

Prevalence of Dental Malocclusion Among Children with Physical, Sensory and Neuropsychological Disabilities in Dar es Salaam, Tanzania

Research Article

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Abstract

Introduction: Proper occlusion is an important component of overall oral health of a child since malocclusion is associated with oral diseases like dental caries, periodontal diseases and temporal-mandibular disorders. Its impact on facial appearance may adversely affect social interactions and psychological well-being of the child. Children with disabilities overwhelmingly suffer from the impact of malocclusion more than the general population. Paying attention to this condition will lead to an improvement in quality of life of these children.

Material and Methods: A cross sectional survey was done among children with disabilities residing in Dar Es Salaam region, Tanzania. Data was collected using structured questionnaires for parents/teachers of the respective school children and clinical examination of malocclusion was done to children using the criteria described by WHO (1997).

Results: The study included 384 participants with majority of children being between 12 and 17 years of age: in addition, males composed 60.4% of the sample. Most of the children (69%) had one or more type(s) of malocclusion/s: Children with neuropsychological disabilities were more affected with malocclusion (75.9%) than other group of disabilities. Increased overjet (18.8%) and reverse overjet (6.2%) were both prevalent in neuropsychological disabilities than other groups. In addition, children with neuropsychological disabilities had higher prevalence of open and deep bite, 25% and 10.7%, respectively.

Conclusion: Malocclusions were prevalent in a greater proportion of children with disabilities: In particular, those with neuropsychological disabilities had significantly higher prevalence of malocclusion, followed by those with physical and sensory disabilities.

Introduction

The World Health Organization (WHO) defines a handicapped individual as one who, over an appreciable time, is prevented by a physical or mental condition from full participation in the normal activities of his age group, including social, recreational, educational and vocational activities [1].

According to WHO, the term disability covers impairments, activity limitations and participation restrictions: In addition, impairment is further categorized into physical, cognitive, intellectual, mental, sensory, developmental, or combination of these conditions.

It is widely reported that individuals with disabilities have poorer oral health status compared to those in the general population [2-6]. Some previous studies have reported up to 95% or higher prevalence of malocclusion among children with disabilities [7, 8]. The reported prevalence of malocclusion in the general population ranges from 22 to 76 percent [9, 10]. Age and social-cultural differences of the studied population as well as the variations in malocclusion classification and diagnostic criteria or indices used by researchers account for the big range of malocclusion reported worldwide [11, 12]. In contrary, the type of disability is the main reason for disparities of reported malocclusion prevalence among handicapped people [8, 13-15].

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The neuropsychologically disabled patients suffer the most with malocclusion compared to other group of disabilities: Whereas, sensory and physically disabled patients are relatively less affected. Vittek et al., [13] and Viglid [8] reported more than 90% prevalence of malocclusions among subjects with cerebral palsy and Down's syndrome, respectively. Nonetheless, the reported prevalence of malocclusion for sensory and physically disabled subjects ranges from 27 to 58 percent [9, 14].

The factors associated with high prevalence of malocclusion in communities with disabilities are diverse. They include genetic predisposition, increased risk to dental trauma, involuntary detrimental oral habits, limitations in maintaining good oral hygiene, barriers in accessing dental care, congenital and developmental orofacial defects as well as social-cultural context of specific communities [2, 4, 16, 17].

The muscles of the face and oral cavity play great role in facial growth and occlusal development by influencing the growth of the bone as a tissue affecting the vascular supply to the bone and as a force element in association with the amount of load applied on jaw bones during mastication [18-20]. Most patients with neuropsychological disability suffer from abnormal orofacial muscle tone and imbalance with improper lips and tongue posture [21]; these features increase the risk of developing malocclusion in these individuals.

Good oral health status of an individual is an important component for overall physical health, oral function, ability to communicate, physical appearance (dental aesthetics) and ultimate quality of life [2, 13]. It is relatively difficult to maintain good oral health of individuals with disabilities because they may often have involuntary behavior that adversely affect their oral health. Some are unable to perform oral hygiene activities and face many limitations in accessing dental care [2, 3, 17]. The social-cultural differences also play a role in the variations of malocclusion prevalence observed between various communities. The same phenomenon applies on malocclusions in children with disabilities [8, 9, 22]. In many developed/western countries, malocclusions in these children is very common, with up to 90% of children displaying some form of malocclusions [8, 13]. The conditions are also quite common in Asian countries, with a reported prevalence of 67% dental aberration among patients with Down's syndrome in Malaysia [23] and up to 70% in India [24]. Furthermore, in some parts of Africa it is as well common: A prevalence of 55.3% has been reported in Nigeria by Onyeaso et al., [25].

