost perfection
- **Grade 2:** is for minor irregularities such as:
    - Slightly protruding upper front teeth.
    - Slightly irregular teeth.
    - Minor reversals of the normal relationship of upper and lower teeth which do not interfere with normal function.
- **Grade 3:** is for greater irregularities which normally do not need treatment for
    - Health reasons.
    - Upper front teeth that protrude less than 4 mm more than normal.
    - Reversals of the normal relationship of upper teeth which only interfere with normal function to a minor degree; by less than 2 mm.
    - Irregularity of teeth which are less than 4 mm out of line.
    - Open bites of less than 4 mm.
    - Deep bites with no functional problems.
- **Grade 4:**
    - For more severe degrees of irregularity and these do require treatment for health reasons.
    - Upper front teeth that protrude more than 6 mm.
    - Reversals of the normal relationship of upper teeth which interfere with normal function greater than 2 mm.
    - Lower front teeth that protrude in front of the upper more than 3.5 mm.
    - Irregularity of teeth which are more than 4 mm out of line.
    - Less than normal number of teeth (missing teeth), gaps need to be closed.
    - Open bites of more than 4 mm.
    - Deep bites with functional problems.
    - More than the normal number of teeth (supernumerary teeth).
- **Grade 5:** is for severe dental health problems
    - When teeth cannot come into the mouth normally because of obstruction by crowding, additional teeth or any other cause.
    - A large number of missing teeth.
    - Upper front teeth that protrude more than 9 mm.
    - Lower front teeth that protrude in front of the upper more than 3.5 mm and where there are functional difficulties too.
    - Cranio-facial anomalies such as cleft lip and palate.

Aesthetic Component Chart

The AC assesses the perception of an individual on the attractiveness of his/her dentition through a 10-point photographical scale showing different levels of dental attractiveness, with photo 1 representing the most attractive and photo 10 the least attractive [13]. Photos 1 to 4 represent 'no need for treatment'; 5 to 7 'borderline need for treatment' and 8 to 10 'definite need for orthodontic treatment'.

Appendix 1

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Data management and analysis

Data was collected, cleaned, entered and analyzed using SPSS (Statistical Package for the Social Sciences) version 20. Descriptive statistic was used to describe data in terms of frequency distribution figures. For all test P- value were set at the 0.05 level.

Ethical Consideration

- Ethical clearance obtained from the faculty of Medicine, Academic Charity Hospitals.
- Verbal informed consent obtained from all participants and a concise explanation of the procedures and aims of the research were given
- Assurance of Confidentiality of data throughout the study and this data will be used only for the purpose of the study.

Results

The following figures and tables showed the frequency distribution and the comparison between male and females of the study as displayed in figures 1 - 6.

- Figure 1 shows the distribution of the study subjects according to frequency distribution of AC. Grade 2 being the most common grade which was 36 (37.1%); grades 6, 7, 9 and 10 had no students that fall under their category.
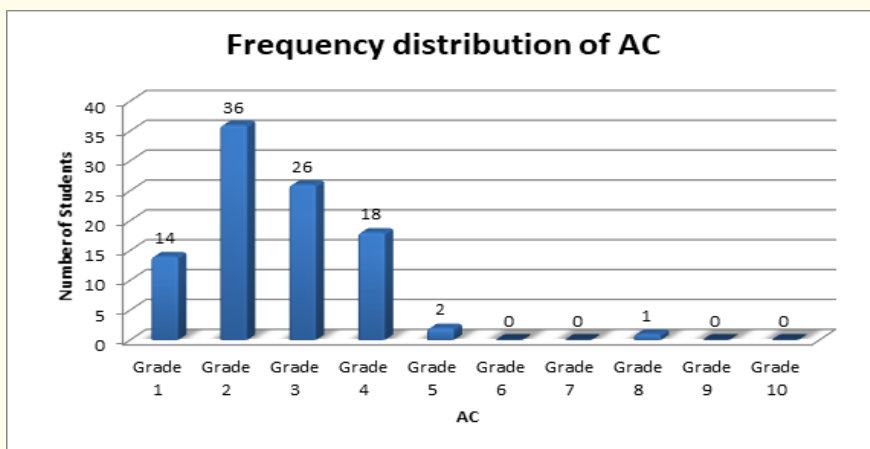

Figure 1: Distribution of the study subjects according to frequency of AC (Total Number: 97).

