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THE CORRELATION OF OROMOTOR DYSFUNCTION TO ORAL HEALTH-RELATED QUALITY OF LIFE IN CHILDREN WITH DOWN SYNDROME

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ABSTRACT

Background: The genetic condition known as Down syndrome (DS) is brought on by chromosome 21 trisomy. Children with DS frequently have oromotor dysfunction. Oromotor dysfunction in children with Down syndrome can lead to oral health issues and lower the oral health-related quality of life. Studies on the relationship between oromotor dysfunction and quality of life related to dental health in children with Down syndrome are still lacking, nevertheless. **Objective:** To analyze the correlation between oromotor dysfunction and oral health-related quality of life in children with DS. **Methods:** Total respondents used in this research was 30 children with DS and the parents in Banjarmasin Special Schools. Oromotor dysfunction was determined using the Oral Motor Assessment Scale (OMAS) and oral health-related quality of life was determined using the Modified Parent-Caregiver Perception Questionnaire (P-CPQ). The Spearman correlation test was used to analyze the correlation between oromotor dysfunction and oral health related quality of life in Down syndrome children. **Results:** The Spearman correlation test showed that there was a significant correlation between oromotor dysfunction and oral health-related quality of life in children with DS with a significance value of 0.000 ($p < 0.05$) with the correlation coefficient of 0.637. **Conclusion:** There was a positive and strong correlation between oromotor dysfunction and oral health-related quality of life in children with DS. The weaker the oromotor function in children with Down syndrome is, the worse the oral health-related quality of life will be.

Keywords: Down syndrome, oral health-related quality of life, oromotor dysfunction.

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INTRODUCTION

Down syndrome (DS) is the most prevalent genetic condition causing intellectual disability. DS was brought on by trisomy of Homo sapiens chromosome 21 (HSA21). The syndrome's eponym comes from Down, who in 1866 provided a description of its clinical feature. The DS phenotype encompasses symptoms that impact various body systems, specifically the neurological, cardiovascular, and musculoskeletal systems. Short stature, craniofacial abnormalities, atlantoaxial instability, low neuronal density, cerebral hypoplasia, intellectual disability, muscular hypotonia, and congenital heart diseases (CHDs), especially atrioventricular septal defects (AVDs), are common in people with DS.¹ Deficiencies in neuromotor coordination and craniofacial and structural abnormalities often

impede the development of effective oral-motor skills, which may lead to the development of potential feeding issues and swallowing dysfunction.²

Oromotor dysfunction is a condition in which the system of coordination and movement of hard tissue, soft tissue, and nerve control in the mouth area is disturbed.³ The previously studies revealed that more than half of the DS children studied (61% and 72%) had oromotor dysfunction assessed.⁴ Oromotor dysfunction can have a negative impact, especially on oral health.⁴

These days, dental health is understood to include not only dental issues like cavities but also physiological, psychological, and social factor that might lower someone's quality of life.^{5,6} Oromotor dysfunction in DS patients makes it difficult for them to do daily activities like eating and

speaking. Children with DS may experience psychological and social difficulties as a result of this activity's limits.²

The impact of oral health on a person's quality of life is referred to as 'Oral Health-related Quality of Life'. Oral health-related quality of life is an integral part of general health and well-being and is recognized by WHO as an important part of global oral health programs.⁷ Studies on the influence of oral health-related quality of life in children with DS have indicated that oral health can have an impact on the lives of people with DS and that this impact affects various aspects of their lives.⁸ However, studies on the relationship between oromotor dysfunction and oral health-related quality of life in children with DS are still not known specifically. Based on this, it is necessary to conduct research on the correlation between oromotor dysfunction and oral health-related quality of life in children with DS.

MATERIAL AND METHOD

This study was an analytical observational study with a cross sectional approach that has received ethical approval by the Health Research Ethics Commission, Faculty of Dentistry, Universitas Lambung Mangkurat No. 060/KEPKG-FKGULM/EC/IV/2021.

The sampling method used was total sampling. The population in this study included all children with DS who attend the Special School (SLB) in Banjarmasin City, South Kalimantan, namely SLBN 2 Banjarmasin, SLBN Pelambuan Banjarmasin, SLB PLUS MADANA DUN YA Banjarmasin, and SLB YPLB Banjarmasin, with a total of 30 children. The research was carried out at the child's home, under the supervision of parents, and in accordance with health protocols.