Although the epidemiology of malocclusion is extensively studied among disabled individuals worldwide, the reported occurrence of malocclusion for every specific type of disability is inconsistent. Moreover, in Tanzania to date, there is no published data regarding the prevalence of malocclusions in children with neuropsychological, sensory and physical disabilities. However, following influx of children with special needs such as children with those disabilities to the largest Dental clinic in the country (Muhimbili hospital), a higher prevalence was suspected among Tanzanian disabled children.

The main objective of the current study was to determine the prevalence of malocclusion in children with Neuropsychological, Sensory and Physical disabilities in Dar es Salaam, Tanzania.

Materials and Methods

A cross sectional survey of primary school children with neuropsychological, sensory and physical disabilities in Dar es Salaam, Tanzania was conducted in 2014.

Study Population

The study involved 384 children with neuropsychological (Mental retarded children, Down's syndrome, Autism and Attention Deficit Hyperactive Disorder), physical and sensory (Vision and Hearing) disabilities aged 6 to 17 years.

The sample consisted of primary school children with disabilities attending special schools for handicapped children. These schools were from all the three districts of Dar es Salaam region namely; Temeke, Ilala and Kinondoni.

The sample included pupils from 10 schools selected from a list of schools (sampling frame) obtained from all municipalities of Dar es Salaam. At the schools, all children who were present were included in the study.

Assuming a previous prevalence of 50% with 1.96 standard deviation and 5% marginal error, a sample size of 384 subjects was required for the study.

Children with physical disabilities, neuropsychological disabilities and sensory disabilities who were 6-17 years of age were included. The study excluded children with other disabilities apart from neuropsychological, sensory and physical and those with very severe disabilities such that clinical examination was very difficult to be performed at the school setting, as well as subjects with history of orthodontic treatment.

Methods of Data Collection

The study used both questionnaire and clinical examination in data collection. The structured questionnaires for parents/teachers of respective school children were filled first, followed by clinical examination to children. The examination of the children was conducted by one trained and calibrated examiner, the principal investigator (PI), using occlusal registration according to WHO criteria [26], with slight modifications.

Validity and Reliability

A pilot study was done to test the research instrument in terms of the time taken for the interview, double meanings, clarity and content of the instruments.

The examiner was trained and calibrated on how to score malocclusions. Intra-examiner consistencies varied from good to excellent, with Kappa values ranging from 0.894 to 1.000.

Data Processing and Statistical Analysis

Data analysis was done using Statistical Package for Social Sciences (SPSS) version 20.0. The data was checked for any errors then frequency distributions were analysed and displayed to find the prevalence of malocclusions among children with physical,

sensory and neuropsychological disabilities.

Bivariate associations were studied by Chi-Square statistics; these were used to find out if there was a statistically significant association between malocclusions and other variables/factors. P-value was set at 0.05.

Ethical Clearance and Informed Consent

Ethical clearance was obtained from Muhimbili University of Health and Allied Sciences (MUHAS) and permission to work with children was sought from local administration authorities and schools administrations. Written informed consent was requested from the participants, parents and teachers before clinical examinations and interviews. Informed verbal consent was requested from the participants, parents and teachers before clinical examinations and interviews.

Results

The study included 384 participants with majority of the children being between 12 and 17 years of age. The detailed socio demographic distribution of participants is given in Table 1.

Regarding prevalence of malocclusion; overall findings showed that 265 (69%) of children suffered from one or more types of malocclusion: Only 31% of them were free from dental malalignment. A small proportion of children (1%) had up to seven different types of malocclusions recorded as shown in Figure 1.

Considering the distribution of participants by type of their disabilities children with sensory disabilities dominated the groups (45.1%) followed by Neuropsychological (29.2%) and Physical (25.8%). Multiple types of disabilities co-existed in some cases.

The analysis of malocclusion distributions by children’s specific type of disabilities revealed that children with neuropsychological disabilities had more increased overjet (>5mm) and reverse overjet (18.8% and 6.2% respectively), compared to children with other disabilities.