- Figure 2 consists of the distribution of the study subjects according to frequency distribution of DHC with Grade 2 being the most common grade which was 38 (39.2%); whilst the least common grade is Grade 5 which was 1 (1%).
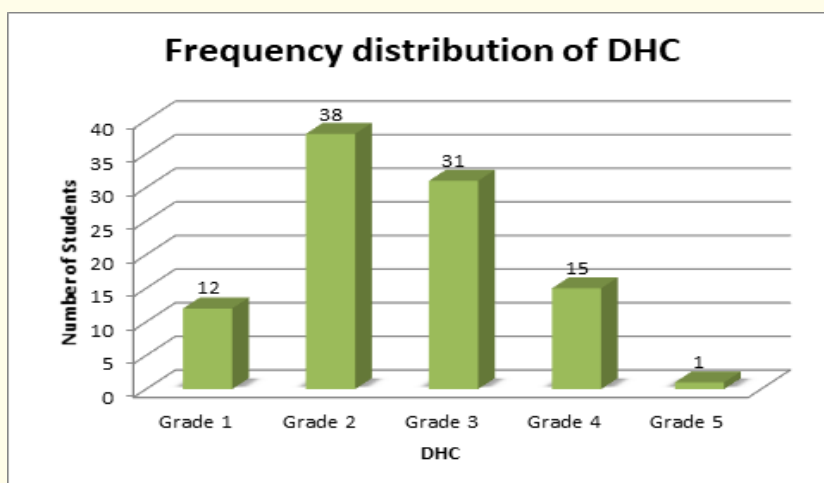

Figure 2: Distribution of the study subjects according to frequency of DHC (Total Number: 97).

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- Figure 3 shows the distribution of the study subjects according to DHC comparing females and males. Grade 2 is the highest number of students for both sexes being 22 for females and 16 for the males. The least common is Grade 5 which had no females but only one male.
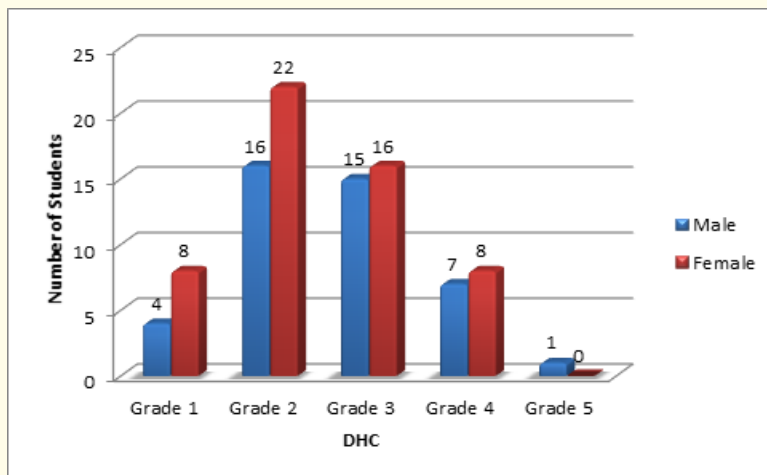

Figure 3: Distribution of the study subjects according to DHC comparing females and males (Total Number: 97).

