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*Research Article*

## INCIDENCE OF MALOCCLUSION AND REQUIREMENT OF ORTHODONTIC TREATMENT IN DOWN SYNDROME PERSONS

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**Abstract:**

***Aim:** To determine the incidence of malocclusion and the need for orthodontic treatment in people with Down syndrome.*

***Place and Duration:** This is a cross-sectional, descriptive environmental study on people with Down syndrome held in the Orthodontic department of Punjab dental Hospital, Lahore for one-year duration from March 2019 to March 2020.*

***Material and methods:** A total of 75 (37 men and 38 women) people with Down's syndrome aged 6-28 years were clinically examined after obtaining the consent of the caregiver, malocclusion was determined based on the classification of angles and incisors. Exclusion criteria included people who had a history of extraction and orthodontic treatment. Data were analyzed using SPSS version 17, with an alpha level of 0.05 and 95% confidence limits.*

***Result:** Class III malocclusion and incisor III defect represent the most common type of malocclusion (58.7%) Angle classification, (53.3%) Incisor classification. Malocclusion of the angular class III was more frequent in women (60.5%) than in men (56.8%). Most people with Down's syndrome require orthodontic treatment (85.3%).*

***Conclusion:** The incidence of malocclusion and the need for orthodontic treatment among people with Down syndrome was high. Class III malocclusion of the angle and incisor, which is the most common feature of malocclusion, is more common in women than in men.*

***Key words:** Down syndrome, class III malocclusion, orthodontic treatment*

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## INTRODUCTION:

Down syndrome (DS) is a genetic disease caused by an extra 21 chromosome or sometimes caused by duplicate small regions of the chromosome. Affecting 1 in 800-1100 births, Down syndrome is the leading cause of mental retardation and congenital heart defects. It also produces distinct facial features and physical features, Down's syndrome has been associated with congenital gastrointestinal malformations, an increased risk of leukemia, immune system defects and Alzheimer's-like dementia<sup>1-2</sup>. Down's syndrome was first described in 1866 by Dr. John L. H. Down, patients with Down's syndrome have many dental conditions that can be considered for orthodontic treatment. People with Down syndrome have some unique features: systemic anomalies that include arterial septal defects, patent ductus arteriosus, lymphopenia, eosinopenia, leukemia, increased ligament laxity, underdeveloped middle face, delayed motor function, dementia, natural spontaneity, true warmth, gentleness, patience, tolerance, ventricular septal loss and few patients report restlessness and stubbornness. Oral anomalies include; reduction in the length, height and depth of the palate, hypotonic tongue, chapped tongue, chapped tongue and macroglossia<sup>3-4</sup>.

Dental abnormalities include delayed eruption of primary teeth up to a year or more instead of about six months, delayed eruption of permanent teeth, reduction in tooth size, presence of spacing due to small tooth sizes, missing teeth, poor alignment, microdontia hypoplasia, partial anodontia, supernumerary teeth, hypothalamus spacing, taurodontism, variants of crowns, difference in the order of tooth eruption, growth deficiency in the upper arch, and bruxism.

Occlusion is defined as the way the upper and lower teeth intertwine with each other in all positions and movements of the lower jaw. It is the result of the neuromuscular control of the masticatory system elements, namely: teeth, periodontal structures, maxilla, mandible, temporomandibular joints and related muscles and ligaments<sup>5-6</sup>.

The term malocclusion was first coined by Guilford and affects most of the population. It is not normal or unhealthy. One major cause of malocclusion is difficult to prove as it develops slowly as a child grows and the development of occlusion is very susceptible to many influences. A malocclusion is defined as an anomaly that disfigures or disrupts functioning and requires treatment if the disfigurement or functional

defect could have been an obstacle to the patient's physical or emotional well-being<sup>7-8</sup>. Malocclusion may be related to one or more of the following: incorrect positioning of individual teeth in each arch, incorrect alignment of the dental arches in relation to the normal bite; (In the anteroposterior, vertical, or transverse planes). In the twenty-first century, researchers proposed two broad theories explaining the causes of malocclusion; genetics and the role of the environment<sup>9-10</sup>.

