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The Effect of Toothbrushing Knowledge on the Quality of Life of Down Syndrome Children in Jember Special School

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ABSTRACT

Children with down syndrome have a genetic disorder that causes intellectual and motor function disorders, especially in understanding and performing toothbrushing activities, thus increasing the risk of oral health problems that impact the child's quality of life. This research uses analytical observational research with a cross-sectional approach method using purposive sampling technique. Data in the form of toothbrushing knowledge questionnaire, OHI-S and C-OIDP questionnaire. The aim is to examine the effect of toothbrushing knowledge on the quality of life of children with Down syndrome in SLB Jember. Based on the results of the research, the highest frequency of the OHI-S category is in the moderate category (53.3%), the toothbrushing knowledge category is in the good category (53.3%), and the quality-of-life category in the mild impact category (87%). The results of the Pearson correlation test of knowledge with OHI-S significance is <0.001 with Pearson correlation value of +0.731. The significant value of knowledge with quality of life is 0.002 with Pearson correlation value of +0.536. The results of the linear regression test with R Square of 0.287. It was concluded that there is an influence between toothbrushing knowledge and the quality of life of children with Down syndrome.

Keywords: Down syndrome; Toothbrushing; Oral health; Quality of life.

INTRODUCTION

Down syndrome is an intellectual disability caused by genetic factors.[1] The World Health Organization (WHO) estimates that 8 million people worldwide have down syndrome, with an incidence of 1 in 1,000 live births. The 2018 Basic Health Research showed that the prevalence of down syndrome in Indonesia was 0.21%, with a total population of 300,000.[2] The prevalence of dental caries in children with down syndrome is high at 93.8%.[3]

Down syndrome occurs when a person has a third copy of the trisomy 21 chromosome, which causes structural and functional abnormalities, as well as intellectual disability.[4] Down syndrome is characterized by hypotonia, which makes it difficult to perform dexterous movements, including brushing teeth, which involves fine motor and sensory activities.[5] Children with intellectual disabilities have difficulty brushing their teeth, which is related to their lack of awareness of the importance of

maintaining oral health, which impacts their oral hygiene status.[6]

A clean oral cavity reflects a healthy body system and thus affects a person's quality of life.[7] Quality of life can be assessed through oral health, known as OHRQoL (Oral Health-Related Quality of Life). One of the instruments used to measure OHRQoL is the Oral Impacts on Daily Performance (OIDP). One such measure developed specifically for children is the Child-Oral Impact on Daily Performance (C-OIDP).[8] The C-OIDP measure is derived from the OIDP with editorial modifications to address children's abilities related to intellectual and cognitive development and demonstrates high validity with eight simple questions.[9]

Previous research has shown that the general health profile of students at Jember State Special Needs Schools (SLB Negeri) is quite good, but their oral health remains poor.[10] Previous research has shown that the majority of respondents with intellectual disabilities have a poor quality of life (64.9%).[11] The quality of life of individuals with down syndrome is often compromised and inadequate due to their limitations.[12] Previous research has indicated that the oral health of children with special needs (SLB) is still poor, and there has been no research on tooth brushing related to the quality of life of children with down syndrome. This research aims to examine the "Influence of Toothbrushing Knowledge on the Quality of Life of Children with down syndrome at SLB Jember" using the C-OIDP instrument, a method previously unseen by other researchers.

MATERIALS & METHODS

This research used an observational analytical design with a cross-sectional approach, conducted in five special needs schools in Jember. Subjects were selected using a purposive sampling technique, with a population of 41 children with down syndrome, and 30 children met the criteria. The criteria for this research were children with down syndrome who could communicate and whose parents signed informed consent. The independent variable in the research was the children's toothbrushing knowledge. The dependent variable in the research was the quality of life of the children with down syndrome.