- Figure 4 consists of the distribution of the study subjects according to AC comparing females and males. Grade 2 is the most common grade for both sexes being 21 for females and 15 for males. The least common is Grade 6, 7, 9 and 10 had no students fall under their categories.
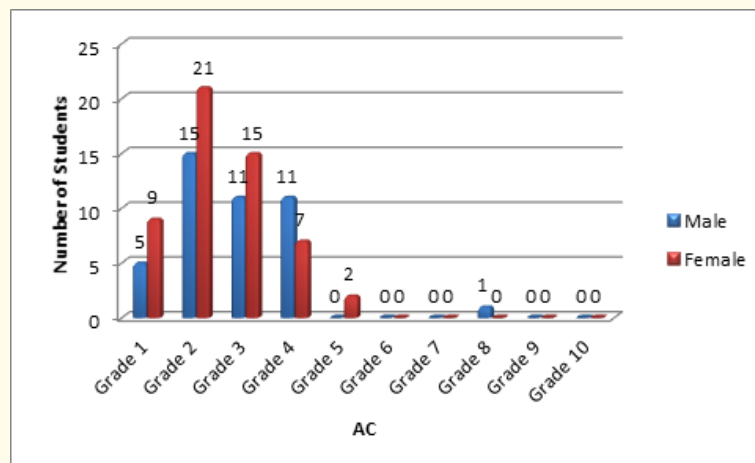

Figure 4: Distribution of the study subjects according to AC comparing females and males (Total Number: 97).

- Figure 5 shows the percentage of students according to the distribution of DHC Grades. DHC Grade 2 being the highest percentage with 39.2 percent and the least common percentage would be DHC Grade 5 with 1 percent.
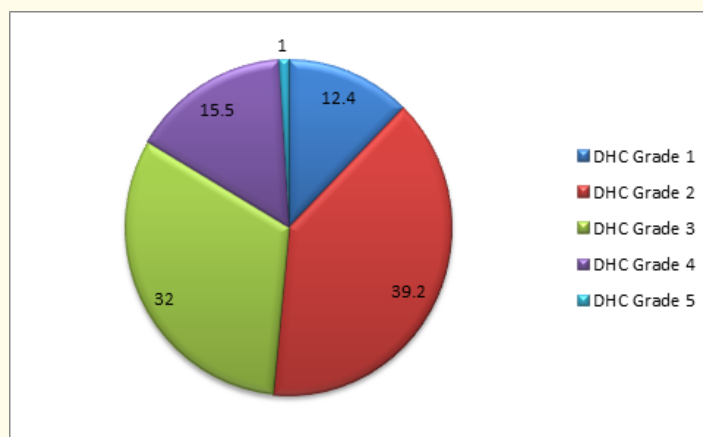

Figure 5: Percentage of Students according to distribution of DHC Grades (Total Number: 97).

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- Figure 6 shows the percentage of students according to distribution of AC Grades. The highest percentage being AC Grade 2 with 37.1 percent while the least percentages are AC Grades 6, 7, 9 and 10 with 0 percent.
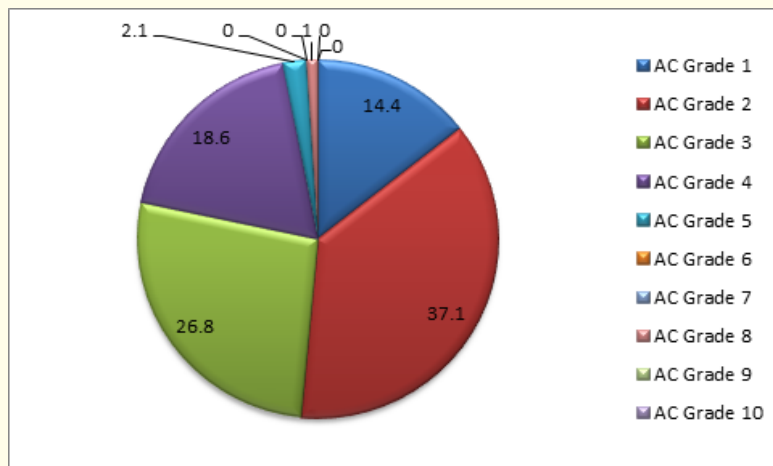

Figure 6: *Percentage of Students according to distribution of AC Grades (Number: 97).*

- Based on aesthetically impaction one male student falls under the grade 8 AC category therefore he is in a great need of orthodontic treatment.
- Based on present or potential dental health and functional indications 16 students fall under the grade 4 and 5 category in DHC.
- From these 16 students 8 females and 7 males are a grade 4 DHC, whilst one male and no females fall under the grade 5 DHC categories.

