

Malocclusion in Individuals with Mental Subnormality-A Review

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Abstract

The occurrence of malocclusion in individuals with mental disability poses an additional obstacle to social acceptance; not only from an esthetic point of view, but also in that it compromises all aspects of oral function. This review examines the reported prevalence of malocclusion in individuals with mental subnormality including Down syndrome, from 1981 to 2013, assessed according to Angle's classification, the Dental Aesthetic Index (DAI), the Index of Orthodontic Treatment Need (IOTN) and certain malocclusions.

Although widely reported in many studies, it is still quite difficult to compare the exact proportion of occlusal anomalies and orthodontic treatment need among mentally challenged individuals. This is due partly to the multiplicity of measurement methods and the difficulty in standardizing criteria. Several studies have reported higher prevalence of malocclusion including anterior open bite, anterior cross bite, severe malocclusions in mentally challenged individuals, especially those with Down syndrome. The findings have been varied and attributed to musculoskeletal abnormalities, altered cranial-base relationships, premature tooth loss or eruption, lip incompetence, etc.

Future research needs to be devoted to determining exactly why malocclusion is higher among individuals with mental subnormalities. It will be a challenge to identify the preventable factors among multiple complex etiologies to reduce these disparities.

Key Words: Malocclusion, Mental subnormality, Down syndrome, Disability, Orthodontic treatment need

Introduction

Mental subnormality is a human problem, which takes its toll in many ways. The inappropriate stigma attached to and the stereotyped images of children with mental subnormality influence their daily lives and may affect the implementation of needed health services, including orthodontic care. The fact is the need for functional and esthetic considerations of those individuals with mental disabilities is comparable to that of normal [1].

Oral health disparities between individuals with mental subnormality and the general population are widely reported in the literature and malocclusion is no exception. As the number of individuals living with mental disabilities grows, so does the need to explore their oral health status. Individual's oral health status affects their overall physical health, oral function, ability to communicate and ultimately, quality of life. Maintaining the oral health of individuals with mental disabilities, in particular, is a challenge because these individuals may engage in involuntary behaviors that adversely affect their oral health, be unable to actively participate in oral hygiene, and face many barriers to their dental care [2].

Malocclusion in individuals with mental disability poses an additional obstacle to social acceptance, not only from an esthetic point of view, but also compromises all aspects of oral function, such as mastication or swallowing patterns [3]. Although a number of studies have examined specific types of malocclusion in certain disability groups, an extensive review of malocclusion and orthodontic treatment needs in individuals with mental subnormality has not been published. Considering the difficulties facing individuals with mental subnormality with regard to basic oral care and the risk of malocclusion, it is important that the prevalence of malocclusion among these individuals be assessed.

Search Methods

Electronic searching was performed using the following databases: National Library of Medicine, Washington, D.C. (MEDLINE-PubMed), the Cochrane Central Register of Controlled Trials (CENTRAL) and EMBASE (Excerpta Medical Database by Elsevier). The search was limited to English language literature published between January 1981 and December 2013, with combinations of the keywords: malocclusion, mental subnormality, mental retardation, Down syndrome, mental impairment, handicap, disability, orthodontic treatment need. Initially, roughly 150 research papers were identified. The search was supplemented by manual searches of the reference lists from each identified paper. Interim reports, abstracts, letters, short communications and chapters in textbooks were excluded from the final review. Of the 150 papers, 22 research papers were selected to provide data for this review, fulfilling the following criteria.

- Human subjects with mental subnormality or a similar intellectual disabilities
- At least one quantitative measure of malocclusion or dentofacial anomalies

The criterion for selection of the studies was the use of Angle's classification of malocclusion, or the Dental Aesthetic Index (DAI), or the Index of Orthodontic Treatment Need (IOTN) to measure malocclusion. Certain malocclusion characteristics like anterior diastema, missing or crowded teeth, increased over jet, deep bite, cross bite, or open bite etc were also used to derive prevalence data.

Edward Angle [4] in 1899 developed a method of classifying malocclusion as a way to prescribe treatment by defining three types of malocclusion i.e., Class I, Class II [divisions 1 and 2], and Class III. For the purpose of this review, data from studies that reported divisions 1 and 2 Class II malocclusions separately are combined.

