Relationship of crowded teeth and Oral Hygiene among urban population in Medan

Siti Bahirrah

Orthodontic Department, Faculty of Dentistry Universitas Sumatera Utara, Jl. Alumni No 2 Kampus USU Medan 20155

E-mail : siti.bahirrah@usu.ac.id

Abstract. Crowded teeth could present a challenge in maintaining oral hygiene through brushing, as it is difficult to remove food debris in the interdental area, causing plaque accumulation and calculus formation, which leads to caries and gingivitis, or even destruction of the supporting tissue, which leads to tooth mobility. This study aims to determine the relationship of crowded teeth and oral hygiene among the urban population in Medan. This research is an analytic study with a cross-sectional design. The samples of this research consists of 100 adolescents in Medan. Based on the examination result of 100 subjects, 50 subjects with normal tooth arrangement, and 50 subjects with crowded teeth. This information was determined by examination of the dental condition and Oral Hygiene Index Simplified (OHI-S) measurement. The examination was performed by placing the explorer on 1/3 incisal or occlusal area and gently moving it to the 1/3 gingival or cervical area on a specific tooth. The results of the study were tested with the Chi-square test. The result shows that subjects with normal tooth arrangement present average OHI-S score of 0.66 which is categorized as good oral hygiene. Subjects with a crowded dentition exhibit an average OHI-S score of 1.33 which was categorized as moderate oral hygiene. The findings of this research reveal that there is a significant correlation between of crowded teeth and oral hygiene among adolescents in Medan. Abnormal tooth arrangement influences the condition of oral hygiene among adolescents.

Keyword: crowding, oral hygiene, adolescents

1. Introduction

Occlusion was defined as the change in the relationship between the maxillary and mandibular tooth surface during mandibular jaw movement which ends in total contact with the teeth in both jaws. Occlusion is due to the interaction of several factors such as dental, skeletal, and muscular system.[1-3] Malocclusion is the deviation from normal occlusion.[1,2] Malocclusion is considered as a major problem in oral health care because it occupies the third position right after dental caries and periodontal disease.[1-4]

Crowded teeth is a condition where the teeth are in abnormal positions.[5] Sometimes, crowded teeth cause problems to the patients. Tooth brushing is difficult to practice in conditions like crowded teeth, because areas such as interdental are difficult to access by the tooth brush which leads to plaque accumulation and calculus formation. Plaque and calculus will cause caries and gingivitis or even further destruction of periodontal tissue which cause tooth mobility.[4-8]

Based on the research done by Beaglehole et al. in 2009 stated there is a significant difference in assessability and utilization of oral health services between the urban and rural area in both

Content from this work may be used under the terms of the Creative Commons Attribution 3.0 licence. Any further distribution of this work must maintain attribution to the author(s) and the title of the work, journal citation and DOI.
Published under licence by IOP Publishing Ltd

developing nor advanced country. Rural and urban areas have the difference in knowledge and awareness towards preventive oral health management such as regular visits to the dentist. North Sumatra province is the biggest province in the west coast of Indonesia. Medan is the capital of North Sumatra which was also categorized as one of the metropolitan city in Indonesia. Medical health care especially dental health is easily accessible in the city of Medan as it holds the status of an urban city because private dental clinics, dental specialists, and dental hospitals can be easily located.

Based on the research conducted by Oktavia Dewi in 2007, the percentage of malocclusion in high school adolescents in Medan is 60.5%. Malocclusion in the lower anterior region was the highest percentage 41.89% whereas 30.75% in the upper anterior region.[9] Research conducted by Rosihan in 2014 stated that the incidence of malocclusion based on gender among adolescents in Pondok Pesantren Darul Hijrah Maertapura were 72% with severe malocclusion in male adolescents whereas 56% with mild malocclusion in the female adolescents.[4]

Based on research conducted by Altrainy 2013 in the study program of dentistry in University of Sam Ratulangi found that crowded teeth was 52.95% on one arch in girls and 42.05% in boys whereas 69.56% on both arches in girls and 30.45% in boys.[5] Asmawati in 2014 conducted research on high school students of PAB 5 Patumbak and found that 14 students were diagnosed with the crowded teeth. Based on this research, plaque accumulation is more likely to happen in the crowded teeth as there are some areas which are difficult to be accessed by tooth brushing method.[7]

Based on this fact, the author was interested to conduct further on the relationship between oral hygiene and crowded teeth among adolescents in Medan as there were still few studies done regarding the crowded teeth with oral hygiene status. This research is carried out in urban population in Medan because the author categorized the urban popualtion has the abitily to understand the importance of maintaining health care including oral health.