The measuring instrument used in the research was the OHI-S. Toothbrushing knowledge was assessed using a toothbrushing knowledge questionnaire assessment rubric, with results categorized as (1) Low: 0–8; (2) Moderate: 9–12; (3) Good: 13–16. Quality of life assessments were obtained from the C-OIDP questionnaire, measured on a 5-point Likert scale, with results categorized as (1) Very bad impact: 0–8; (2) Bad impact: 9–16; (3) Moderate: 17–24; (4) Mild: 25 – 32. The research procedure involved interviews to complete questionnaires and OHI-S examinations. The subjects brushed their teeth independently, and the researcher observed and completed the assessment rubric for the toothbrushing knowledge questionnaire. The researcher provided education on how to brush their teeth to the subjects. The ethical clearance application to the Health Ethics Commission of the Faculty of Dentistry, University of Jember, was approved under No. 2693/UN25.8/KEPK/DL/2024.

The toothbrushing knowledge questionnaire was tested for validity using Cohen's Kappa and Cronbach's Alpha reliability. Normality was tested using the Shapiro-Wilk test, followed by the Pearson correlation test. Data are considered correlated if the significance value is less than 0.05. A Pearson correlation value of 0.00 – 0.20 indicates no correlation; 0.21 – 0.40 indicates weak correlation; 0.41 – 0.60 indicates moderate correlation; 0.61 – 0.80 indicates strong correlation. 0.81 – 1.00: perfect correlation. Correlations can be positive or negative. Data analysis was also performed using linear regression to determine the influence of behavior and its domain. A significance value greater than 0.05 indicates an influence.

RESULT

Research conducted on the influence of knowledge about brushing teeth on the quality of life of children with down syndrome in SLB Jember. The total population was 41 children aged 7-20 years who attended five SLB Jember. There were 4 children who did not meet the research criteria and 7 children were considered dropouts because they did not complete the research stages, so that at the end of the research there were a total of 30 children as research respondents. Data of the gender of children with down syndrome can be seen in table 1.

Table 1. Frequency Distribution Gender Based Down Syndrome

Gender	Patrang State Special School		Branjangan Special Needs School		SDLB BCD YPAC Kaliwates		BCD YPAC Kaliwates Special Junior High School		Balung Special Needs School		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
Man	5	35.7	1	33.3	1	100	1	50	4	40	12	40
Woman	9	64.3	2	66.7	0	0	1	50	6	60	18	60
Total	14	100	3	100	1	100	2	100	10	100	30	100

Based on table 1, shows the frequency distribution of the gender of children with down syndrome, the sample obtained was down the number of male children with down syndrome at SLB Balung was 4 (40%) and the number of female children was 6 (60%). The highest frequency of gender in the down syndrome sample is a female respondent.

Table 2. Frequencies Down Syndrome in SLB Jember Based on Age

Age	Patrang State Special School		Branjangan Special Needs School		SDLB BCD YPAC Kaliwates		BCD YPAC Kaliwates Special Junior High School		Balung Special Needs School		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
7	3	21.43	0	0	0	0	0	0	0	0	3	10
8	2	14.29	0	0	0	0	0	0	0	0	2	6.7
9	1	7.14	0	0	0	0	0	0	0	0	1	3.3
10	0	0	1	33.3	0	0	0	0	1	10	2	6.7
11	1	7.14	0	0	1	100	0	0	0	0	2	6.7
12	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	1	10	1	3.3
14	1	7.14	0	0	0	0	1	50	2	20	4	13.3
15	0	0	0	0	0	0	1	50	0	0	1	3.3
16	2	14.29	0	0	0	0	0	0	1	10	3	10
17	2	14.29	1	33.3	0	0	0	0	0	0	3	10
18	2	14.29	0	0	0	0	0	0	0	0	2	6.7
19	0	0	1	33.3	0	0	0	0	2	20	3	10
20	0	0	0	0	0	0	0	0	3	30	3	10
Total	14	100	3	100	1	100	2	100	10	100	30	100

Based on table 2 frequency distribution based on age, the sample frequency is obtained syndrome in Patrang State Special Needs School, the highest prevalence was at the age of 7 years, namely 3 children (21.43%). The frequency of down syndrome samples at SLB Branjangan equivalent to the ages of 10 years, 17 years, 19 years, as many as 1 child each (33.3%). The frequency of down syndrome samples in SDLB BCD YPAC Kaliwates only occurred at the age of 11 years in 1 child (100%). The frequency of down syndrome samples at SMPLB BCD YPAC Kaliwates equivalent to the age of 14

years and 15 years as many as 1 child each (33.3%). The most frequent down syndrome sample in SLB Balung occurred at the age of 14 years, with 3 children (30%). The highest sample frequency down syndrome in five SLB in Jember at the age of 14 years as many as 4 children (13.3%).