Proffit and McDonald suggested that crowding and misalignment are mainly due to inherited tendencies that determine facial proportions and soft tissue contour, as well as teeth and jaw size. Mild to moderate degree of mismatch may occur even in the absence of habit or environmental factors, however, extreme crowding likely has both a genetic component and an environmental component.

## Classification of malocclusion

Different methods of classifying malocclusion are needed for different purposes. The clinical categorization requirements differ from the epidemiological requirements. Several types of indicators describing malocclusion have been developed; collect epidemiological data (which measure bite characteristics), bite classification (Angle classification), priority need for treatment - oral health needs, index of orthodontic treatment needs, treatment success (which compares pre- and post-orthodontic treatment records and records quality of outcome) and the dental arch relations (which classifies the dental arch relations in children with unilateral complete cleft lip and palate).

The need for treatment depends on the aesthetics and whether the procedure is harmful to the health of the teeth and supporting structures. Therefore, this study aimed to determine the incidence of malocclusion and the need for orthodontic treatment in a sample of people with Down syndrome.

## MATERIALS AND METHODS:

This is a cross-sectional, descriptive environmental study on people with Down syndrome held in the Orthodontic department of Punjab dental Hospital, Lahore for one-year duration from March 2019 to March 2020. All people with Down syndrome whose parents consented to participate in the study and signed their consent were included in the study. The clinical examination was conducted in the teachers' office sitting in a chair in front of the investigator and data sheets were completed for each. People who had

problems with teeth, malocclusions or poor oral hygiene were referred to the dental clinic for appropriate treatment. The sample included all people with Down's syndrome attending special needs centers, except those who received or received orthodontic treatment. The following criteria were used to assess the type of malocclusion.

#### Angular classification of malocclusion

**Class I:** Correct alignment of molars but incorrect occlusal line due to faulty teeth, rotation or other causes.

**Class II:** Lower molar distal to the upper molar.

**Class III:** Lower molar mesially located in relation to the upper molar.

#### Classification of malocclusion incisors

**Class I:** The lower edges of the incisors are below the rim of the upper central incisors.

**Class II:** The edges of the lower incisors are located behind the gyrus plateau of the upper middle incisors:

**Division 1:** arched upper incisors and increased above the stream

**Division 2:** Upper incisors sloped and reduced over the stream.

**Class III:** The edge of the lower incisors lies forward from the plateau of the rim of the upper incisors, with a reduced or inverted stream.

Data were analyzed by a specialized statistician using the Social Science Statistical Package (SPSS) version 17, with an alpha level of 0.05 and 95% confidence limits.

#### RESULTS:

The total number of people with Down's syndrome was 98, three received orthodontic treatment, and 20 individual parents refused to keep a consent form. Therefore, the number in the current study was 75 people; 37 (49.3%) men and 38 (50.7%) women. The age range of the study group was 6-23 years. Table 1 shows that the most common type of malocclusion according to the Angle classification was class III malocclusion in all age groups, followed by class II malocclusion, although no significant relationship was found between Angle classification and age group. Table 2 shows that angular class III malocclusion was the most common malocclusion in women (60.5%) compared to men (56.8%), although no significant association was found. Table 3 shows that the malocclusion of class III incisors was the highest type (58.1%) among all age groups in class II, but no significant association was found. Table 4 shows that class III incisors were the most common among both sexes, 54.1% in males, 52.6% in females, followed by Class I and II malocclusions, but no significant association was found.