2. Methods and Materials

This research is an analytical research with cross sectional design. The population from this research was randomly selected from all the students in government high school Medan. The reason behind using the samples from government high school Medan is that the social economy condition in government school is more heterogenous compared to private schools.

Samples of this research are those who fulfill the inclusion and exclusion criteria. Total samples are obtain by calculation. The inclusion criteria for the sample of this research: permanent dentition, no history of facial trauma, during orthodontic treatment or none, no smoking habits (at least six months from this research).

The technique used in obtaining samples was simple random sampling. Total samples consists of 100 samples where 50 samples with normal tooth position as a control group and the remaining 50 samples with crowded teeth. This research obtained the approval from ethical commissions from the medical faculty of University of North Sumatera. Clinical examination is carried out with mouth mirror to examine whether the students have crowded teeth or not. Oral hygiene examination was performed using the OHI-S method shown in figure 1 by measuring debris and calculus index using mouth mirror and explorer on the specific surface of the tooth such as the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, the lingual surface of tooth 36 and 46. The examination was carried out by placing the explorer on the 1/3 incisal or occlusal surface and then move towards 1/3 gingival or cervical.[11-13]

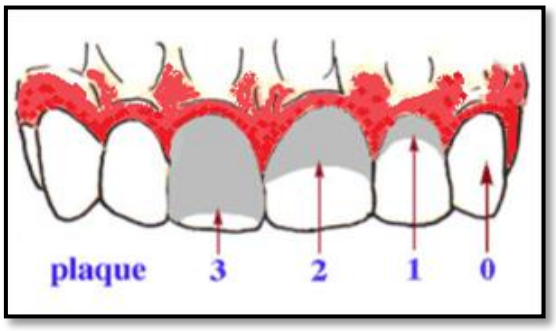


Figure 1. Debris Index Criteria
0 = no debris or stain.
1 = debris covering not more than 1/3 surface of tooth or stain without debris covering the tooth
2 = debris covering more than 1/3 surface of tooth but less than 2/3 surface of tooth
3 = debris covering more than 2/3 surface of tooth

3. Results

Total subjects of this research are 100 students which consist of 50 subjects with normal tooth positions and remaining 50 subjects with crowded teeth. Students that make up the subjects are chosen from class 10-12 of the government high school Medan. Distribution of subjects in this research was shown in Table 1.

Table 1. Distribution of students in government high school Medan with normal and crowded teeth

	Tooth status			
	Normal		**Crowded**	
	N	**%**	**N**	**%**
Male	**27**	**54**	**23**	**46**
Female	**23**	**46**	**27**	**54**
Total	**50**	**100**	**50**	**100**

Table 1 shows that distribution of subjects in government high school Medan with normal position and crowded teeth. Based on the sampling method, proportioned stratified sampling, 100 samples were needed in this research where 50 samples with normal tooth position as the control group and the remaining 50 samples with crowded teeth. Observation of general malocclusion features was made to determine whether the subject possess normal or crowded teeth. Clinical examination was carried out by the operator using the mouth mirror. Photos of the oral cavity of the patients was taken as proof of clinical examination. Based on results of the examination on 100 samples, 50 samples had normal tooth arrangement whereas the remaining 50 samples had crowded teeth.

Distribution based on gender with normal tooth arrangement was 54% (27 subjects) of male and 46% (23 subjects) of female. Distribution based on gender with crowded teeth was 46% (23 subjects) of male and 54% (27 subjects) of female. Distribution of subjects with normal and crowded teeth based on gender shown in figure 2.

