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RESEARCH ARTICLE
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A CROSS-SECTIONAL STUDY OF INDEX OF ORTHODONTIC TREATMENT NEEDS(IOTN) IN MENTALLY DISABLED CHILDREN IN SPECIAL EDUCATION SCHOOL, MULTAN

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ABSTRACT:

Background: High rates of malocclusion are among the major oral health issues that children with mental illnesses like Down syndrome, autism spectrum disorder, and cerebral palsy encounter. These disorders make it difficult to receive dental treatment and affect speech, chewing, and self-esteem. Although the Index of Orthodontic Treatment Need (IOTN) aids in assessing the degree of malocclusion, nothing is known about how well it works in this susceptible,group.

Aims and objectives: The purpose of this study was to evaluate the influence of orthodontic treatment on the quality of life of mentally and physically handicapped children by utilizing IOTN to assess their orthodontic treatment needs. Assessing the degree of malocclusion (DHC and AC components), oral hygiene habits, and psychological issues pertaining to dental aesthetics were among the specific goals.

Materials and Methods: 100 youngsters (≥12 years old) with mental disabilities—aside from those with non-communicable diseases—were the subjects of a cross-sectional study. Clinical exams (IOTN-DHC and AC) and a structured questionnaire on nutrition, self-perception, and dental hygiene were used to gather data. To guarantee uniformity, examiners were calibrated. To identify treatment needs and related factors, statistical analysis was done.

Findings: Of the subjects, 79% needed orthodontic treatment, with 52% having an extreme need. Crossbite (57%), overjet (55%), and missing teeth (60%), were common problems. 80% of people regularly ate sugary snacks, and 65% of people only brushed their teeth once a day, indicating poor oral hygiene. Psychosocial effects were noteworthy, with 20% reporting bullying and 25% reporting low self-esteem as a result of dental appearance. Thirty percent of referred children had unresolved treatment-related problems, despite the fact that fifty-five percent were happy with orthodontic care.

Conclusion: Children with mental disabilities require more orthodontic treatment, highlighting the need for easily available, specialized care. Although its aesthetic component necessitates careful interpretation, IOTN is a useful tool. Oral health, appearance, and general quality of life can all be enhanced by attending to these needs. To improve care options for this neglected population, future research should include longitudinal assessments and increase sample numbers.

Keywords: Index of treatment needs Dental Health Component, Aesthetic Component, Periodontal Disease Index and Dental Aesthetic Index.

ABBREVIATIONS:

IOTN:	Index of Treatment Needs
DHC:	Dental Health Component
AC:	Aesthetic Component
MOCDO:	Missing teeth, Overjet, Cros Displacement of contact points, Overbite
DS:	Down Syndrome
ASD:	Autism Spectrum Disorder
ADHD:	Attention Deficit Hyperactivity Disorder
CP:	Cerebral Palsy
QoL:	Quality of Life
OHI:	Oral Hygiene Index
OHI1:	Oral Hygiene Index 14
BOP:	Bleeding On Probing
PI:	Plaque Index
CPITN:	Community Periodontal Index of Treatment Needs
PDI:	Periodontal Disease Index
DAI:	Dental Aesthetic Index

INTRODUCTION:

Mentally disabled children are defined as individuals who need additional support for a medical, physical or psychological disability that restricts their ability to perform essential activities. (1) Patients with special needs reporting to the dental clinic or hospital are mostly suffering from Downs syndrome (DS), Autism spectrum disorder (ASD), Attention deficit hyperactivity disorder (ADHD), Cerebral palsy (CP), Alzheimer's disease and Epilepsy. In the United States, approximately 10,000 children are born yearly with DS (1 in 691 live © 2019 Special Care Dentistry Association and Wiley Periodicals, Inc. births; prevalence of 10.3 per 10 000) (2) while 18 per 10,000 live births in Saudi Arabia. (3) For patients with CP, 1.2–3.6 cases per 1000 live births have been reported. (4) A neurodevelopmental disorder ADHD, with a prevalence range from 0.1 to 8.1% in children and adolescent, ASD with a high prevalence, ranging from 0.08 to 9.3% in the while AD comprises less than 5% (5)

Malocclusion is "any deviation from normal occlusion of teeth". It is regarded as an irregularity of the teeth or a mal-relationship of the dental arches beyond what is considered as normal (6) Such individuals have more chances to have poorer oral hygiene; more advanced and untreated dental disease, such as caries and periodontal disease; and limited access to dental services than the general population (1) Many studies described an increased incidence of dental caries, Angle's Class II malocclusion, anterior open bite and dental trauma. The gingival status of such children was poor and mainly related to inadequate oral hygiene due to inadequate neuromuscular control and other health priorities (7).