#### Data management and analysis:

Table 1: Distribution of Angle classification in the different age groups

Angle classification	Age group			Total
	6 - 11 years	12 - 17 years	18 - 23 years	
Class I	2 (6.5%)	6 (20.0%)	1 (7.1%)	9 (12.0%)
Class II	10 (32.3%)	6 (20.0%)	6 (42.9%)	22 (29.3%)
Class III	19 (61.3%)	18 (60.0%)	7 (50.0%)	44 (58.7%)
Total	31 (100%)	30 (100%)	14 (100%)	75 (100%)

Table 2: Distribution of Angle classification among gender groups

Angle classification	Gender		Total
	Male	Female	
Class I	6 (16.2%)	3 (7.9%)	9 (12.0%)
Class II	10 (27.0%)	12 (31.6%)	22 (29.3%)
Class III	21 (56.8%)	23 (60.5%)	44 (58.7%)
Total	37 (100%)	38 (100%)	75 (100%)

Table 3: Incisor classification in different age groups

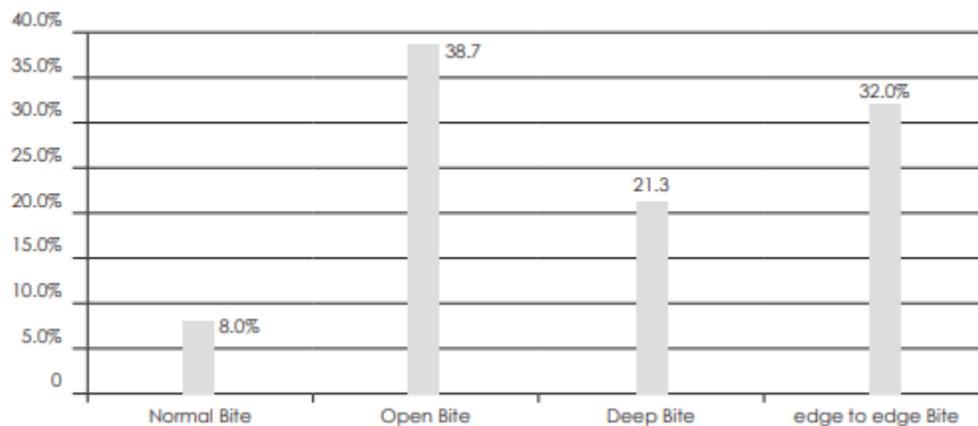
Incisor classification	Age group			Total
	6 - 11 years	12 - 17 years	18 - 23 years	
Class I	2 (6.5%)	9 (30.0%)	1 (7.1%)	12 (16.0%)
Class II	11 (35.5%)	6 (20.0%)	6 (42.9%)	23 (30.7%)
Class III	18 (58.1%)	15 (50.0%)	7 (50.0%)	40 (53.3%)
Total	31 (100%)	30 (100%)	14 (100%)	75 (100%)

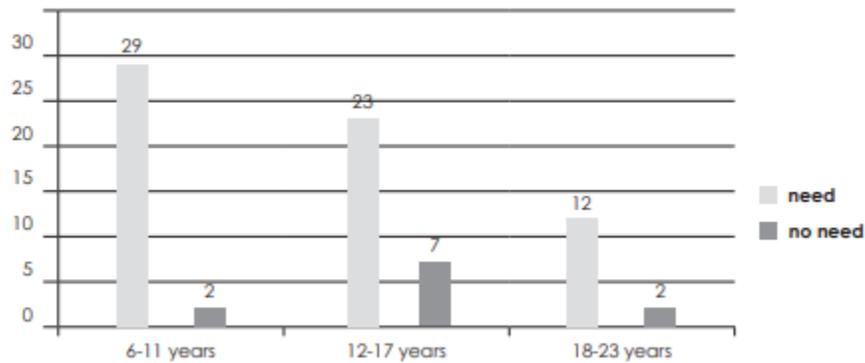
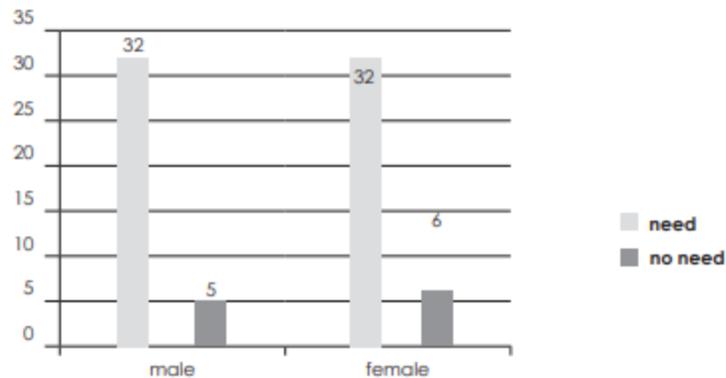
Table 4: Incisor classification among gender groups