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The World Health Organization uses the Dental Aesthetic Index, which is based primarily on socially defined esthetic standards, to classify malocclusion [5]. This index uses 10 weighted clinical and aesthetic components that constitute a final DAI score. Resulting DAI scores are then grouped into one of four categories corresponding to the degree of malocclusion and treatment need (*Table 1*). Those individuals with a DAI score of 25 or more are classified as having a malocclusion [6].

The Index of Orthodontic Treatment Need (IOTN), described by Brook and Shaw [7], measures the dental health component separately from the esthetic component. Each component has five grades ranging from grades 1 (no need for treatment) to 5 (very great need for treatment).

In this analysis, the data provided by selected articles were collated and grouped according to the orthodontic

index used and type of subnormality. The terms disabled, handicapped, and impaired were considered equivalent, as were subnormality and retardation. In the resulting analysis, the proportion or percentage of individuals with mental subnormalities, who had malocclusion and specific malocclusion characteristics, was compared across studies and by type or severity of subnormality.

Results

The reported prevalence of malocclusion among individuals with mental subnormality varied from 54 to 84% (*Table 2*), with individuals with Down syndrome showing even higher prevalence; however a study by Asokan [8] reported this prevalence as low as 16.7%. *Table 3* provides the data on proportion of the type of subnormality with Angle's Class I, Class II, or Class III malocclusion. The result indicates that

Table 1. The interpretation of final DAI scores.

Grade	DAI Score	Severity levels	Treatment indication
Grade I	≤ 25	No abnormality or minor malocclusion	No or slight need
Grade II	26-30	Definite malocclusion	Elective
Grade III	31-35	Severe malocclusion	Highly desirable
Grade IV	≥ 36	Very severe or handicapping malocclusion	Mandatory

Table 2. Percentages of mentally subnormal individuals and down syndrome with malocclusion.

Type	Author	Country	Year	Age group	Number of individuals	Malocclusion in %
Mentally subnormal	Muppa et al. [9]	India	2013	6-30	844	71.5
	Onyeaso [10]	Nigeria	2003	12-18	124	58
	Dinesh [11]	India	2003	11-30	178	54
	Mitsea [12]	Greece	2001	6-15	70	57
	Vittek [13]	U.S.A	1994	6-87	458	74
	Nunn & Murray [14]	U.K.	1987	2-19	---	62.5
Down syndrome	Vigild [15]	Denmark	1985	13-19	181	84
	Asokan [8]	India	2008	---	17	16.7
	Bhowate [16]	India	2005	10-14	27	37
	Meštrović [17]	Croatia	2002	2-36	112	92
	Shyama [18]	Kuwait	2001	3-20	183	85
	Vittek [13]	U.S.A	1994	6-87	57	82
	Vigild [15]	Denmark	1985	13-19	37	97

Table 3. Percentages of the type of subnormality in individuals according to Angle's class of malocclusion.

Type of subnormality	Author	Country	Year	Age group	Number of individuals	Class I	Class II	Class III
Mentally subnormal	Vittek [13]	U.S.A	1994	6-87	458	71.6	16.7	11.7
Mild	Vittek [13]	U.S.A	1994	6-87	101	78.2	11.9	9.9
Moderate	Vittek [13]	U.S.A	1994	6-87	142	72.2	19.0	8.8
Severe	Vittek [13]	U.S.A	1994	6-87	215	68.2	17.4	14.4
Down syndrome	Oredugba [19]	Nigeria	2007	<6-20+	43	51	2	47
	Meštrović [17]	Croatia	2002	2-36	112	-	-	43.8
	Vittek [13]	U.S.A	1994	6-87	57	53.7	9.8	36.5

Table 4. Percentage of mentally subnormal individuals in each DAI score category.

Type of subnormality	Author	Country	Year	Age group	Number of individuals	DAI ≤25 Normal or minor	DAI 26-30 Definite	DAI 31-35 Severe	DAI ≥36 Very severe or handicapping
Mentally subnormal	Onyeaso [10]	Nigeria	2003	12-18	124	42.0	17.0	9.0	32.0
Mild	Dinesh [11]	India	2003	11-30	74	40.5	28.4	17.6	13.5
Moderate	Dinesh [11]	India	2003	11-30	52	61.5	15.4	7.7	15.4
Severe	Dinesh [11]	India	2003	11-30	52	38.5	23.1	23.1	15.4
Down syndrome	Shyama [18]	Kuwait	2001	3-20	183	14.8	48.6	36.6	-----

Table 5. Percentage of mentally subnormal individuals with selected malocclusion characteristics.

