MALOCCLUSION AMONG TANZANIAN ADULTS;

PREVALENCE AND TREATMENT NEEDS IN A GROUP OF NURSING STUDENTS IN MOSHI

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ABSTRACT… Introduction: An increase for oral health care uptakes in Tanzanian through current surge of health insurance establishments has placed adult individuals to seek for orthodontic care which was nonexistent at their adolescent age. However, prevalence of malocclusion and magnitude of orthodontic treatment needs not known in Tanzanian adults. This study aimed to survey on the prevalence of malocclusion and objective orthodontic treatment needs among the adult population in Tanzania. **Study Design:** Survey study. **Setting:** Conducted at Kilimanjaro Christian Medical Centre Teaching Hospital, Moshi, Tanzania. **Period**: January to April in 2014. **Subjects and methods:** A population of 217 nursing student at Kilimanjaro Christian Medical Centre Teaching Hospital in Moshi, Tanzania were involved for clinical examination of malocclusion traits. The traits were registered according to the criteria developed by Bjork, Krebs and Solow in 1964. Dental Aesthetic Index (DAI) was used to determine orthodontic treatment needs in this group of Tanzanian adults. Data for malocclusion traits were analyzed using Statistical Package for Social Sciences. The Intraclass Correlation Coefficient (ICC) was used to determine intra-examiner reliability of the discrete variables of Bjork criteria and DAI components. ICC value classification was based on those developed by Landis and Koch in 1977. The intra-examiner reliability by ICC in our study was almost perfect (ICC=0.895-1.000). **Results:** The overall prevalence of malocclusion was 94.4%. Angle's Class II and Class III malocclusion occurred in 12.9% and 6.7% respectively of the studied population. Aplasia or impacted teeth excluding the last molar occurred in 8.4% of the students. Deep bites occurred in 7% and frontal open bites in 9.3% of the students studied respectively. Crowding in both jaws were found in almost half of the students with more crowding in mandibular incisors. Midline displacement was registered in 38.8% of the students. The populations mean DAI score was 27.7 (8.64 ±SD). About 51% of the students had either no need or slight orthodontic treatments. About 49% were found with orthodontic treatment needs ranging from elective, highly desirable to mandatory. **Conclusion:** The current findings showed presence of malocclusion traits in this population with tendency for some of the traits to increase in severity compared to the findings in the adolescents studied previously in Tanzania. Higher overall prevalence of malocclusion according to Bjork criteria in this population corresponded with considerable orthodontic treatment needs assessed by DAI scores.

Key words: Malocclusion, orthodontics, adults, Tanzania

INTRODUCTION

Malocclusion is a global condition which exhibits variations in occurrence between ethnic groups.[1,2] Although not to every affected individual, some of the handicapping malocclusion traits have shown to exert psychosocial impacts on the wellbeing of individuals in the communities.[3] Moreover, it may be difficult to maintain good oral hygiene in individuals with certain traits of malocclusion. This may predispose to chronic periodontal diseases and dental caries in some individuals. Researches for malocclusion in Tanzania were limited to adolescents of few areas in Tanzania considering its huge land mass. Higher overall prevalence of malocclusion was reported in one of the similar studies in Tanzania.[4] Magnitude of uptake for orthodontic services in Tanzanian population are not documented. Due to limited orthodontic care in Tanzania, majority of the children might have turned into adulthood still with

severe to handicapping malocclusion. However, to what extent is the prevalence of malocclusion in Tanzanian adults and the magnitude of adult orthodontic treatment needs are not known. The purpose of this study was to survey on the prevalence of malocclusion traits and orthodontic treatment needs in a nursing students' population at Kilimanjaro Christian Medical Centre Teaching Hospital.

SUBJECTS AND METHODS

This was a survey study involving 217 nursing students at Kilimanjaro Christian Medical Center Teaching Hospital in Moshi, Tanzania in 2014. A population of nursing students at Kilimanjaro Christian Medical Centre Teaching Hospital in 2014 was finite and small, whence the whole population was recruited for the study. Nursing students were examined for prevalence of malocclusion traits using Bjork et al. criteria[5] and orthodontic treatment needs using DAI scores.[6] The Bjork et al. criteria were chosen for use in this study due to its sensitivity so that all malocclusion traits could be registered to add on the few available data on malocclusion in Tanzanian adults. DAI was used in this study due to its simplicity in linking conspicuous aspects of malocclusion to address the severity and treatment needs. In Tanzania, where there are very few oral health care cadres in orthodontic specialty, a DAI criterion was a choice for the present referral system in Tanzania. Ethical clearance was sought from Kilimanjaro Christian Medical University College Ethics Committee in Moshi, Tanzania, Research Clearance No. 655. All 217 students who comprised student nurse population were Tanzanians of African origin. Written informed consent was obtained from each of the student nurses who were examined. Clinical examinations were carried out in a classroom under natural daylight. This was achieved by having a student nurse sit on a chair next to a window. Ordinary dental probes and mirrors were used. Standardized plastic rulers and dividers were used for all linear measurements. One dental specialist carried out all the clinical examinations of the subjects. A slight modification of the Bjork et al. criteria[5] used was done. This involved combining Grade I and II Bjork et al. criteria[5]