With previous knowledge and clinical experience, it has been observed that all the patients are serious sufferers of dental malocclusion due to short maxilla (micrognathia) and a large mandible bone. This mismatch results in dental malocclusion and a small or large facial profile. The prevalence of coeliac disease is found to be increased in those with Down syndrome and has shown a significant variation between different countries, but a 2018 meta-analysis resulted in a pooled prevalence of 5·8% in children and adults with Down syndrome compared with 0·5–1% of people in the general population. Moreover, Down syndrome children have been noticed with increased risk of comorbidities such as hypotonia and orofacial dysfunction that can affect the feeding ability in early life and systemic ailments like thyroid disease (e.g. hypothyroidism)that affect energy metabolism and utilization. (8) Thus it was obvious for such children to have extreme difficulty to perform daily life activities like

eating, playing, sleeping, keeping themselves clean and performing day to day regular chores of life, so expecting an adequate oral hygiene was beyond expectation.

Oral diseases during the childhood/adolescence of children with special needs are strongly linked to an impaired perception of parents/caregivers about the quality of life (QoL). (2) (9)

Also, it has been observed that in fact, that only 40% of general dental practitioners were of the view that they can work with disabled children and that their dental education had not prepared them well to work with special needs populations.

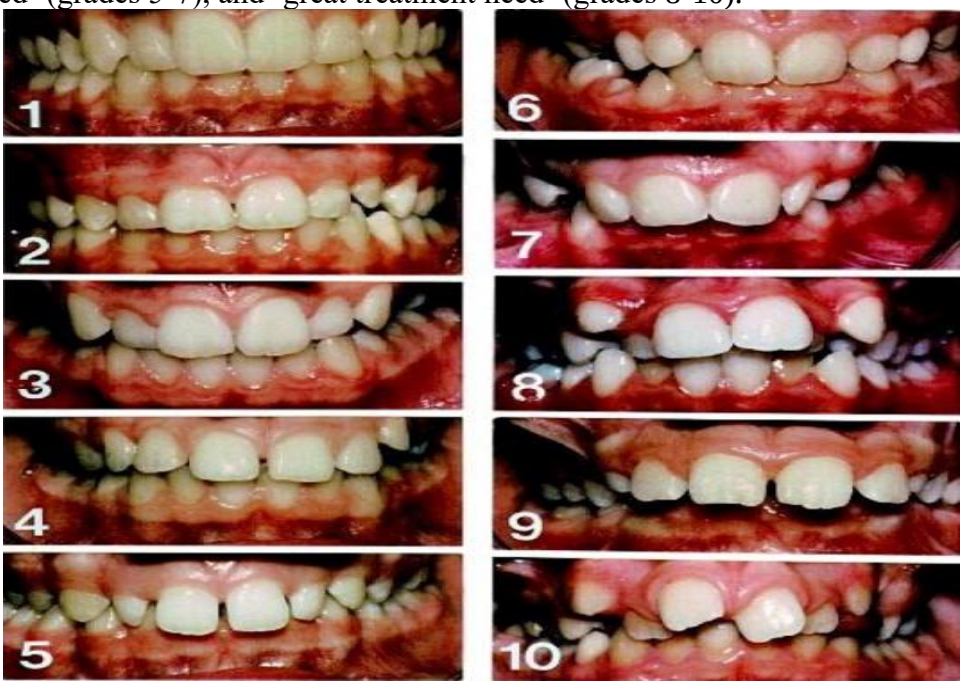
Index of Orthodontic Treatment Needs (IOTN) comprises of two separate components i.e. dental health index (DHC) and aesthetic index (AC). DHC represents biological or anatomical aspect of IOTN that record treatment need on the basis of dental health and function. On the other hand, the Aesthetic component (AC) consists of a 10-grade scale illustrated by a number of colored intra-oral photographs.

This index known as IOTN has its significance because it not only measures the malocclusion and aesthetic profile but also specifies the degree of need of treatment. It gives guidance to the clinicians or practitioners to classify the severity of malocclusion. (10) . IOTN has 3 major components.