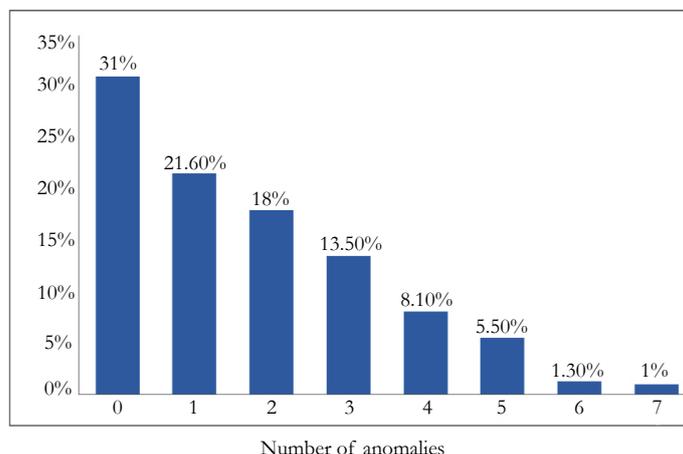
In the vertical occlusal plane; most of children with sensory and physical disabilities were free from vertical malocclusion, 80.9% and 72.7% respectively; and children with neuropsychological disabilities had higher prevalence of open (25%) and deep (10.7%) bite than children of other groups of disabilities.

Among the malocclusions assessed in the transverse plane; posterior cross-bite affected children with physical disabilities (11.1%)

Table 1. Socio Demographic Distribution of Children with Neuropsychological, Sensory and Physical Disabilities by Number and Percentage.

Variable	Category	Number (n)	Percentage (%)
District	Temeke	218	56.8
	Ilala	121	31.5
	Kinondoni	45	11.7
Age	6-11 years	155	40.4
	12-17 years	229	59.6
Gender	Male	232	60.4
	Female	152	39.6
With whom do you live	Parents	190	49.5
	Guardians	25	6.5
	Hostels	169	44

Figure 1. Distribution of Children with Physical, Neuropsychological and Sensory Disabilities by Number of Anomalies.



more than other groups of disabilities and children with neuropsychological disabilities had higher prevalence of scissors bite (5.4%) than other groups of disabilities (Table 2).

The results showed that crowding in the incisal segments was more prevalent (28.6%) among children with neuropsychological disabilities than other groups of disabilities. Children with physical disabilities had more spacing (14.1%) in the maxillary incisal segments than other groups of disabilities (Table 3). Overall, children with neuropsychological disabilities were most (75.9%) affected by dental malocclusion compared to those with Sensory disabilities (65.9%) and Physical disabilities (66.7%).

In respect to participants' distribution by their occlusal status, majority of children with physical disabilities had Angle's Class I molar relationship (87.9%) compared to neuropsychological (75.9%) and sensory (73.6%). More details are shown in Tables 4 and 5.

Discussion

Good facial appearance enhances positive peer appraisal which

strengthens an individual's self-esteem. Thus, malocclusion with impact on individual's facial appearance may adversely affect social interactions and psychological well-being [27, 28].

Children with disabilities suffer more from oral health problems than the general population [2, 29, 30]. The results of this study indicated that majority of children (69%) had one or more type(s) of malocclusions.

While facial appearance is an important determinant of social acceptability and personality [31], with impact on how we choose people to hire or help, as well as partners for dating and socialization: Disabled individuals with compromised oral-facial health are further challenged by high prevalence of malocclusion in communities which tend to judge individuals by their physical appearance [31, 32]. Malocclusion in children with disabilities possess an additional obstacle to social acceptance and compromises all aspects of oral functions and may have great bearing on children's quality of life. Several studies have addressed malocclusion epidemiology and treatment challenges of disabled children and recommended various measures to rescue the oral health of these children, with

Table 2. Prevalence and Number of Specific Types of Inter-Arch Malocclusions in a Sample of Children with Physical, Neuropsychological and Sensory Disabilities.

Type of occlusion		Distribution	
Occlusal Plane/Category	Occlusal Trait	Frequency (n)	Percentage (%)
Molar relation-Right side	Class I	301	78.4
	Class II	48	12.5
	Class III	35	9.1
Molar relation-Left side	Class I	303	78.9
	Class II	45	11.7
	Class III	36	9.4
Overjet	No increased overjet >5mm	346	90.1
	Increased overjet >5mm	38	9.9
	Reversed overjet	18	4.7
Vertical	Normal	281	73.2
	Deep bite	50	13.0
	Edge to edge	19	4.9
	Open bite	34	9.9
Transverse	Cross-bite posterior	22	5.7
	Scissors bite	16	4.2

Table 3. Prevalence and Number of Specific Types of Intra-Arch Malocclusions in a Sample of Children with Physical, Neuropsychological and Sensory Disabilities.