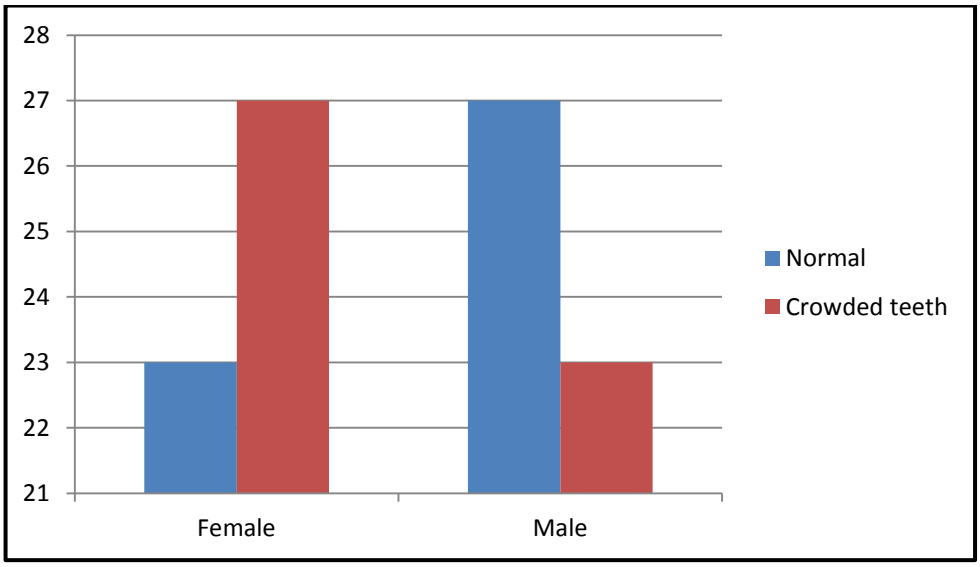


Figure 2. Distribution of normal and crowded teeth based on gender among students in government high school Medan.

Figure 3 shows that distribution of crowded teeth location among students in government high school Medan. Crowded teeth mostly located in both arches which made up 46% (23 subjects). Crowded teeth only in lower jaw was found to be 18% (9 subjects) whereas crowded teeth only in upper jaw was the least to be found which is 16% (8 subjects).

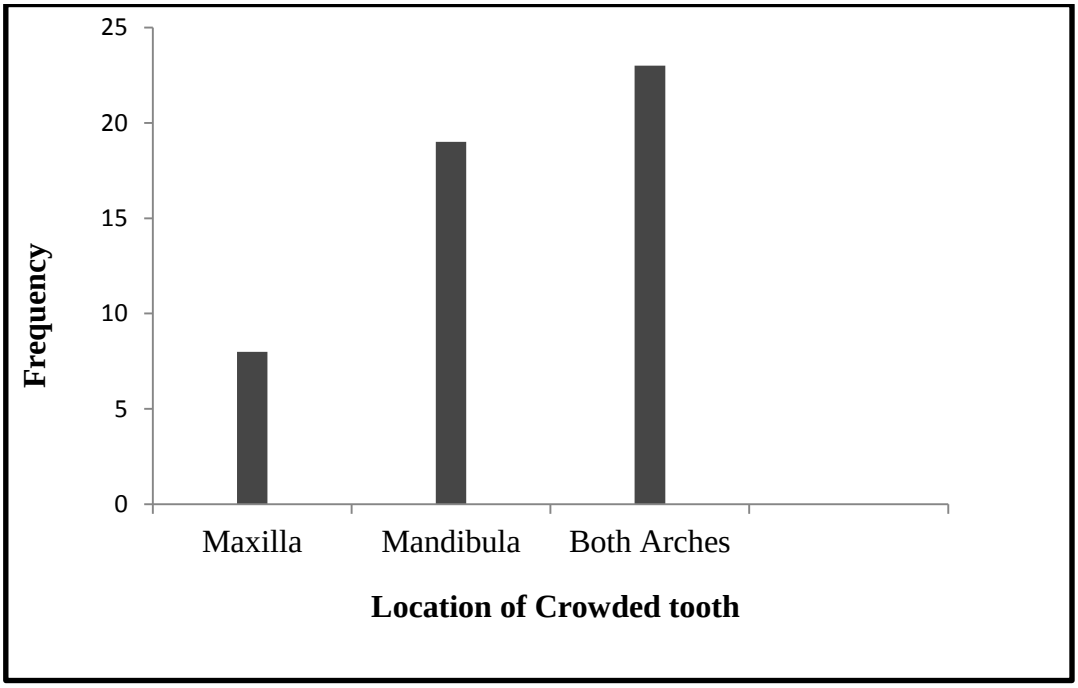


Figure 3. Distribution of crowded teeth location among students in government high school Medan.