1. Aesthetic Component (AC) calculated with the photographic chart

- **Grade 1** – virtually perfect
- **Grade 2** – minor irregularities including a slight overjet or open bite
- **Grade 3** – greater irregularities including a greater overjet, open bites, deep bites and bigger displacements
- **Grade 4** – severe irregularities including a large over jet, large reverse overjet affecting speech and large displacements
- **Grade 5** – extreme irregularities which need treatment including impacted teeth* (such as ectopic canines) and severe hypodontia

This grading signifies the need for orthodontic treatment to treat the malocclusion. E.g. the photographs represent three treatment categories: ‘no treatment need’ (grades 1-4), ‘border-line treatment need’ (grades 5-7), and ‘great treatment need’ (grades 8-10).



2. Dental Health Component (DHC) calculated with the acronym MOCDO

M= missing teeth
O= overjet
C=cross-bite
D= displacement of contact points
O=overbite

3. Treatment needs calculated after measuring the aesthetic component (AC) and dental health component (DHC).

Converting the theoretical knowledge learnt in the course into real-world experience is the practicum's goal. The learning goals centers on the development and application of managerial roles through the Health Services Academy's hospital management curriculum. This entails effectively organizing, leading, and organizing a healthcare program. The practicum also seeks to increase analytical abilities for gathering information from the program's insights, which will help pinpoint problem areas and put plans for future developments into action.

MATERIALS AND METHODS:

This was a prospective cross-sectional study design with a target population of disabled children due to diseases like Downs syndrome, ASD, ADHD, CP, Alzheimer's disease and Epilepsy. Such special individuals have poor motor control as well so expectance of an excellent oral hygiene would be impossible. Ethical approval was obtained from ethical review board of EDO SPECIAL EDUCATION DEPARTMENT MULTAN.. The study included children over the age of 12 who were free of non-communicable diseases. Furthermore, only youngsters who were cooperative and whose guardians gave their informed consent were recognized as eligible. On the other hand, those with multiple disabilities (compound disabilities), children under the age of twelve, and those with non-communicable disorders like diabetes, hypertension, or cardiovascular issues were not included. Additionally, the study did not include children who were not cooperative.

The questionnaire comprised of simple yet specific questions and it had two portions. First portion consisted of introduction and family history that is name, age, gender, number of siblings, their genetic diseases and detailed questions about the individual himself that did he brush regularly? If yes how many times. What he uses for brushing his teeth. If his/her diet involves sugary food as this will give insight about the frequency of caries exposure in teeth. Other questions included: What is your diet mostly composed of? How many times a day do you take sweets? What part of your facial appearance do you not like? Do you feel the natural shape and size of your teeth bring you low self-esteem? Have you ever been subject to bullying due to your appearance? Do you think your facial appearance results in low confidence? Do you think by getting orthodontic treatment you will have a better facial appearance? Will you find yourself having more confidence and self-esteem after completion of your procedure? Do you think the current situation of your teeth needs a dental intervention? Do you think your front and back teeth are mal-aligned? Have you ever been referred to an orthodontist by a general dental practitioner for your mal-aligned teeth? If Yes: Were you satisfied with the treatment plan provided with the orthodontist? If No: Do you have any misconceptions or unanswered questions related to an orthodontic treatment? Do you think orthodontic treatment will have more pronounced effects on your appearance as opposed to cosmetic surgeries? Do you have any missing teeth? Is there any overjet? Is there cross bite? Is there displacement of contact points? Is there any overbite?The study method comprised of extra-oral facial analysis, intraoral occlusal analysis (sagittal, vertical and transverse plane), Dental Health Component (DHC) and Aesthetic Component (AC). The examination was undertaken by two house officers, one post graduate resident and three of us senior colleagues. We trained and calibrated the house officers and post graduate resident in using the IOTN and were working in the field of orthodontics. For intraoral examination, diagnostic instrument kits were selected. It comprised of four essential instruments that is mouth mirror, dental probe, tweezers, cotton rolls and excavators (all were sterile).