Type of subnormality	Author	Country	Year	Age group	Number of individuals	Missing tooth (≥ 1)	Crowding (1-2 segments)	Anterior diastema (1-2 segments)	Excessive overjet (>3 mm)	Anterior crossbite (<0 mm)	Anterior openbite (>0 mm)	Deep bite (over bite ≥ 5 mm)	Posterior crossbite (uni/bilateral)	Antero-posterior molar relation ($>1/2$ unit cusp Mesial/ distal)
Mentally subnormal	Muppa et al. [9]	India	2013	6-30	844	-	21.91	-	-	1.77	2.01	16.23	-	-
	Onyeaso [10]	Nigeria	2003	12-18	124	7.0	32.0	53.0	19.0	5.0	16.0	-	-	37.0
	Dinesh [11]	India	2003	11-30	178	-	-	-	53.4	4.5	4.5	-	-	39.3
	Vittekk [13]	U.S.A	1994	6-87	458	-	-	-	9.7	-	12.6	8.2	18.4	-
Mild	Vigild [15]	Denmark	1985	13-19	181	-	-	-	27.0	6.0	23.0	12.0	29.0	-
	Dinesh [11]	India	2003	11-30	74	-	-	-	63.5	4.1	2.7	-	-	50.0
	Vittekk [13]	U.S.A	1994	6-87	101	-	-	-	6.0	-	5.0	17.0	27.0	-
	Dinesh [11]	India	2003	11-30	52	-	-	-	44.2	3.9	1.9	-	-	26.9
Severe	Vittekk [13]	U.S.A	1994	6-87	142	-	-	-	15.6	-	12.0	5.7	14.2	-
	Dinesh [11]	India	2003	11-30	52	-	-	-	48.1	5.8	9.6	-	-	36.5
	Vittekk [13]	U.S.A	1994	6-87	215	-	-	-	7.6	-	16.6	5.7	17.1	-
	Vittekk [13]	U.S.A	1994	6-87	57	-	9.8	-	7.3	-	4.9	-	14.6	-
Down syndrome	Vigild [15]	Denmark	1985	13-19	37	-	-	-	14.0	41.0	38.0	3.0	65.0	-

Angle's Class III was more common among Down syndrome individuals, when compared to non-Down syndrome mentally challenged individuals, as described in the study of Vittek et al. [13].

Table 4 presents data regarding the proportion of individuals with mental subnormalities in each of the four categories of malocclusion treatment need as assessed by the Dental Aesthetic Index. Most of the studies have illustrated that the majority of individuals with mental subnormalities scored below 25 of DAI score, which represents no treatment need. However, Shyama et al. [18] observed that a majority of individuals with Down syndrome had slight (48.6%) or severe (36.6%) malocclusion. Dinesh et al. [11] have reported that the frequency of very severe or handicapping malocclusion increased slightly with increased mental disability (13.5% to 15.4%). Onyeaso [10] found that subjects with mental subnormality had the highest proportion (32%) of malocclusion, scoring above 36 on the DAI, representing mandatory treatment need.

In general, excessive anterior overjet was more prevalent among other types of subnormality than in individuals with Down syndrome, which demonstrated high rates of anterior open bite, negative overjet and posterior crossbite (Table 5).

Discussion

Reports in many studies [10-19], estimated the exact proportion of occlusal anomalies and orthodontic treatment need among the mentally challenged young individuals. However, it has proved a mammoth task, due partly to the multiplicity of measurement methods and the difficulty in standardising the criteria. The lack of suitable universal methods for recording and grading malocclusion and the different criteria used to define malocclusion have made comparison between studies difficult. None of the studies used IOTN for recording and analyzing malocclusion among mentally challenged individuals.