Table 3. Frequencies Down Syndrome in SLB Jember Based on Age Group

Age	Patrang State Special School		Branjangan Special Needs School		SDLB BCD YPAC Kaliwates		BCD YPAC Kaliwates Special Junior High School		Balung Special Needs School		Total	
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)
7-11	7	50	1	33.3	1	100	0	0	1	10	10	33.3
12-16	3	21.4	0	0	0	0	2	100	4	40	9	30
17-20	4	28.6	2	66.7	0	0	0	0	5	50	11	36.7
Total	14	100	3	100	1	100	2	100	10	100	30	100

Based on table 3, the frequency distribution based on age group, the highest frequency in the down sample Syndrome occurs in the 17-20 age group (36.7%).

Table 4. OHI-S Examination Results

Category OHI-S	Inspection	
	n	(%)
Good	4	13.3
Currently	16	53.3
Bad	10	33.3
Total	30	100

Based on table 4, the OHI-S value in the good category was 4 students (13.3%), the moderate category was 16 students (53.3%), and the poor category was 10 students (33.3%).

Table 5. Distribution of Tooth Brushing Knowledge Questionnaire

Tooth Brushing Knowledge Category	Frequency (n)	Presentation (%)
Good	16	53.3
Currently	13	43.3
Low	1	3.3
Total	30	100

Based on table 5, the knowledge value of brushing teeth is in the high category for 16 students (53.3%), the medium category for 13 students (43.3%) and the low category for 1 student (3.3%).

Table 6. Distribution of Quality of Life with the C-OIDP Questionnaire in Children with Down's Disease Syndrome at SLB Jember

Quality of Life Category	Frequency (n)	Presentation (%)
Very Bad Impact	0	0
Adverse effects	0	0
Moderate Impact	4	13
Mild Impact	26	87
Total	30	100

Based on table 6, quality of life with the Child-Oral Impact questionnaire on Daily Performances show that out of 30 students, no students showed the very bad impact and bad impact categories, 4 students (13%) showed the moderate impact category, and 26 students (87%) showed a mild impact on their quality of life.

Table 7. Cohen's Kappa Test for Tooth Brushing Questionnaire

		Value	Approximate Significance
Measure of Agreement	Kappa	0.474	0.002
N of Valid Cases		30	

Based on table 7, the Kappa value is 0.474 and p (value) or Approximate The significance is 0.002, it can be concluded that the results have a moderate level of agreement, which is statistically significant in assessing questionnaire data on 30 respondents. A significant Kappa value as above can be considered valid and consistent, so it is suitable for use in subsequent analyses.

Table 8. Reliability Test of the Tooth Brushing Knowledge Questionnaire

Number of Questions	Cronbach's Alpha	Condition	Information
16	0.720	0.6	Reliable

From table 8 it is known that 16 questions got Cronbach's value Alpha 0.720 where the alpha value is greater than 0.6, so the tooth brushing knowledge questionnaire is reliable.

Table 9. Results of Normality Test with Shapiro Wilk

Score	Significance Value
OHI-S	0.257
Knowledge	0.096
Quality of Life	0.076

Based on table 9, the results of the normality test show that the significance value is > 0.05, so H0 is accepted and it is concluded that the data is normally distributed.