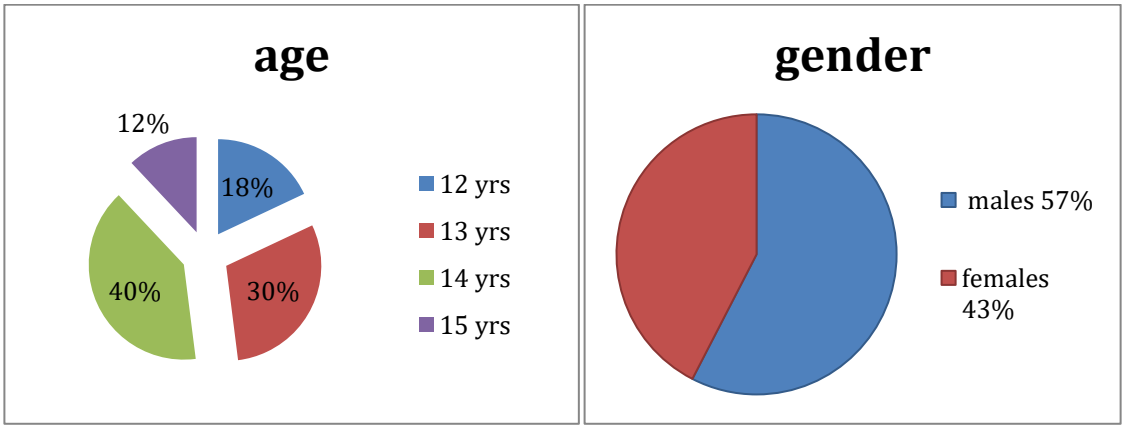
RESULTS:

How do you brush your teeth?	**45% Brush**	**15%Miswak**
How many times do you brush your teeth?	**65% Once**	**20%Twice**
What is your diet mostly composed of?	**15% Healthy Meal**	**80% Snacks**
How many times a day do you take sweets?	**15% Once**	**85% Twice**

A sizable percentage of respondents (25%) said that brushing their teeth hurt. Concerns over dental appearance were also common; 25% of respondents said that their self-esteem was impacted by the size and shape of their natural teeth. 10% thought their facial features contributed to their lack of confidence, and 20% reported being bullied because of their appearance. Interestingly, 39% of respondents believed that orthodontic treatment could improve the appearance of their face, and 40% expected to feel more confident following the procedure. Furthermore, 65% of respondents admitted to having malaligned teeth, and 35% believed that their dental health needed to be treated. While 30% of those who were not referred had concerns or unanswered issues, 55% of those who were referred to an orthodontist (35%), expressed satisfaction with their treatment plan. It's interesting to note that 30% of respondents thought orthodontic treatment improved attractiveness more than cosmetic surgery.

Question	Yes	No
Do your teeth hurt during brushing?	25	70
Do you feel the natural shape and size of your teeth bring you low self-esteem?	25	60
Have you ever been subject to bullying due to your appearance?	20	25
Do you think your facial appearance results in low confidence?	10	26
Do you think by getting orthodontic treatment you will have a better facial appearance?	39	24
Will you find yourself having more confidence and self-esteem after completion of your procedure?	40	10
Do you think the current situation of your teeth needs a dental intervention?	35	20
Do you think your front and back teeth are mal-aligned?	65	10
Have you ever been referred to an orthodontist by a general dental practitioner for your mal-aligned teeth?	35	30
If Yes: Were you satisfied with the treatment plan provided with the orthodontist?	55	25
If No: Do you have any misconceptions or unanswered questions related to an orthodontic treatment?	30	25
Do you think orthodontic treatment will have more pronounced effects on your appearance as opposed to cosmetic surgeries?	30	52

Overall, a total of 50 children were examined altogether males and females. Out of these only 33 were selected as some did not fit into age category, while others were excluded due to non-communicable diseases. Results are depicted via graphs and tables.



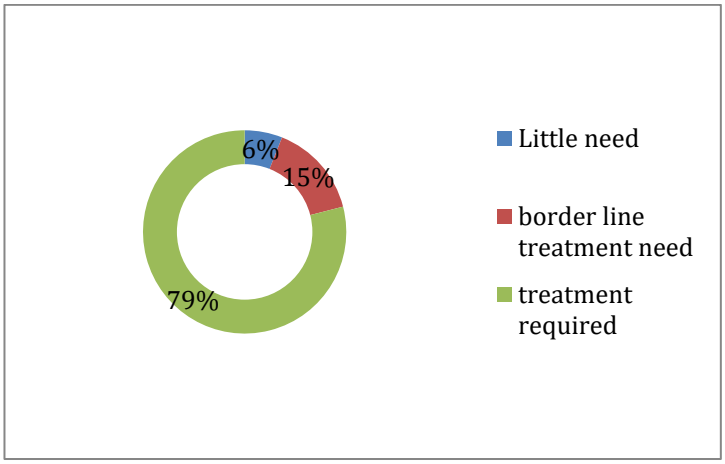
ORTHODONTIC ASSESSMENT RESULTS (IOTN-DHC)

VARIABLE n=33	NUMBER %
MISSING TEETH	Yes = 20 (60%) No = 13 (40%)
OVERJET	Yes = 18 (55%) No = 15 (45%)
CROSSBITE	Yes = 19 (57%) No = 14 (43%)