into a single score for recording occlussal traits. However, clinical recording of malocclusion traits was not aided by any other method. A total of 22 student nurses were re-examined to evaluate intra-examiner reproducibility for the data of malocclusion traits studied in both of the criteria used.

Data for malocclusion traits were entered in a computer and analyzed using Statistical Package for Social Sciences (SPSS) version 20.0 and Microsoft Excel programme. The Intraclass Correlation Coefficient (ICC) was used to determine intra-examiner reproducibility of the discrete variables of Bjork criteria and DAI components. ICC values were classified as: <0.40-poor to fair; 0.40-0.60-moderate; 0.61-0.80-excellent; and 0.81-1.00-almost perfect.[7] Individual final DAI scores determined student's orthodontic treatment need according to the cut off points of treatment categories. Treatment categories according to the author of DAI[6] were used in the current study. These were DAI scores of ≤ 25 which indicated "no or minor orthodontic treatment need" and 26 - 30 DAI scores which indicated "elective" orthodontic treatment need. DAI scores of 31 - 35 and ≥ 36 indicated "highly desirable and mandatory" orthodontic treatments need respectively (Table-V).

RESULTS

Only 214 (98.6%) students were reached for investigation. The mean age of the examined subjects was 27.2 years (SD ± 7.35 years). Age ranged between 18 and 53 years. About 72% of the respondents were in the young age group (below 31 years). Table-I summarizes the distribution of examined subjects according to age groups. Overall prevalence of malocclusion according to Bjork criteria was relatively the same across the age groups. There was uneven gender distribution of the subjects studied (25 males only against 189 females). Intra-examiner reliability values for discrete data of malocclusion traits registered by Bjork criteria and malocclusion traits registered by DAI was almost perfect (ICC=0.895-1.000) whence almost perfect agreement.

Age intervals in years	With malocclusion	Without malocclusion	Total (n = 214)
	No. (%)	No. (%)	No. (%)
18-30	151 (93.8)	10 (6.2)	161 (75.2)
31-42	39 (97.5)	1 (2.5)	40 (18.7)
43-54	12 (92.3)	1 (7.7)	13 (6.1)
Total	202 (94.4)	12 (5.6)	214 (100)

Table-I. Overall distribution of malocclusion according to age of nursing students (n= 214)

The entire population surveyed had no one who had orthodontic therapy before. The overall prevalence of malocclusion according to Bjork criteria was 94.4% (Table-I). Malocclusion per trait categories according to Bjork criteria used is summarized in Tables-II, III and IV. Rotated teeth and inversion of maxillary incisors were the most common features in the group of dentition anomalies traits (Table-II). The commonest anteroposterior molar relation was Angle's Class I in the category of occlussal traits. Other commonest occlussal traits in this category were frontal open bites and Deep bites (Table-III). Both crowding and spacing occurred frequently in all the jaws examined with the mandible exhibiting more anterior crowding (Table-IV).

Malocclusion feature	Total	
	No.	(%)
Inversion maxillary incisors (3 or <teeth)	21	(9.8)
Aplasia/Impacted (exclude last molars)	18	(8.4)
Transposition	6	(2.8)
Supernumerary	6	(2.8)
Rotated (estimated 15^0)	46	(21.5)
Malformation	0	(0.0)

Table-II. Prevalence of dentitional anomalies in nursing students (n= 214)

Malocclusion feature	Total	
	No.	(%)
Angle's class I (normal molar occlusion)	156	(80.4)
Angle's class II (≥½ cusp width)	25	(12.9)
Angle's class III (≥½ cusp width)	13	(6.7)
Excessive maxillary over jet (≥ 6 mm)	7	(3.3)
Mandibular over jet (>0mm)	3	(1.4)
Deep bite (≥50% incisor overlap)	15	(7.0)
Frontal open bite (>0mm)	20	(9.3)
Lateral open bite	2	(0.9)
Cross bite (posterior)	3	(1.4)
Scissor bite	1	(0.5)

Table-III. Prevalence of occlussal anomalies in nursing students (n=214)

Note: Twenty students did not meet the criteria for examination of first molar anteroposterior relations.