Despite the fact that 'ideal occlusion', a hypothetical concept, rarely found in nature; the prevalence and severity of malocclusion was found to be higher in mentally subnormal individuals and more severe in Down syndrome individuals. Although there is general information available about the malocclusion of mentally challenged individuals, including Down syndrome subjects, there is a big paucity of true measurement of it and comparable data of different types of mental subnormality. Overwhelmingly, the evidence supports the idea that individuals with mental subnormality will have higher levels of occlusal deformities than those, who are normal. Fact, which has verified in the study of Vigild [15] that, the mentally challenged group exhibited increased frequencies of extreme maxillary over jet, frontal open bite, mandibular over jet, mesial molar occlusion and crossbite when compared to normal individuals in the same dental stage.

Studies have recognized an increase in Class III malocclusion concomitant with a reduction of Class II cases in individuals with Down syndrome. The increased occurrence of mesio-occlusion in Down syndrome can probably be attributed to any of the following: an under-developed maxilla, an enlarged and abnormally positioned

tongue, or a relatively large and prognathic mandible [20]. The antero-posterior disparity seen in Down syndrome may be due to platybasia, which is the obtuse nasion-sella-basion angle formed by the anterior cranial base segment with the posterior cranial base segment to such a degree that it appears as a straight line, indicating a flat cranial base [21].

Quite a few studies [22-24] have adopted DAI as an epidemiological tool because it is confirmed to be a valid, reliable and easily applied instrument. It has been successfully used in numerous studies in the case of normal individuals, which found no differences in the perception and acceptance of occlusal conditions among different populations of the world. Regardless of many studies showing a number of mentally challenged individuals requiring either no or minor orthodontic treatment, Down syndrome subjects exhibited severe to very severe malocclusion pattern, which represented a great need for orthodontic treatment. There appears to be a simple correlation between mental status and the severity of occlusal handicap. However, in the case of Down syndrome the effect of chromosomal aneuploidy coupled with mental deficiency manifests not only as anomalies of dental occlusion, but also discrepancies of the craniofacial complex [21].

The increased prevalence of anterior cross bite and open bite in Down syndrome is a reflection of a tendency in that group; while in the other types of individuals with mental subnormality showed class II tendency with increased anterior over jet. A slight trend towards increased prevalence of anterior open bite was observed in correspondence with increasing severity of mental subnormality or decreased Intelligent Quotient (IQ) [11,13]. It is believed that a mentally subnormal child is sensitive and more vulnerable to stress due to inadequate concepts of other environment. This may result in emotional insecurity and forces the child to diversify into deleterious oral habits, such as thumb sucking, tongue thrusting etc. [11]. The habits bring about harmful unbalanced pressures to bear upon the immature, highly malleable alveolar ridges, with potential changes in position of teeth and in occlusion. Many etiological factors have been associated with the high incidence of open bite in Down syndrome subjects, including deficient maxillary growth

accompanied by tongue thrusting habit [20].

In most cases, over one-third of mentally subnormal individuals showed severe to very severe malocclusion, which is significantly higher than in the normal population. Oral dysfunctions and parafunctions of the masticatory system were hypothesised as being responsible for the increased prevalence of malocclusion in mentally subnormal individuals [25].

In addition, although the prevalence of malocclusion was generally higher among individuals with mental disabilities compared to controls, not all differences were significant. For example, Onyeaso [10] found no significant differences in any of the 10-malocclusion traits assessed by the DAI. Another study [26] reported no association between function level and malocclusion or need for orthodontic therapy. Similarly, we would expect the percentage of people with antero-posterior molar relations $>1/2$ unit cusp to be similar to the proportion of Class II and III cases. Indeed for individuals with mental subnormality 37% to 39% reportedly had antero-posterior molar relations $>1/2$ unit cusp whereas an estimated 20 to 30% were Class II or III cases [11,13].

However, the findings of this review can be subject to limitations, since the restricted number of studies included in this review made it difficult to make generalizations and proper conclusions.

Conclusion

Evidence supports high prevalence of dentofacial anomalies among mentally challenged young individuals to develop strategies to increase patient acceptance for routine care, additional training for dentists to provide this care, and the development of more effective preventive strategies. Though many factors may contraindicate orthodontic management, it should in many cases be promising to improve the dental situation for this group; thereby helping these patients the earliest possible, to a better oral function. Future research should be devoted to determining exactly why malocclusion is higher among children with mental subnormalities. It will be a challenge to determine the preventable factors among multiple complex etiologies.

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