Oromotor dysfunction was determined using the Oral Motor Assessment Scale (OMAS) by observing and assessing a child's ability to chew, suck, and swallow food and drinks using three different types of food consistency: 1) soft (porridge) using a spoon, 2) solid (Tango™ wafers), and 3) liquid (UHT milk/mineral water using a glass with and without a straw). The chewing, sucking, and swallowing pattern were recorded and observed using a digital camera (PANASONIC LUMIX G7 16 mega pixels) from the child's right side, as well as a Smartphone camera on the front of the child.

Two observers assigned a score to each OMAS item score using a scale of 0 to 3. A score of '0' indicates no function (Non-functional), a score of '1' indicates poor function (Sub functional), a score of '2' indicates moderate function (Semi functional), and a score of '3' indicates normal function (Functional). The final

score for oromotor skills was based on the most frequently obtained scores during the evaluation process.^{13,14,15} To distinguish between children who had oromotor dysfunction and those who had normal oromotor function, the four groups of initial classification of oromotor skills, namely non-functional (score 0), sub-functional (score 1), semi-functional (score 2), and functional (score 3), were transformed into two groups. Scores of 0, 1 and 2 form a subgroup called a sub-functional group (oromotor dysfunction), and a score of 3 forms a functional group (normal oromotor function).¹⁴

Oral health-related quality of life was determined using the Modified Parent - Caregiver Perception Questionnaire (P-CPQ), which consists of 14 closed-ended questions and is divided into four subscales of quality of life aspects: oral symptoms (OS), functional limitations (FL), emotional well-being (EWB), and social well-being (SWB). The P-CPQ uses 5 Likert scales with scores of '0' never, '1' once or twice (1-2x in 3 months), '2' sometimes (> 2x in 3 months), '3' often (almost every week), and '4' very often (almost every day). The total score ranges from 0-56, with the highest score being 56.¹⁶ To categorize the final results of the questionnaire, oral health-related quality of life value were categorized into several groups based on the total score, where children who have a good quality of life have a total score <33. Children who categorized a moderate quality of life had a total score of 33-44, and children who categorized poor quality of life had a total score >45.

Bivariate data analysis was then carried out using non-parametric tests, namely the Spearman correlation test to analyze the correlation between oromotor dysfunction and oral health related quality of life in DS children.

RESULTS

In this study, there were as many as 30 respondents, including their parents. There were 14 males (47%) and 16 females (53%) among them. Based on Figure 1, the respondents varied in age from 9 to 20 years old. Most respondents were dominated by children aged 12 years (6 children) and the least were children aged 9, 10, 14, 15 and 18 years (each consisting of 1 child).

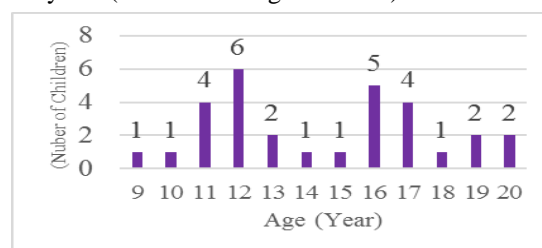


Figure 1. Distribution of respondents based on age

The distribution of respondents based on the scores of each evaluated oromotor skills item is shown in Table 1, where the unique oromotor function characteristics of the respondents can be observed. The majority of children with DS (24; 80%) demonstrated adequate mouth closure while using eating utensils or got a score of 3. However, only eight children (26.7 %) were able to close their lips properly on a utensil. The rest, mostly children (20; 66.7%), got a score of 2 because their lips were unable to close sufficiently, resulting in food loss. There were no children who scored 0 on

the oromotor skills items for lip closure when swallowing, food control when swallowing, chewing, and fluid control when swallowing. The majority of children demonstrate enough functioning to perform these oromotor skills.

After that, grouping was carried out into 2 subgroups, namely a sub-functional group (oromotor dysfunction), and functional group (normal oromotor function). Based on Figure 2 it is known that only 5 children (16.7%) had oromotor dysfunction and the remaining 25 children (83.3%) had normal oromotor function.

