ORIGINAL ARTICLE

Correlation between oral health and the quality of life of children with disabilities using healthy-dis: an observational study

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ABSTRACT

Introduction: Children with disabilities require special attention due to various limitations, such as difficulty in maintaining oral hygiene, communication barriers, and behavioral challenges. This study aimed to investigate the impact of oral health on the quality of life of children with disabilities in Jember, using the Healthy-Dis software. **Methods**: This analytical observational study employed a cross-sectional design. The study population consisted of 180 students enrolled at SLB C TPA Jember and SLB N 1 Patrang Jember. Caries severity was assessed using the DMF-t/def-t index, oral hygiene using the OHI-S index, and oral health-related quality of life (OHRQoL) using the COHIP-SF 19 questionnaire. Dental care needs were evaluated using the Required Treatment Index (RTI). The COHIP-SF 19 and RTI instruments were modified and integrated into the Android-based *Healthy-Dis* application. **Results**: A significant correlation was found between gender, caries severity, oral hygiene status, and the quality of life of children with disabilities ($p < 0.05$). A strong positive correlation was observed between oral hygiene status and quality of life ($r = 0.446$), while caries severity and gender showed negative correlations. These findings highlight the importance of maintaining good oral hygiene to improve the overall well-being of children with disabilities. **Conclusion**: Oral health status—including caries severity and oral hygiene level—is significantly associated with the quality of life of children with disabilities. Efforts to promote better oral hygiene may enhance their daily functioning and overall well-being.

KEYWORDS

DMF-t index, def-t index, ohis index, oral health-related to quality of life, cohip-sf 19

INTRODUCTION

Research indicates that children with disabilities exhibit higher prevalence rates of dental caries, periodontal diseases, and a compromised overall Oral Health-Related Quality of Life (OHRQoL).[1] Children with disabilities require greater attention compared to their typically developing peers due to various limitations, such as reduced ability to maintain oral hygiene, communication difficulties, and behavioral challenges. These factors collectively increase their risk of developing oral and soft tissue diseases.[2–4]

Based on the 2018 Basic Health Research Report by the Indonesian Ministry of Health, the number of people with disabilities in Indonesia was 920.924.[5] In contrast, data from the Central Statistics Agency of Indonesia (BPS) in 2023 reported 933.893 individuals with disabilities, of which 14.16% were aged 5-19 years. According to the Central Statistics Agency of East Java in 2018, there were 39.342 individuals with disabilities, including 1.250 (3.18%) residing in Jember.[6]

These figures indicate that a considerable number of children with disabilities live in Jember.

Anggraini et al. (2025) reported that the majority of oral hygiene status among children with special needs at Helen Keller SEND School was in the poor category (68.80%), with most prevalent among intellectual disabilities students (81.3%). Otherwise, Patidar et al. (2022), found that the oral hygiene index of children with disabilities generally fell into the moderate category (62%). Furthermore, children with dental caries experience a significantly greater negative impact on their quality of life compared to those without dental caries.[8,9]

The need to evaluate one's dental and oral health, and its influence on daily functioning, has led to growing research interest in assessing the Oral Health-Related Quality of Life (OHRQoL). This multidimensional construct reflecting the impact of oral conditions on overall well-being.[10]

Instruments that can assess the effects of oral health conditions on functional, social, and psychological well-being include the Child Oral Health Impact Profile Short Form-19 (COHIP-SF 19).[8] This instrument has been widely tested and validated, enabling accurate measurement of specific dental and oral health conditions that affect children's daily lives. The COHIP-SF 19 is applicable for children aged 8 to 18 years.[11–13], with a total subscale score of 76.[14]

While research on oral health-related quality of life (OHRQoL) in typically developing children has been extensively conducted, similar studies involving children with disabilities remain limited.[15] Previous assessments have generally been performed manually, and no studies have yet incorporated software-based evaluation. The present study utilizes the Healthy-Dis application, which integrates the Indonesian version of the COHIP-SF 19 questionnaire and the Required Treatment Index (RTI), to enable a more effective and efficient assessment process.

The research's novelty lies in predicting the quality of life for children with disabilities by utilizing the modified COHIP-19 SF questionnaire and incorporating the calculation of the Required Treatment Index (RTI) within an Android-based application. Therefore, this study aims to investigate the impact of oral health on the quality of life of children with disabilities in Jember, using the Healthy-Dis software.

METHODS

The type of research used was an analytical observational with a cross-sectional design. This study centers on the Quality of Life (QoL) among children with disabilities as the dependent variable. The analysis will assess its relationship with the independent variables of oral health status, specifically measured using the modified COHIP-SF 19 and the Required Treatment Index (RTI) instruments. The study population consisted of students from SLB C TPA Jember and SLB N 1 Patrang Jember, totaling 200 eligible students; 130 met the inclusion criteria and were included in the final analysis.

The sampling technique employed was purposive sampling, with inclusion criteria requiring parental informed consent, students actively attended school at SLB, could communicate effectively, or had a companion present during the interview and examination. Children who were uncooperative during examination, absent during data collection, had communication difficulties were excluded.

The research was conducted from May to October 2024 and was carried out by nine researchers trained in data collection techniques by a pediatric dentist. Consent to participate as a research respondent was obtained by providing information to parents and the school regarding the research to be conducted, the examinations required for data collection, and it was emphasized that this research would not pose any risk to the respondents. Then, parents were asked to sign the informed consent form. The research has been ethically approved by

the Health Research Ethics Committee of the Faculty of Dentistry, Jember University, with number 2553/UN25.8/KEPK/DL/2024.

