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# The Correlation Between Dental Crowding and Oral Hygiene Status Among Urban Adults at Dijlah University College

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## Abstract

**Aim of the study:** Dental crowding is a frequent feature of malocclusion, which is characterized by a reduction in the arch perimeter resulting in teeth displacement and rotation. The difficulty with cleaning crowded teeth leads to plaque accumulation and predisposes to the development of dental caries and periodontal disease. The study aims to investigate any potential relationship between dental hygiene and crowded teeth.

**Material and method:** This is an analytical cross-sectional study. The investigation was conducted in the dental department at Dijlah University College with a total number of samples of 200 subjects: 50 male and 50 female participants with normal aligned teeth, in addition to 50 male and 50 female participants with crowded teeth who are between 18-24 years of age. The crowding status (moderate and severe) was assessed clinically to determine tooth alignment. While the oral hygiene condition was evaluated using the Oral Hygiene Index Simplified (OHI-S) index.

**Results:** Independent samples T-test was applied to evaluate the data. According to the results of the current study, the average OHI-S score for subjects with normally aligned teeth is 1.55 while individuals with a crowding status display an average OHI-S score of 1.748. The study's findings indicate that there is no significant correlation (p-value=0.315) between dental crowding and oral hygiene.

**Conclusion:** According to the results of this study, teeth irregularities and crowding had no effect on oral hygiene.

**Keywords:** Crowding, malocclusion, oral hygiene, periodontal diseases, plaque.

## Introduction:

Dental crowding, sometimes called swarming, is defined as a mismatch between the size of teeth and the arch's dimensions that results in malocclusion. It is extremely difficult to clean teeth that are crowded, which leads to poor oral hygiene and additional dental and medical problems. The effect of genetic and environmental factors on dental arch measurements like width, length, and circumference can result in the development of dental crowding. Additionally, the mesiodistal tooth width is influenced by heredity, race, and gender (Das et al., 2017). However, there is still much to know about the causes of overcrowding (Hussain et al., 2014). Large teeth, bony bases, and the growth pattern toward smaller face skeleton dimensions could result in teeth-arch discrepancy, dental maturation and facial growth are not necessarily synchronous and may contribute to teeth crowding (Yan-Vergnes et al., 2013). The size of the teeth and dental arches affect the space availability for the dentition resulting in either crowding or spacing (Mustafa and Abuaffan, 2021), both of which are influenced by genetic and developmental factors in varying degrees (Lin et al., 2023).

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The purpose of the current study was to assess the oral hygiene status of individuals (dental students and patients) using the Simplified Oral Hygiene Index (OHI-S) in the dental department at Dijlah University College with crowding and normal occlusion to find if there is a correlation between crowding and oral hygiene.

**Methodology**

The institutional ethical committee at Dijlah University College permitted to begin this research (reference number: 3 date: January 2024) which was intended to be an analytical cross-sectional study. 200 individuals (dental students and patients) at Dijlah University College, ages eighteen to twenty-four, made up the sample. Every person who is younger or older, from another country, who has received orthodontic treatment in the past or is now receiving it, who has had extractions of teeth in the past—apart from the third molars—who did not provide informed consent to be included in the study were excluded from the study.

The clinical examination was conducted in the orthodontic clinic located on the fourth floor of the dental department's teaching hospital at Dijlah University College. The sample was examined from January to April of 2024. The researcher collected demographic data from the participants, such as age, gender, and nationality, by asking them to fill out a particular case sheet.

The intra-oral examination is next performed to evaluate each person's oral hygiene status and crowding utilizing a dental mirror, periodontal probe, and dental probe.

The dental crowding was assessed by clinical examination of the dental arch when there was a disparity between the length of the arch and the substance of the teeth that was greater than 4 mm, cases with moderate and severe crowding (greater than 4 mm) had been included in the sample.

By measuring the Oral Hygiene Index Simplified (OHI-S), which consists of the calculus index and plaque (debris) index, the oral hygiene status was evaluated. To perform the assessment, the periodontal probe was placed on the incisal or occlusal 1/3 of a tooth and then carefully moved to the gingival or cervical 1/3 and according to the quantity of deposit (plaque and calculus) on each tooth surface; a numerical value range from 0-3 was given.

Oral Hygiene Index Simplified (OHI-S) = plaque (debris) index (DI) + calculus index (Cl)

After that, we compute the sum of degrees assigned for each Plaque and calculus index individually. The result is then divided by the total number of surfaces that were checked.

Next, by combining the calculus index (CI) and debris index (DI), we obtain the oral hygiene index simplified (OHI-S)

If teeth needed for examination were missing or had fillings or caries, the next tooth was used in its place. The first molars were replaced by the second molar, and the central incisor on the opposite side served as a substitute for the central incisors.

**Statistical analysis**

Statistical Package for the Social Sciences (SPSS) USA version 20.0 was used to evaluate the data. For each variable, the mean and standard deviation values were calculated

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as part of the descriptive statistics computation.

Independent samples T-test was used to see if there was a significant relationship between dental alignment and oral hygiene by comparing OHI-S mean values between crowding and non-crowding groups. The level of statistical significance was set at ≤ 0.05.

**Results**

The total number of participants in this study is 200, comprising 100 individuals with non-crowded teeth (50 male and 50 female) and 100 persons with crowded teeth (50 male and 50 female).