Table 10. Pearson Correlation Test of OHI-S, Knowledge and C-OIDP Examination Data

		Knowledge	OHI-S	Quality of Life (C-OIDP)
Knowledge	Pearson Correlation	1	(-0.731)	(+0.536)
	Sig. (2-tailed)		< 0.001	0.002
	N	30	30	30
OHI-S	Pearson Correlation	(-0.731)	1	(-0.726)
	Sig. (2-tailed)	< 0.001		< 0.001
	N	30	30	30
Quality of Life (C-OIDP)	Pearson Correlation	(+0.536)	(-0.726)	1
	Sig. (2-tailed)	0.002	< 0.001	
	N	30	30	30

Based on table 10, the significant value of knowledge on OHI-S is <0.001. Since the significant value is less than 0.05, it means there is a significant relationship between the value of knowledge on brushing teeth and OHI-S. Pearson value The correlation coefficient of (-0.731) means that the correlation strength or relationship is moderate. The negative correlation coefficient above indicates that the higher the knowledge score about brushing teeth, the lower the OHI-S index score, which means better oral hygiene.

The results of the significant value of the OHI-S on quality of life were <0.001, because the significant value was less than 0.05, meaning there was a significant relationship between the OHI-S and quality

of life. Pearson value the correlation coefficient of (-0.726) means that the level of correlation strength or relationship is a moderate relationship. The correlation coefficient number above is negative, indicating that the lower the OHI-S (oral hygiene index) value, the higher the quality-of-life value of children with down syndrome disease.

The significance value of knowledge on quality of life is 0.002, because the significance value is less than 0.05, it means there is a significant relationship between knowledge and quality of life. Pearson value the correlation coefficient of (+0.536) means that the level of correlation strength or relationship is a weak relationship. The correlation coefficient figure above is positive, indicating that the higher the knowledge score for brushing teeth, the higher the quality of life of children with down syndrome disease.

Table 11. Regression Test Results of Knowledge and Quality of Life Data

Variables	Significance Value	R-value	R Square Value
Knowledge *Quality of Life	0.002	(+0.536)	0.287

The results of the regression test in table 11 show that the significance value is less than 0.05, namely 0.002, it can be concluded that there is a significant influence between knowledge of brushing teeth on quality of life. The positive R value of (+0.536) means that a higher level of knowledge increases the chance of a higher quality of life. The R Square value of 0.287 means that 28.7% of changes in quality of life can be explained by knowledge, the rest (71.3%) is explained by other factors.

DISCUSSION

Gender prevalence from the research results shows the number of girls (40%) with down syndrome disease more than boys (60%). The difference in the number of females with down syndrome that is more common than men is influenced by various biological, genetic, environmental and social factors.[13] Based on table 2, the frequency of the most samples down syndrome in five SLB in Jember was 14 years old (13.3%). These results are in line with research conducted by Budiman et al [14], showing that children with down syndrome have the highest proportion in children aged 14 years and above. Based on Table 3, the 17–20 age group is the most dominant age group, with 11 children (36.7%). The number of children with down syndrome is 11. Down syndrome is more common in late adolescence. The WHO categorizes late adolescence as being between 15 and 19 years old, characterized by significant changes in physical, emotional, social, and intellectual aspects.[15] The prevalence of syndrome is higher at this age due to various factors, including increased life expectancy, earlier diagnosis, decreased premature mortality, extended educational attainment, and adaptive care.[16] The oral hygiene examination using the OHI-S (Oral Hygiene Index - Simplified), the majority of respondents were in the moderate (53.3%) and poor (33.3%) categories. These results align with statement Kusumawardani et al [10], that stated that the general health profile of students at Jember State Special Needs School is quite good, but their oral health remains poor. These results also align with research conducted by Prihatiningrum et al [17], which found that the oral health status of elementary school children in an agro-industrial environment in Jember showed moderate oral hygiene, with low caries in permanent teeth and moderate caries in deciduous teeth. Their cognitive and fine motor limitations lead to poor hand coordination, difficulty understanding instructions, and communication barriers in children with down syndrome.[18] Down's syndrome, making it difficult to maintain oral hygiene.[19] Dental and oral health problems are also associated with a lack of awareness of dental visits, inadequate oral hygiene practices or patterns, a lack of fluoridation, and a lack of involvement from

parents of Down's disease sufferers the syndrome.[3,20]