DEEPBITE	Yes = 12 (36%) No = 21 (64%)
OVERBITE	Yes =14 (43%) No = 19 (57%)

ORTHODONTIC ASSESSMENT RESULTS(IOTN-AC)

IOTN-AC **n=33**	FREQUENCY	%age
2--- Little need	2	6%
3--- Moderate need	5	15%
4--- Treatment need required	9	27%
5--- Extreme treatment need required	17	52%



Discussion:

The importance of using the IOTN index for this study design was to assess the orthodontic treatment needs in children with mental disability. The limitation of this index is that there is discrepancy between DHC and AC. The AC only evaluates malocclusion in frontal view and hence is subjective in nature (3).

Findings of the current study identify that the special needs children who require orthodontic treatment are 79%. Of those who are on borderline of the treatment are 15% and those with no treatment need are only 6%. Overall, 52% are in extreme need of treatment; these findings are coherent and supported by previous studies too. (4) (9) (7) (1). There are several reasons for the high rate of orthodontic treatment needs (79%) in children with special needs, including genetic and developmental conditions that impact craniofacial growth, such as cerebral palsy and Down syndrome(11). Malocclusions are further exacerbated by oral behaviors as thumb sucking, mouth breathing, and tongue thrusting, and swallowing and chewing patterns are impacted by neuromuscular disorders that cause poor oral muscle coordination. Over time, dental problems grow as a result of challenges in maintaining oral hygiene and getting regular dental care(12). Dental alignment can also be impacted by medical comorbidities and drugs, especially those for behavioral disorders and epilepsy(13). The severity of these children's issues is highlighted by the result that 52% of them require extensive treatment, which is consistent with earlier research showing a higher orthodontic burden in this cohort.

This also shows how the mental disability and the malocclusions are affecting the overall quality of life QoL (2). Because of their impacts on psychological, physiological, and social well-being, mental disabilities and malocclusions have a substantial impact on special needs children's overall quality of life (QoL). Speech, swallowing, and chewing difficulties brought on by malocclusions can result in communication problems and nutritional inadequacies. Furthermore, social anxiety and low self-

esteem can be exacerbated by poor tooth aesthetics, making peer interactions more difficult(14). Maintaining good oral hygiene is typically difficult for kids with mental disorders, which raises their risk of tooth pain and infections and can further interfere with their everyday activities and general comfort. In addition to making health issues worse, the combination of these conditions also makes it harder for them to engage in interpersonal, and educational, and recreational pursuits, which lowers their quality of life(15).

Conclusion:

Seventy-nine percent of children with mental disorders require orthodontic treatment, with 52 percent in serious need, according to the study. These results demonstrate how severely malocclusion impairs their quality of life, influencing social relationships, self-worth, and general oral health. Despite differences between its Dental Health Component (DHC) and Aesthetic Component (AC), the Index of Orthodontic Treatment Need (IOTN) was a useful tool for evaluation. The findings are consistent with previous studies and highlight the additional difficulties these kids encounter as a result of behavioral, developmental, and genetic variables in addition to structural obstacles to dental care. Improving their everyday functioning and general well-being requires attending to these orthodontic demands.

Strength and Limitations:

This study's thorough method of assessing orthodontic requirements using the DHC and AC components of the IOTN index is one of its main advantages. The study addresses a significant vacuum in the literature by concentrating on adolescents with mental disorders, a population that is frequently disregarded in dentistry research. The approach was sound, and assessments were consistently made by examiners who had been trained and calibrated. Furthermore, combining self-reported and clinical data offered a comprehensive understanding of the effects of malocclusion. These features strengthen the study's therapeutic applicability and highlight how urgently customized orthodontic treatments are needed for this susceptible group.

The study contains a number of shortcomings in spite of its contributions. The findings' generalizability is limited by the small sample size of 100 participants. Due of their subjective character and reliance on frontal-view ratings, the Aesthetic Component (AC) assessments are susceptible to bias. Additionally, the results may not be as generalizable to a larger population if children with various disabilities or non-communicable disorders are excluded. Conclusions on causality or long-term effects are likewise precluded by the cross-sectional approach. Lastly, the study was only carried out at one university in Pakistan, which can have an impact on the findings' cultural and regional significance. The evidence foundation for orthodontic therapy in this population would be strengthened if future studies addressed these shortcomings.

Conflict of interest:

Authors declared no conflict of interest.

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