Besides observing the tooth position, this research also examines the oral hygiene status of the subjects. Furthermore, oral hygiene examination of the samples was measured using the OHI-S method by measuring the debris and calculus index using mouth mirror on the specific surface of the tooth such as the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, the lingual surface of tooth 36 and 46. The examination was carried out by placing the explorer on the 1/3 incisal or occlusal area of the tooth and moves towards 1/3 gingival or cervical. The score of debris and calculus index were recorded on the examination sheet. The average score of OHI-S and oral hygiene status of subjects with normal or crowded teeth can be seen in table 2.

Table 2. Average OHI-S Score and Oral Hygiene Status of students in government high school Medan with normal and crowded teeth.

Tooth Status	**N**	**Average OHIS score**	**Category Status *Oral Hygiene***
Normal	50	0,66	Good
Crowded	50	1,33	Moderate

Table 2 shows that the average OHI-S score and oral hygiene status of students in government high school Medan with normal or crowded teeth. The average OHI-S score in normal tooth arrangement was obtained by adding the total OHI-S score of students with normal tooth arrangement and then divided by total number of students with normal tooth arrangement. The average OHI-S score in crowded teeth was obtained by adding the total OHI-S score of students with crowded teeth and then divided by the total number of students with crowded teeth. OHI-S score was obtained by adding the plaque and calculus index on every specific area of the tooth. Plaque index was calculated by adding the plaque score on the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, the lingual surface of tooth 36 and 46 and then divided by six. Calculus index were obtained by adding the calculus score on the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, the lingual surface of tooth 36 and 46 and then divided by six.

After obtaining the OHI-S score, oral hygiene status of the samples was categorized. Score for good category (0.0-1.2), moderate category (1.3-3.0) and severe category (3.1-6.0). Table 2 shows that students with normal tooth arrangement had an average OHI-S score of 0.66 and was categorized as good oral hygiene status. Students with crowded teeth had an average OHI-S score of 1.33 and was categorized as moderate oral hygiene status. Observation result of normal or crowded teeth and oral hygiene status were analyzed using chi square test. Chi square test was used to identify whether there is a relationship between crowded teeth and oral hygiene status among the samples. Results of Chi square test are as shown in table 3.

Table 3. Chi square test results

Tooth Status	**N**	**Average OHI-S score**	**Statistic Results**
Normal	50	0,66	0,004
Crowded	50	1,33	

Based on the above table, chi-square test shows that significant value of 0.004. This result shows that significant value of 0.004<0.05, which means that null hyphotesis is rejected. Based on this statistical analysis, it can be concluded that there is a relationship between the two variables. This shows that there is a relationship between crowded teeth and oral hygiene status among the students government high school Medan.

4. Discussion

Crowded teeth is a condition which tooth are not in the normal arrangement. Crowded teeth seldom occurs in deciduous dentition. Condition such as crowded teeth often be seen in permanent dentition.[5] Crowded teeth happens when there is a disharmony between available basal arch length and arch length needed for good arrangement of tooth.[24] Condition such as crowded teeth possesses problems to the patient. Crowded teeth is difficult to be access with tooth brushing because food debris in interdental region is difficult to access with tooth brush which leads to plaque accumulation dan calculus formation. This will further cause dental caries and gingivitis or even further destruction of periodontal tissue which leads to tooth mobility.[5-8,15-16]