Based on Table 4, it shows that most children are in the moderate knowledge category (43.3%). This is confirmed by the research of Sukarsih et al. [21], which stated that the results of the knowledge of brushing teeth of children with special needs before counseling using videos were in the high (54%) and moderate (46%) categories. These results not in line with research conducted by Primawati et al. [22], where scores before being given intervention using dental health education were in the low knowledge category (73%). The results of this research can differ due to several factors, namely the characteristics of different research samples, the active involvement of parents, teachers, and health workers in guiding children with disabilities, the type of disability and different cognitive levels.[23]

Based on the results by the research, it was found that some children have down syndrome. Children with down syndrome use a horizontal brushing technique, which only reaches the outer surfaces of the teeth. Tongue brushing, which is important for reducing bad breath-causing bacteria, is also rarely practiced by children with down's syndrome during the research. Another problem in the research is that Children with down's syndrome have difficulty positioning their toothbrush correctly due to limited fine motor skills.[24] This is consistent with Desa et al statement that limited hand coordination and insufficient pressure when brushing make brushing less effective and uneven.[19]

Overall, the research results indicate the need for guidance, repeated education, and modified brushing techniques tailored to the motor skills of children with down's syndrome, such as the combination of horizontal modification and fones techniques. The fones modification technique is suitable for children with disabilities because it requires minimal dexterity and is easy to learn.[25]

The quality-of-life category using the C-OIDP questionnaire, 87% of children were classified as having mild impacts. This is in accordance with research conducted by Wibisana et al [26], that found that the quality of life of children with disabilities was categorized as good (66.67%) based on the physical health domain. These results can be explained by several factors, including children's perceptions of oral health problems, particularly among children with disabilities, including children with down syndrome disease. These children have unique cognitive and emotional characteristics, which prevent them from always recognizing or expressing discomfort caused by oral problems. Most children's activities at school and at home are still largely supported by parents or caregivers, so the impact of poor oral hygiene is not always immediately felt by the child.[27] Emotional and social support from family, teachers, and the surrounding environment also plays a role in maintaining a child's quality of life.[28]

Results of the Pearson correlation test it can be seen that there is a significant relationship between knowledge, OHI-S (Oral Hygiene Index -Simplified), and quality of life in children with down syndrome in SLB Jember. All significance values were less than 0.05, indicating a relationship between these variables. The correlation between knowledge, OHI-S, and quality of life showed that the lower a child's knowledge of brushing teeth, the higher their OHI-S score. A higher OHI-S score indicates poor oral hygiene. The lower a child's knowledge of brushing teeth, the worse their quality of life is.[29] Low levels of knowledge can lead to children not understanding the importance of maintaining dental hygiene, the recommended brushing frequency, and effective brushing techniques.[30] Limitations in cognitive and motor aspects that are not supported by sufficient knowledge or adequate guidance from parents or teachers, lead to a tendency to neglect oral hygiene.[31] Knowledge is an important factor influencing oral hygiene status. Children with low knowledge tend to exhibit poorer oral hygiene conditions, which affect their quality of life.[18]

Based on table 11, the results of the linear regression test show that knowledge of brushing teeth has an effect on the quality of life of children with down syndrome disease. There is a positive relationship with a weak correlation strength, meaning that the more knowledge a child has about brushing their teeth, the better their perceived quality of life. A linear regression test revealed that the contribution of knowledge about brushing teeth was only 28.7%, considering that many other factors also influence the quality of life of children with down's syndrome, such as family support, general health, school environment, and other psychosocial aspects.[12] Toothbrushing knowledge is an important factor that can be intervened to improve the quality of life of children with special needs and toothbrushing knowledge can be significant predictor of the quality of life of children with Down's syndrome. A sustainable and structured oral health education program is essential to increase knowledge and positively impact the quality of life of children with Down's syndrome.

Although the implementation of this research was optimal, it still has shortcomings and limitations. The researcher was limited in collecting respondents from a limited population and limited communication with some children with down syndrome.

CONCLUSION

Based on the results of the research that has been conducted, the results of the regression test with a significance value of less than 0.05 and a regression value of (+0.536), it can be concluded that there is a significant influence between knowledge of brushing teeth and quality of life. There is a proven positive relationship, namely that the higher the level of knowledge of brushing teeth, the better the quality of life will be.

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