Malocclusion feature	Total	
	No.	(%)
Lack of space (maxillar ≥ 2mm)	92	(43)
Lack of space (mandible ≥ 2mm)	115	(53.7)
Excess of space (maxillar ≥ 2mm)	51	(23.8)
Excess of space (mandible ≥ 2mm)	44	(20.7)
Maxillary median diastema (≥ 2mm)	40	(18.8)
Abnormal maxillary labial frenum	17	(7.9)
Midline displacement (≥ 2mm)	83	(38.8)

Table-IV. Prevalence of space anomalies, median diastema, midline displacement and abnormal maxillary labial frenum (n= 214)

Maxillary median diastema and abnormal maxillary labial frenum traits were found in 18.8% and 7.9% of the population respectively. Midline displacement traits were found in 38.8% of the studied population (Table 4).The populations mean DAI score was 27.7 (8.64 ±SD). Out of 214 students examined for DAI scores, 20 of them did not meet criteria for anteroposterior molar relation. About 51% of the subjects who met all the criteria for DAI scores had either no need or had slight orthodontic treatments. The rest were found with orthodontic treatment needs ranging from elective, highly desirable to mandatory (Table-V).

DISCUSSION
The results of our study showed the overall prevalence of malocclusion to be higher across the all age groups studied. Crowding and spacing traits occurred more frequently in both jaws with the mandible exhibiting more anterior crowding. Registration of malocclusion was purely on clinical basis. Some of the specific occlussal traits which may need imaging like aplasia/impacted teeth may have not been fully assessed. Since the admission of nursing students at this school draws candidates from all over the country in Tanzania the information emanated from this study may represent a true occurrence of malocclusion in Tanzanian adults. However, random inclusion of multicentre in the country is needed to make such a statement bold.

Variable			No or slight need		Elective		Highly desirable		Mandatory	
			Treatment indications							
			(≤ 25 DAI Scores)		(26-30 DAI Scores)		(31-35 DAI Scores)		≥ 36 DAI Scores	
	No.	%	No.	%	No.	%	No.	%	No.	%
Young (18-30 years)	144	74.2	74	51.4	29	20.1	17	11.8	24	16.7
Old (31 years and above)	50	25.8	25	50.0	9	18.6	6	12.0	10	20.0
Total	194 [Ω]	100	99	51.0	38	19.6	23	11.9	34	17.5

Table-V. Orthodontic treatment needs among nursing students in Tanzania based on the category of DAI scores treatment indications.

Key: [Ω] = Out of 214 students examined for DAI scores 20 students did not meet criteria for anteroposterior molar relation.

In post-adolescence most of the malocclusion traits remain stable with some exhibiting increased severity related to aging in the craniofacial complex over time.[8,9] In additional, the studied population had transformed into adulthood without orthodontic treatment exposure. It is with these arguments that it was found justified to compare current findings of malocclusion traits with some of the previous findings among the adolescents worldwide.

Majority of the students were female. This was not surprising since in Tanzanian communities professional nursing is mostly liked by females. No recent overall prevalence of malocclusion reports have been documented in Tanzanian adults communities for comparison. Current overall prevalence of malocclusion in this population was in accordance to the previous report in Tanzanian adolescents investigated using the same criteria in this locality.[4] However, this was far higher than those reported elsewhere in Tanzania among the children where the same criterion was used.[10] Since there is almost no self-correcting malocclusion after adolescence, the discrepancies in the present findings for overall prevalence of malocclusion in comparison with those reported before in Tanzania[10] could be explained probably by the difference in the sample size studied and the inclusion of minor malocclusion traits in the current study. Furthermore, Tanzania possesses high diversity of ethnic groups. Whence, ethnic variation in regard to occurrence of malocclusion may have contributed to the observed inconsistencies on the overall prevalence of malocclusion reported elsewhere in Tanzania using the current criterion.