The aim of this research is to examine the relationship between crowded teeth and oral hygiene among urban population in Medan in 2016. This research was conducted by observing the form of occlusions from the samples. Besides that, oral hygiene examination of the samples was measured using the OHI-S method by adding debris and calculus index of the tooth measured. Debris index was obtained by adding the debris score on the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, lingual surface of tooth 36 and 46 and divided by six. Calculus index was obtained by adding the calculus score on the buccal surface of tooth 16 and 26, the labial surface of tooth 11 and 31, the lingual surface of tooth 36 and 46 and divided by six. After obtaining the OHI-S score, oral hygiene status of the samples was categorized. Score for mild category (0.0-1.2), moderate category (1.3-3.0) and severe category (3.1-6.0).[20-22]

Based on the results of this research, students diagnosed with crowded teeth were 46% (23 samples) of male and 54% (27 samples) of females. Crowded teeth in both arches were found 46% (23 samples). This results agrees with the findings by Altriany (2013) in study program of Faculty of Dentistry in University of Sam Ratulangi which stated that crowded teeth happens more often in both arches. [5] Research conducted by Vishwas stated that crowded teeth are more likely to happen in female compared to male.[6]

This research also shows that students with normal tooth arrangement have average OHI-S score of 0.66 and categorized as good oral hygiene status. Students with crowded teeth have average OHI-S score of 1.33 and categorized as moderate oral hygiene status. This results of this research were in line with the findings by Asmawati in 2014 of the students of SMP PAB 5 Patumbak. Based on that research stated that the occurrence of plaque accumulation were more likely in crowded teeth as there are areas in oral cavity which are difficult to be accessed by tooth brushing.[7] The results of this study were supported by the findings of Altriany which stated that most of the subjects with crowded teeth in both arches (66.67%) have moderate oral hygiene.[5]

Moderate oral hygiene status in subjects with crowded teeth were caused by difficulty in maintaining oral hygiene. The results of this study were in line with the findings of Rosihan which stated that the characteristics of malocclusion especially crowded teeth cause trapping of food debris between the teeth which makes it difficult during tooth brushing and this condition was worsen when the food debris was accumulated by bacteria and turns to plaque which were more difficult to get rid.[4]

Based on the chi-square results, it can be concluded that there was a relationship between both study variables. The results showed that there was a relationship between the crowded teeth and oral hygiene status among students in the government high school in Medan. This results were supported by the findings by Altrainy which stated that crowded teeth may be causing problems to the patient. Crowded teeth were difficult to clean by tooth brushing because areas such as interdental in crowded teeth were difficult to be access by tooth brush which leads to plaque accumulation and calculus formation. Plaque and calculus can trigger the incidence of caries.[5] This is also supported by the findings of Jennifer which stated that subjects with crowded teeth on both arches possess higher DMFT (decay, missing, filling tooth) score.[8]

Continuous motivation and instruction were very much needed on high school students especially those with crowded teeth because the results of the research showed that crowded teeth condition possesses moderate oral hygiene status. Oral hygiene can be maintained by tooth brushing, tissue stimulation, hydrotherapy and other procedure which helps to maintain oral health.[19,29,30] Students with crowded teeth were supposed to maintain their oral hygiene with the combination of three techniques such as correct method of tooth brushing, usage of mouthwash and flossing.[26,29,30] Flossing is recommended as it can access areas which are inaccessible by tooth brush. This method is beneficial to reach the areas of crowded teeth which are inaccessible by tooth brush.[30]

Besides maintaining oral hygiene with different methods, orthodontic treatment is the best way to overcome crowded teeth. Correct orthodontic treatment can restore crowded teeth into their normal arrangement.[2,24] Plaque control can be easily carried out when the tooth are in their normal

position in the arch. Normal teeth arrangement permits the tooth brush to reach every surface of the tooth in order to eliminate all the plaque and calculus.[7]
Regular maintenance of oral hygiene is very much needed by attending regular dental check up minimum once every six months. Regular dental check up are able to achieve early diagnosis. Inaccessible plaque and calculus during in home plaque control can be eliminated by regular scaling procedure and favourable for subjects with normal or crowded teeth to maintain optimal oral hygiene.[25] From this study, we found that crowded teeth were correlated with oral hygiene and it plays important role in motivation for the subjects with crowded teeth to maintain their oral hygiene and to pursuit orthodontic treatment to restore normal tooth arrangement in order to manage their oral hygiene easily.