Table 1. Distribution of respondents based on the score of each item of oromotor skills

Oromotor Skills	Scores (%)			
	Non Functional (0)	Sub Functional (1)	Semi Functional (2)	Functional (3)
Mouth closure on utensil	1 (3,3%)	0	5 (16,7%)	24 (80%)
Lip closure on utensil	1 (3,3%)	1 (3,3%)	20 (66,7%)	8 (26,7%)
Lip closure during deglutition	0	3 (10%)	3 (10%)	24 (80%)
Control of food during deglutition	0	0	12 (40%)	18 (60%)
Mastication	0	4 (13,3%)	1 (3,3%)	25 (83,3%)
Sucking straw	1 (3,3%)	0	8 (26,7%)	21 (70%)
Control of liquid during deglutition	0	0	3 (10%)	27 (90%)

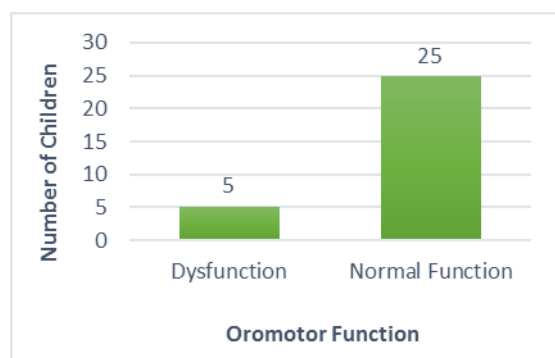


Figure 2. Distribution of respondents based on the final results of oromotor skills of children with Down syndrome

The distribution of respondents based on age and oromotor skills in children with DS are presented in Figure 3. According to these findings, almost all children who had oromotor dysfunction were in the young age group (9, 10, 12 years old), and one child who had oromotor dysfunction were in the older age group (17 years old).

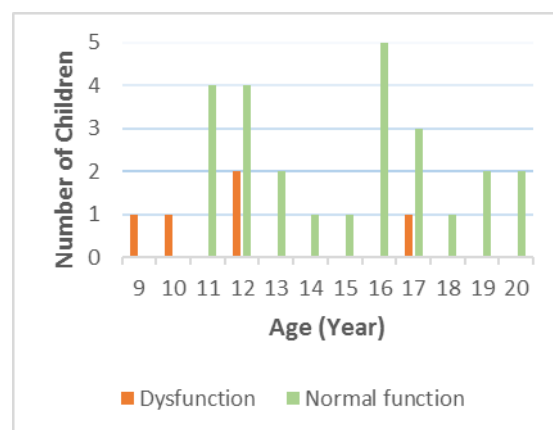


Figure 3. Distribution of respondents based on age and oromotor skills in children with Down syndrome

The results of the Modified P-CPQ are presented in Figure 4. According to these findings, more than half of the respondents (17 children or 56.7%), had a good quality of life. The remaining 10 children (33.3%) had a moderate quality of life, and 3 children (10%) had a poor quality of life.

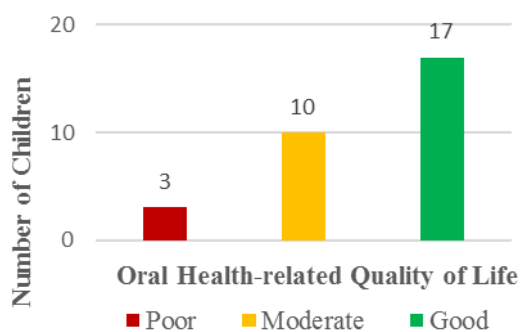


Figure 4. Distribution of respondents based on the level of oral health-related quality of life of children with Down syndrome

Table 2 shows the level of oral health-related quality of life based on oromotor function in children with DS in Banjarmasin Special Schools. According to these findings, there were no children with oromotor dysfunction who had a good quality of life. All children with oromotor dysfunction had a poor (3; 60%) to moderate (2; 40%) quality of life. The majority of children with normal oromotor function (17; 68%) reported a good quality of life, and none had a poor quality of life.

Table 2. Level of oral health-related quality of life based on oromotor function in children with Down syndrome

Oromotor Function	Oral Health-related Quality of Life in Children with DS			N
	Poor	Moderate	Good	
Dysfunction	3 (60%)	2 (40%)	0 (0%)	5 (100%)
Normal Function	0 (0%)	8 (32%)	17 (68%)	25 (100%)

Based on the results of the Spearman correlation test, there was a significant correlation between oromotor dysfunction with oral health-related quality of life in children with DS in Banjarmasin Special Schools with a significance value of 0.000 ($p < 0.05$) and a correlation coefficient value of 0.637. This means that there was a strong and positive correlation between oromotor dysfunction and oral health-related quality of life in children with DS in Banjarmasin Special Schools.