Distribution of samples according to the alignment of teeth, mean and standard deviation values for OHI-S were displayed in table 1.

**Table 1:** Distribution of individuals according to alignment of teeth, mean, and standard deviation values for OHI-S

| | group | No. | Mean | Std. Deviation |
|---|---|---|---|---|
| Debris index | Crowding | 100 | 1.222 | 0.6001 |
| | Non-crowding | 100 | 1.074 | 0.6010 |
| Calculus index | Crowding | 100 | 0.526 | 0.5907 |
| | Non-crowding | 100 | 0.502 | 0.4838 |
| OHI-S | Crowding | 100 | 1.748 | 1.0436 |
| | Non-crowding | 100 | 1.550 | 0.9203 |

The values are given as mean and Standard Deviation (SD). No: number of individuals

Based on statistical analysis, the study's findings indicate that there is no significant correlation between dental hygiene and crowded teeth (p-value = 0.315). Table 2 displays the results of the T-test and p-values for debris index, calculus index, and OHI-S to determine the link between dental alignment (crowding & non-crowding) and oral hygiene.

**Table 2:** T-test results and p-value for debris index, calculus index and OHI-S between crowding &non-Crowding groups

| | group | No. | T-test | P-value |
|---|---|---|---|---|
| Debris index | Crowding | 100 | 1.2333 | 0.218 |
| | Non-crowding | 100 | | |
| Calculus index | Crowding | 100 | 0.2223 | 0.824 |
| | Non-crowding | 100 | | |
| OHI-S | Crowding | 100 | 1.0066 | 0.315 |
| | Non-crowding | 100 | | |

Significant Difference ($p \leq 0.05$) No: number of individuals

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Dental crowding makes it challenging to maintain oral hygiene since the interdental areas are difficult to access leading to food debris accumulation in these areas which cannot be removed by regular brushing, resulting in plaque and calculus formation that in turn causes gingivitis and dental caries. The findings of this study indicate that there was no significant correlation between oral hygiene and crowded teeth (p-value 0.315). This finding comes in agreement with a study conducted by Manoharan and Aravindkumar in 2020 in India, who showed that patients who have crowded teeth were more likely to practice appropriate dental hygiene and that dental abnormalities could not impede patients from maintaining good oral hygiene (Manoharan and Aravindkumar, 2020). Another study conducted by Abu Alhaija and Al-Wahadni in 2006 showed no association between irregularity of teeth and periodontal diseases (Abu Alhaija and Al-Wahadni, 2006). These findings indicate that oral hygiene is governed by many structural and behavioral factors, with a differential impact on one factor at the expense of others. In other words, the willingness of individuals to achieve good oral hygiene acts as a motivator to recruit more time and effort even in the presence of dental irregularities which may complicate oral hygiene maintenance procedures, in comparison to individuals with well-aligned teeth who show the prevalence of dental caries and periodontal diseases in spite of normal alignment because of poor oral hygiene. Furthermore, Shah and his colleagues carried out a study in a private dental hospital in 2020; they reported that the prevalence of gingivitis among moderately crowded dental arches was found to be 2%, and it was not statistically significant (Shah et al., 2020). However, a different study found that only severe crowding in the anterior area of the dental arch was significantly correlated with plaque production and periodontal problems (Bernhardt et al., 2019).

On the other hand, numerous studies have showed inconclusive (Bahirrah, 2018; Gul, 2023) found a significant correlation between dental health and crowded dentition, these findings could explain why it is more difficult to maintain proper dental hygiene when there are teeth irregularities. Because it is challenging to brush teeth that are misaligned within the dental arch, plaque and calculus buildup results. Consequently, Periodontal disease results in early tooth loss in young adults (Bahirrah, 2018; Gul, 2023). In a study conducted by Salim and her colleagues in 2021, they found that crowding is highly

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associated with poor oral hygiene and even moderate crowding showed higher OHI-S compared to mild or no crowding cases (Salim et al., 2021). Another study suggested that crowded areas of the dental arch can promote microbial colonization since they offer them a nourishing and reproducing environment, even with regular dental hygiene care (Rafiei et al., 2022).

The findings of our study could be attributed to the small sample size (only 200 individuals), which could not be representative enough for the community. Furthermore, the majority of the individuals included in this study are dental students since the study was conducted in the dental department at Dijlah University College. The awareness of dental students about the importance of oral hygiene maintenance is relatively higher in comparison to non-dental students (Li et al., 2020); in other words, those students because of their academic field became more motivated and allocated more time and effort in teeth brushing and flossing achieving a relatively high level of oral hygiene with less chance of developing gingivitis and periodontitis even in presence of malocclusion or any other plaque retentive factors. The fact that OHI-S records obtained at a certain point in time did not always accurately reflect the oral health condition of the individual is another issue that could have an impact on the current study's findings (Gul, 2023).

## Conclusion

According to the findings of the current study, crowded teeth and oral hygiene do not significantly correlate. Malocclusion and teeth irregularities could aid in plaque retention compromising oral hygiene; however, oral hygiene is a multifactorial status that results from the collaboration of structural and behavioral contributors which have different impacts on overall health status. Accordingly, crowding has no effect on oral hygiene.

## Supplementary Material

None.

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## Data Availability Statement

Data are available from the authors upon reasonable request.

## Conflict of interest

The authors reported that they have no conflicts of interest.

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