5. Conclusion

This study shows significant correlations between the crowded teeth and oral hygiene among the urban population in Medan.

Reference

[1] Foster TD 2014 *Buku Ajar Ortodonsi* (Jakarta: EGC) p 22-39.

[2] Singh G 2007 *Textbook of Orthodonti* (New Delhi: Jaype) p 159-208.

[3] Proffit WR 2007 *Contemporary Orthodontics* (Canada: Elseivier) p 1-18.

[4] Sasea A, Lampus BS, Supit A 2013 *Gambaran status kebersihan rongga mulut dan status gingiva pada mahasiswa dengan gigi berjejal*. J e-gigi 1 (1) 52 -58.

[5] Bunsai V, Priyanka V, Bunsai, Anggarwai S, Butra M, Gupta M 2013 Tooth size in crowded and spaced dentition among Wastern Uttar Pradesh population: a biometric study). J of International Scientific Study 1(3) 81-88.

[6] Asmawati, Hamsar A, Nurhamidah 2014 Indeks plak antara gigi berjejal dengan tidak berjejal setelah menyikat gigi pada siswa-siswi SMP PAB 5 Patumbak tahun 2014. Jurnal Ilmiah Pharmacist, Analyst, Nurse, Nutrition, Midwifery, Environmental, Dentist 9(2):10-106.

[7] Jennifer L, Caplin, Clara A, Evans, Ellen A, Begole 2015 The Relationship between caries and maloclusiion in Chinese migrant workers children in Shanghai. The Chinese J of Dental Research 18(2) 103-110.

[8] Beaglehole R, Benzian H, Crail J, Mackay J. 2009. *The oral health atlas*: mapping a neglected global issue. Geneva: FDI World Dental Federation. p. 96–103.

[9] Dewi O 2008 *Analisis hubungan maloklusi dengan kualitas hidup pada remaja SMU kota Medan tahun 2007* Tesis. Medan: Program Pascasarjana Universitas Sumatera Utara 100-99.

[10] Adhani R, Kusuma RH, Widodo, Rianta S 2014 Perbedaan Indeks plak atara maloklusi ringan dan berat pada remaja di Ponpes Darul Hijrah Martapura J. Dentino 2(2) 14-17.

[11] Dalimunte SH 2008 Terapi Periodontal. Medan: Departemen Periodonsia FKG USU, p 55-57.

[12] Dalimunte SH 2006 Terapi Periodontal. Medan: Departemen Periodonsia FKG USU, p 293.

[13] WHO. OHI-S (Simplified) Green and Vermillion 1964. [serial online]. http://www.whocollab.od.mah.se/expl/ohisgv.html. [26 Mei 2014].

[14] Abbas Assad, Syed IB, Abbas H, Malik F 2015 Prevalence of malocclusion and its relationship with dental caries in a sample of Pakistan school children. Journal of Pakistan Oral and Dental 35(2) 216-219.

[15] Majid ZS 2015 Effect of malocclusion on oral health related quality of life. J Scientific 11(21) 386-400.

[16] Fejerskov O, Kidd E 2008 Dental Caries the Disease and its Clinical Management. (England: Blackwell Munksgaard Ltd) **2** 252.

[17] Imail P 2012 Comparison of interdental brush to dental floss forreduction of clinical parameters of periodontal disease: A systematic review. Can J of Dental Hygiene 46(1**)** 63–78.

[18] Bhalaji Sundaresa Iyyer 2006 Orthodontics The Art and Science (New Delhi : Arya (MEDI) Publishing House) 1-109.

[19] Turkaslan Suha 2009 Esthetic rehabilitation of crowded maxillary anterior teeth utilizing ceramic veneers: a case report. Cases Journal 2009; 2 832.

[20] Bernes C 2005 Comparison of irrigation to floss as an adjunct to tooth brushing: Effect on Bleeding, Gingivitis, and Supragingival Plaque. J of Clin Dent. **16** 71-77.