Incisor classification	Gender		Total
	Male	Female	
Class I	7 (18.9%)	5 (13.2%)	12 (16.0%)
Class II	10 (27.0%)	13 (34.2%)	23 (30.7%)
Class III	20 (54.1%)	20 (52.6%)	40 (53.3%)
Total	37 (100%)	38 (100%)	75 (100%)

Figure 1 shows that a vertical malocclusion in the subjects with Down syndrome; The open bite was 38.7% and the edge-to-edge bite was 32.0%, and only 8% had a normal bite. Figure 2 shows the frequency of people requiring treatment in each age group. Figure 3 shows that out of the 37 male subjects, 32 require treatment, and of the 38 female subjects, 32 also require treatment.

Figure 1: Vertical malocclusion among Down syndrome individuals.



**Figure 2: Distribution of orthodontic treatment need in different age group with Down syndrome****Figure 3: Orthodontic treatment need for Down syndrome individual in both genders.****DISCUSSION:**

The aim of the study was to determine the frequency of malocclusion and the need for orthodontic treatment in people with Down syndrome. The small number of people with Down's syndrome in special care facilities may be partly due to a lack of knowledge of the syndrome itself in the population, and most parents prefer to keep their child at home for safety and better care than at court. The present study showed that the dominant angle classification in people with Down syndrome was class III malocclusion (58.7%), and the percentage of open bite (38.7%), which is consistent with the studies by Folakemi and Yink<sup>10-12</sup>. In the population of Nigeria and Croatia, where angle class III malocclusion was reported (60%) and (43.8%), and the percentage of an open bite was (8%). 19.20 However, a very high percentage (70%) of class III malocclusion has been reported in Saudi Arabia<sup>13</sup>. The rate of Class III malocclusion among the normal population was very low (3%). The fact that class III malocclusion is the predominant feature in the Down syndrome population. In the studies conducted so far, the incidence of malocclusion was very high (85.3%). A slightly smaller percentage (74%) was

recorded in Rio de Janeiro, and in Amman, Jordan - 45.3%. In Nigeria, Onyeaso reported that only 17% of people with Down syndrome had pronounced malocclusion during elective treatment, 9% had severe orbital malocclusion, and treatment was highly desirable, and 32% had very severe or disabling malocclusion with treatment considered as obligatory. In addition, southern Canara, India has a low percentage (24%) of orthodontic treatment needs<sup>14</sup>.

Differences in outcomes between people with Down's syndrome and healthy people across all classifications of malocclusion may be due to known skeletal diseases in people with Down's syndrome, while differences in outcomes between people with Down's syndrome in different countries can be partly attributed to differences in age groups, gender, geographic area, environmental factors and ethnic origin<sup>15</sup>.

**CONCLUSION:**

There was a high frequency of malocclusion and the need for orthodontic treatment among the respondents with Down syndrome. The angle and incisor of the 3rd

class malocclusion, representing the most common trait, more common in women than in men. A comprehensive survey should be conducted to understand the overall prevalence of people with Down's syndrome, as well as the malocclusion and need for treatment. Healthcare facilities should pay particular attention to people with disabilities and should establish dental awareness and oral hygiene information education programs for parents and teachers in special needs centers to give people with Down syndrome more attention. Mental or physical limitations should not be an obstacle to dental treatment. It should be necessary to determine the degree of malocclusion, identify the consequences of the lack of treatment, and establish the goals and results of treatment.

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