DISCUSSION

Due to DS-specific muscular hypotension, many children with the disorder have trouble eating and swallowing. These issues include difficulty controlling their tongue, opening their mouth,

anomalies of their faces and occlusals, and a tendency to become tired easily.⁹ Oromotor dysfunction brought on by aberrant orofacial morphology and clumsy lip, tongue, and cheek movements causes DS children to struggle to acquire masticatory function.¹⁰ According to Ross et al. (2019), a large number of kids with DS would only eat "easy" low-textured foods and would not chew. A lack of diversity in dietary and nutritional intake may be the downstream effect of oral sensory alterations and texture preference.^{11,12}

Oromotor dysfunction in children with DS has been demonstrated in other studies using different instruments.⁴ To the author's knowledge, this study is the first research that use the Oral Motor Assessment Scale (OMAS) to measure oromotor function in children with DS.

The final results of the oromotor skills assessment revealed that 83.3% of the children had normal oromotor function, and only 16.7% of the children had oromotor dysfunction. This result is different with the study conducted by Kamrujjaman (2018), which found that more than half of the DS children studied (61% and 72%) exhibited oromotor dysfunction.⁴ This can be caused by the differences in methods for determining oromotor function disorders in children. The participants in this research were dominated by the adults aged group (14-20 years) which showed better oromotor skills than children in the younger age group (9-13 years). Whereas in the previous study, the sample was dominated by children in the younger aged group (4-13 years), and the presence of oromotor was determined only based on the opinion of the parents on the lip, tongue, and jaw movements of their children.⁴

Age can affect the development of a oromotor function, especially in children with neurological disorders such as children with DS.^{10,13} These results are in line with the study conducted by Ortega, et al (2014), which states that there is an increase in the oromotor function of children with age.¹⁴ However, in this study, children with oromotor dysfunction were also found in the older group of children. This is may be caused by the child's higher level of cognitive impairment.

Children with Down syndrome may also experience cognitive impairment, which can inhibit the development of oromotor function.¹⁵ The high level of cognitive impairment in children with DS might result in a gap between the child's chronological and mental ages. Children with a mental age that differs from their chronological age might experience delays in their growth and development, including oromotor development. As a result, the more severe the child's cognitive

impairment, the more severe the motor function impairment.^{9,16,17}

The role of parents and caregivers in providing stimulation to children also influences oromotor skills.¹⁸ This is because chewing is a learned action, if the child is not exposed to food that requires adequate chewing action, as the jaw grows and develops, the chewing mechanism will not develop efficiently.^{13,19} Based on research by Ross et al (2019), it is known that children tend to eat soft food and do not want to chew. Lack of stimulation from parents will cause the oromotor dysfunction to continue to occur.¹²

A person's quality of life is determined by a combination of various aspects of oral health, such as physiological, psychological, and social.²⁰ The study's findings in Figure 2 indicate the degree of oral health-related quality of life in children with Down syndrome. It is clear that more than half of the respondents (56.7%) have a good quality of life, while the remaining (10%) have a poor quality of life.

The high proportion of well-achieved DS children, which have a good quality of life, can be attributed to the study groups' preponderance of older age groups. This finding is in line with Scalion, et al (2018), who found that age is one of the factors that is strongly related to negative parental perceptions of their children's oral health. Children under the age of ten require extra parental supervision to maintaining oral hygiene because they are unable to do so on their own.²¹

The results showed that the presence of oromotor dysfunction in children with DS can affect the oral health-related quality of life in all aspects. In the aspect of oral symptoms, the presence of oromotor dysfunction in children can lead to a lack of ability to clean the mouth. The inability to chew certain meals, such as fruits and vegetables, might reduce saliva secretion and natural mouth cleansing, resulting in poor oral hygiene, which can lead to cavities and periodontal disease.^{22,23}

On the aspect of functional limitations, the presence of structural abnormalities such as a small oral cavity with a relatively large tongue combined with poor oromotor function in children with DS makes it more difficult for them to make precise movements in chewing and swallowing food, so that it will affect their daily feeding. Such as the habit of avoiding certain foods, the need for a specific position when eating, the need for food with a smaller shape, the need for liquids to swallow food, and a longer meal time. The impact of oral symptoms and functional limitations above can affect aspects of the child's emotional well-being, such as making the child cry, stop laughing,

or become angry, resulting in a poor mood. This can affect the child's social well-being.²⁴

It can be concluded that there was a positive correlation between oromotor dysfunction and oral health-related quality of life in children with DS. The weaker the oromotor function in children with Down syndrome is, the worse the oral health-related quality of life will be.

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