The prevalence of dentitional anomalies was slightly higher in the current study compared to one of the previous studies among the adolescents in Tanzania.[4] Craniofacial growth changes and diseases like periodontitis in adulthood probably could have led these traits to express fully with the current criterion used. Surprisingly, no malformed teeth were found in this population which had some of the subjects born during the time of high pick of infant dental mutilation practices in Tanzania.[11]

The results of the current study had Angle's Class II malocclusion twice as much of the previous findings reported among the Tanzanian adolescents.[4,10] A considerable number of individuals with Angle's Class III malocclusion were found in the studied students. This number was in the range of the African subcontinent prevalence of Angle's Class III malocclusion reported before in a systematic review and meta-analysis study[12] and concurred with the range of prevalence of this trait reported previously in Tanzanian adolescents.[4,10]

The finding for extreme maxillary overjet in the current study was lower compared to the previous report which used the same criteria to register overjet in Tanzanians adolescents.[4] This trait has been reported to remain stable in post-adolescence through old age.[10] Whence, the current findings on this trait may depict the true occurrence of this malocclusion trait in the current population. Mandibular overjet was extremely rare and concurred with previous regional findings which used the same criteria.[4] Deep bites have also shown to remain stable

during aging process from adolescence to late adulthood.[9] Deep bites were slightly lower than the previous finding in Tanzanian adolescents in which the same criteria was used.[4] Frontal open bites were in the range reported previously among the Tanzanian adolescents[4] with the exception of findings in the Dar es Salaam adolescents[10] where the prevalence of open bites was reported higher in adolescents than in the current study. Prevalence of frontal open bites is associated with ethnic variation in relation to craniofacial growth and some of improper oral habits.[13,14] However, oral habits were reported to be lower in African population at the age when the current population was in the childhood period.[15] Some of the oral habits are associated with lateral open bite, posterior cross bites and scissor bites. Lateral open bite, posterior cross bites and scissor bites were extremely rare in this community agreeing with the previous findings in this region.[4] Indeed, this is in agreement with rarity of oral habits among the African populations in the region.[15]

Prevalence of spacing in this study was higher compared to the previous findings in Tanzanian adolescents' studies.[4,10] Since impacted/aplasia teeth are associated with individual spacing, the considerable aplasia/impacted teeth observed in this population probably could account for the present findings.

Prevalence of crowding in this study was very high especially in the mandible. Early extraction of deciduous carious teeth predispose to crowding. However, in Tanzania, early extraction of deciduous carious teeth is very low.[16] Probably arch dimension changes[8] coupled with mesial drift tendencies for the posterior teeth in the jaws could have increased crowding traits in this adult population compared to other Tanzanian counterparts at adolescence age.[4,10]

Maxillary median diastema and abnormal maxillary labial frenum traits were in accordance with the previous regional findings in adolescents.[4] Midline displacements were excessively higher compared to the findings in adolescents reported before in Tanzania.[4] Effect of loss of teeth in some of the anterior segments not reported in the current study of adult population could have created space distribution to account for excessive midline shifts found in the current findings.

Only one retrievable study has been carried out on orthodontic treatment needs in adults using DAI criteria in East African region.[17] In this scenario exhaustive direct comparison for orthodontic treatment needs in East African communities based on DAI criteria becomes difficult. Based on the author of the current index used to assess orthodontic treatment needs, cut-off point of 31-35 DAI scores for the current study was slightly less than the previous reports in Rwandese study[17] and Brazilian army adults[18] where DAI criterion was used. This signified that few adults in the current studied community had malocclusion in need for elective treatment compared to the counterparts in Rwanda[15] and in a group of Brazilian army adults.[18] Likewise few Tanzanian adults in the current study had mandatory treatment needs compared to their counterparts in Rwandese study[17] but with exceedingly more individuals with mandatory orthodontic treatment needs compared to Brazilian army adults.[18] The number of subjects in need for mandatory orthodontic treatment in the current study was comparable to that reported in Spanish adults[19] and Peruvian young adults.[20]

Although no information was sought on their expressed need to get treatment among the students who were objectively found to need orthodontic treatment in the current study, the previous study among Tanzanian adolescents expressed their aware and concern of their malocclusion and they desired to eliminate it.[21]

CONCLUSION
The prevalence of malocclusion traits in this study did not differ much compared to the previous studies in adolescents of this area. Considerable objective orthodontic treatment needs were present in the current adult population as determined by DAI criteria.
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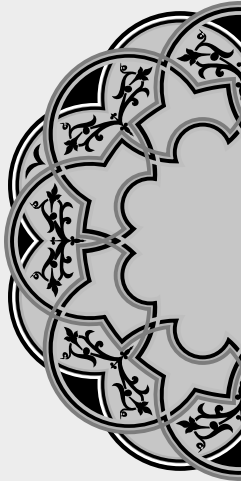
"Don't base your decisions on the advice of those who don't have to deal with the results."

Unknown

AUTHORSHIP AND CONTRIBUTION DECLARATION

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