Type of Malocclusion		Frequency (n)	Percentage (%)
Crowding incisal segment maxilla	Yes	89	23.2
	No	295	76.8
Crowding incisal segment mandibular	Yes	82	21.4
	No	302	78.6
Spacing incisal segment maxilla	Yes	46	12.0
	No	338	88.0
Spacing incisal segment mandibular	Yes	34	8.9
	No	350	91.1

Table 4. Distribution of Children with Physical, Neuropsychological and Sensory Disabilities by their Occlusal Status.

Types of Occlusions		Types of Disabilities						
		Physical		Sensory		Neuropsychological		
	Occlusal trait	n	%	n	%	n	%	
Molar relation right side	Class I	87	87.9	131	73.6	85	75.9	
	Class II	6	6.06	29	16.3	16	14.3	
	Class III	6	6.06	18	10.1	11	9.8	
Molar relation left side	Class I	85	85.9	136	76.4	84	75	
	Class II	8	8.1	22	12.4	17	15.2	
	Class III	6	6	20	11.2	11	9.8	
Increased overjet >5mm	Yes	5	5.1	15	8.4	21	18.8	
	No	94	94.9	163	91.6	91	81.2	
Reversed overjet	Yes	3	3	8	4.5	7	6.2	
	No	96	97	170	95.5	105	93.8	
Vertical relationship	No	72	72.7	144	80.9	68	60.7	
	Open bite	15	15.2	8	4.5	28	25	
	Deep bite	9	9.1	14	7.9	9	10.7	
	Edge to edge	3	3	12	6.7	4	3.6	
Transverse relationship	Posterior cross-bite	Yes	11	11.1	5	2.8	6	5.4
		No	88	88.9	173	97.2	106	94.6
	Scissors bite	Yes	4	4.0	6	3.4	6	5.4
		No	95	96.0	172	96.6	106	94.6

n = number of children, % = percentage

Table 5. Distribution of Children with Physical, Neuropsychological and Sensory by their Intra-Arch Occlusal Status.

Type of malocclusions			Types of disabilities					
			Physical		Sensory		Neuropsychological	
			n	%	n	%	n	%
Intra arch	Spacing incisal maxillary segment	Present	14	14.1	20	11.2	12	10.7
		Absent	85	85.9	158	88.8	100	89.3
	Spacing incisal mandibular segment	Present	10	10.1	14	7.9	10	8.9
		Absent	89	89.1	164	92.1	102	91.1
	Crowding incisal maxillary segment	Present	23	23.2	36	20.2	32	28.6
		Absent	76	76.8	142	79.8	80	71.4
	Crowding incisal segment mandibular	Present	23	23.2	33	24.1	27	24.1
		Absent	76	76.8	145	81.5	85	75.9
	Upper median diastema	Present	10	10.1	24	13.5	10	8.9
		Absent	89	89.9	154	86.5	102	91.1
	Lower median diastema	Present	2	2	2	1.1	4	2.1
		Absent	97	98	176	98.9	108	97.9

n = number of children, % = percent

special health care need on the globe [2-6, 22].

The present research is the first in Tanzania that has considered the prevalence of malocclusions among children with neuropsychological, sensory and physical disabilities.

The 69% malocclusions prevalence is considerably higher than that which was reported in Nigeria by Onyeaso et al., [22]. This prevalence is much lower than that which was reported in India by Aggarwal et al., [33], who reported the prevalence of up to 84% in their population of children with disabilities.

Considering specific types of malocclusions among children with neuropsychological, sensory and physical disabilities, majority of children had Angle's class I molar relationship (78%). This prevalence is lower than 87.4% which was reported in Nigeria by Utomi and Onyeaso [34] among children of the same disabilities. Likewise, lower prevalence of incisal crowding (23.3%) was observed in the current study against 27.3% reported in Nigeria [34]. Some minor variations in scoring malocclusions among these children might have caused the differences in prevalence between the two studies.

Regarding the distribution of malocclusions among the children

with specific disabilities, neuropsychological, sensory and physical disabilities; children with neuropsychological disabilities had more malocclusions than the other two groups of disabilities, this result is similar to that which was reported by Oreland et al., [35] and Onyeano [22]. Neuropsychological disabilities comprising of mental retardation, autism, Down's syndrome and Attention deficit/hyperactive disorders is the group of disabilities frequently reported to have high prevalence of malocclusions by previous studies. This may be contributed by underdevelopment of oral facial musculature [36, 37] and presence of oral dysfunction and parafunctions of masticatory system among some of these children [35].