Discussion

The present research was aimed to determine the prevalence of malocclusion and orthodontic treatment needed amongst final year medical students at University of Medical Science and Technology by using the IOTN. There are 106 students and from these students 97 fit the inclusion criteria whilst the other 9 students are excluded due to currently receiving or have already received orthodontic treatment.

Based on aesthetically impaction one male student falls under the grade 8 AC category therefore he is in a great need of orthodontic treatment. Based on present or potential dental health and functional indications, 16 students fall under the grade 4 and 5 category in DHC. From these 16 students 8 females and 7 males are a grade 4 DHC, whilst one male and no females fall under the grade 5 DHC categories. When a student falls in the Grade 4-5 DHC category or the Grade 8-10 AC category they are in great need for orthodontic treatment [14].

In the present study, the great need of treatment (DHC) was found to be 16.5 percent which is low compared to the studies done in the Turkish school population which was 38.8 percent, moderate need of treatment was found to be 32 percent which is high in comparison to the studies done in the Turkish school population which was 12.0 percent, whilst little or no need of treatment was found to be 51.6 percent which is considered high compared to the studies done in the Turkish school population which was found to be 4.8 percent. Whilst the present study, the great need of treatment (AC) was found to be 1 percent which is low compared to the studies done in the Turkish school population which was 4.8 percent, moderate need of treatment was found to be 2.1 percent which is low in comparison to the studies done in the Turkish school population which was 4.8 percent, and little or no need of treatment was found to be 96.9 percent which is high when comparing to the studies done in the Turkish school population which was found to be 90.4 percent [15].

The great need of treatment in the present study was found to be 16.5 percent which is high compared to the studies done in Tehranian schoolgirls was 5.2 percent to 7.4 percent, the moderate need of treatment in the present study was 32 percent which was low compared to the studies done amongst the Tehranian schoolgirls, and no treatment needed in the present study was found to be 96.9 percent which is high in comparison to the 16.3 percent in the study conducted on the Tehranian schoolgirls [16].

Different factors could be contribute to the wide range of the variation in the results such as environmental factors, genetic factors, ethnic backgrounds and/or gender.

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In the present study, the definite need of treatment was found to be 38.8 percent which is high in comparison to the study done on the adolescent Kuwaitis which was found to be 31.1 percent, whilst the present study showed that 51.6 percent no need for treatment which is high compared to the study done on the adolescent Kuwaitis which was found to be 40.2 percent [17].

The two studies' results could possibly be comparable due to the similar Arab background that the Kuwaitis and Sudanese people have in common.

In the current study, the great need of treatment (AC) was found to be 1 percent which is low in comparison to the study done on the Iranian schoolchildren which was found to be 17.9 percent, the moderate need of treatment was found to be 2 percent in the present study which is low in comparison to the study done on Iranian schoolchildren which is 36.1 percent, and the little or no need for treatment was found to be 96.6 percent which was high compared to the study done on the Iranian schoolchildren which was found to be 46 percent [18].

The possible cause of the extreme range in the results could be due to the wide and broad maxilla and mandible found in the Sudanese people due to the Afro-Arab background.

Conclusion

The findings of the present study were:

1. One male student falls under the grade 8 AC category therefore he is in a great need of orthodontic treatment.

2. Sixteen students fall under the grade 4 and 5 category in DHC, 8 being females whilst 7 are males that have grade 4 DHC. There's one male and no females that fall under the grade 5 DHC category. Therefore they are eligible for orthodontic treatment.

3. The highest numbers of students that fall under the Grade 2 DHC category are 38 and the highest numbers of students that fall under the Grade 2 AC category are 36. Students that are either Grade 2 AC or DHC do not need orthodontic treatment.

Recommendations

1. Further studies should be done among a larger population to study the relation between malocclusion and a larger population and the need for orthodontics treatment.
2. Further studies are recommended to be done on a specific age group to give a more broad perspective on the malocclusion.
3. To raise awareness to the ministry of health, dental schools, practitioner and the general population about prevalence of the types of malocclusion, as well as preventive and interceptive orthodontics.
4. To raise awareness of preventive measures of changes in occlusion caused by increase in age.

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