Children with neuropsychological disabilities had more increased overjet of (>5mm) and reverse overjet, 18.8% and 6.2% respectively, compared to children with other disabilities. While increased overjet and reverse overjet are opposing malocclusion features associated with Angle's class II and III, respectively: Their co-existence in neuropsychological group can be explained by the combination of disabilities in the group comprising of mental retardation, autism, Down's syndrome and attention deficit/hyperactive disorders.

Down's syndrome has been reported to have high class III malocclusion [38, 39], probably due to disharmony in cranial-base relationships [6, 13, 40], reduced dental arch size, decreased arch length, and inadequate maxillary size [15]. Meanwhile, cerebral palsy subjects who are often mentally retarded have high prevalence of class II [15, 41] attributed to early eruption of primary teeth and abnormal tongue and head posture [15, 42-44]. Furthermore, lip incompetence and failure of the maxillary orbicularis muscle is another cause of excessive overjet in cerebral palsy patients [45-48].

Upper median diastema was prevalent among children with sensory disabilities than other groups of disabilities. This may either be contributed by the genes; these children may have inherited from their parents or may be due to presence of prominent buccal fraenum.

In contrast to Muppa et al., [49], who reported the severity of anterior crowding and spacing to be higher among children with sensory disabilities, the current study revealed a higher prevalence of these types of malocclusions in children with neuropsychological disabilities and physical disabilities, again this may be contributed by poor development of oral-facial musculature with tongue and lips parafunctions common in cerebral palsy [45, 46] as well as small dental arch size especially among Down's syndrome subjects [15].

Regarding the number of anomalies (malocclusions) per individual subject, majority of children with neuropsychological disabilities had higher number of anomalies than other groups of disabilities; this might be contributed by frequency episodes of airway infection [36], frequency of oral habits and general poor muscle development [8, 35]. The current study also found a higher prevalence of anterior open bite and deep bite among the children with neuropsychological disabilities than sensory and physical disabilities. Since the group comprises Down's syndrome, mentally retarded and cerebral palsy subjects, the open bite may be attributed to the oral habit of projecting the tongue against the teeth and frequent episodes of upper air way infection which

lead to a greater prevalence of mouth breathing and malocclusions, including anterior open bite [37]. These features are common in cerebral palsy and mentally retarded patients. Meanwhile, deep bite incidence in neuropsychological disabilities may be due to Down's syndrome members of the group who are reported to have reduced vertical dimension of the maxilla and mandible, short teeth, forward rotation of maxillary and mandibular planes [50]. The present study found a low prevalence of posterior cross-bite (5.4%) than that obtained by Oliveira et al., [51] (21.5%), among children with neuropsychological disabilities; this may also be contributed to the age differences of the studied populations. Also, different methods of scoring malocclusions may have contributed to this difference.

The study observed Class I molar relationship of about 75% among children with neuropsychological disabilities, this is in contrast to that reported by Utomi et al., [52] who found slightly lower prevalence of Class I molar relationship (68.6%) in similar group of disabilities. Nevertheless, the observed difference in the prevalence is not so marked. Considering the space anomalies, the prevalence of crowding in incisal segment (58.8%) reported by the current study is similar to that which was reported in Nigeria [52] in an identical group of disabilities. However, there was a considerable difference in the prevalence of spacing in incisal segment between the current and the one which was reported in Nigeria [25], this might be attributed to the difference in indices used in scoring malocclusion.

Study Strength and Limitations

The study involved children from Dar-es Salaam region, the most heterogeneous city with a mixture of tribes and socio-demographic backgrounds than any other regions in the country; this may reflect the status of occlusal conditions in such children elsewhere in Tanzania.

The study involved children with neuropsychological, physical and sensory disabilities of different levels and types. Their disabilities might have influenced the responses and cause some difficulties during clinical examination and thus affecting data collection.

Conclusion

Malocclusions were prevalent in a greater proportion of children with disabilities: In particular, neuropsychological disabled participants had significantly higher prevalence, followed by those with physical and sensory disabilities. Increased overjet, reverse overjet, open bite as well as deep bite were predominant among children with neuropsychological disabilities than other groups.

Recommendations

Malocclusions is a problem among children with neuropsychological, sensory and physical disabilities, therefore, it is very important to plan for and provide oral health care, preventive and interceptive orthodontics to children with disabilities so as to reduce a double burden to this group of children.

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