The tools and materials needed in the study include a headlamp, diagnostic kit, mouth opener, wooden spatula, disposable gauze, cotton pellet, disclosing agent, questionnaire, informed consent form, and examination sheet. Assessment of caries severity using the DMF-t/def-t index and oral hygiene using the OHI-S index, while evaluating children's quality of life related to dental and oral health using the COHIP-SF 19 index, and dental care needs using the Required Treatment Index (RTI). Both instruments were modified and integrated into the Healthy-Dis android-based application. The Cronbach's Alpha value is 0.605, acceptable for exploratory studies. with the sensitivity level of the Healthy-Dis application showing a value of 90.7%, specificity of 95%, positive predictive value of 100% and negative predictive value of 87.7%, supporting the validity of the Healthy-Dis application.

Data tabulation using a frequency distribution table for age, gender, type of disability, school origin, caries index, OHI-S index, and children's quality of life related to dental and oral health using SPSS version 22.0 (IBM Corp., Armonk, NY, USA). Data analysis using Kolmogorov-Smirnov and the homogeneity test using Levene's test. The correlation between the caries index and OHI-S index about quality of life was analyzed using the Chi-Square test. Pearson's correlation is selected if the variable data are on an interval/ratio scale and all parametric assumptions (particularly normality and linearity) are satisfied. Should these assumptions fail, or if the data are measured on an ordinal scale, then Spearman's rho becomes the more appropriate choice.

RESULTS

The total number of participants was 200 students, divided into 120 students from State Special School (SLB N) 1 Patrang and 80 students from Special School (SLB) C TPA Jalan Jawa. Of the initial 200 participants, 70 students were excluded (27 from SLB N 1 Patrang and 43 from SLB C TPA) due to parental non-consent, absence, or inability to communicate effectively, resulting in a final sample of 130 participants.

Table 1. Frequency distribution of research subjects based on age group, gender, and school

Variable	n	%
Age Group (year)		
6-8	24	18.5
9-11	33	25.4
12-14	16	12.3
15-17	35	26.9
18-20	18	13.8
21-23	4	3.1
Total	130	100
Gender		
Male	71	54.6
Female	59	45.4
Total	130	100
School		
SLB N 1 Patrang	93	71.5
SLB-C TPA Sumbersari	37	28.5
Total	130	100

Table 1 indicates that the largest proportion of subjects belonged to the 15-17 year age group, comprising 35 students (26.9%). The distribution by gender revealed a predominance of male students (54.6%) over female students. Furthermore, the highest number of subjects, representing 71.5% of the total, were recruited from SLB N 1 Patrang Jember

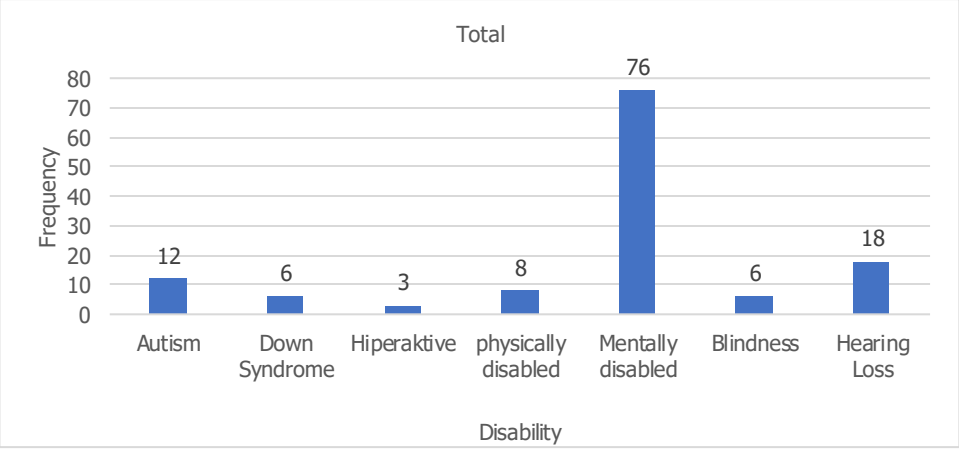

Figure 1. Distribution of disability category in both Special School C TPA and State Special School 1 Patrang

As shown in Figure 1, most participants (58.5%) had intellectual disabilities.

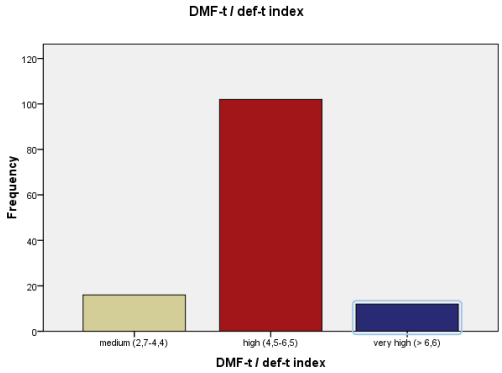

Figure 2. Average caries index using DMF-t / def-t index from the 2 Special School (SLB)

The majority had a high caries index (78.5%) (Figure 2) and poor oral hygiene (54.6%) (Figure 3).

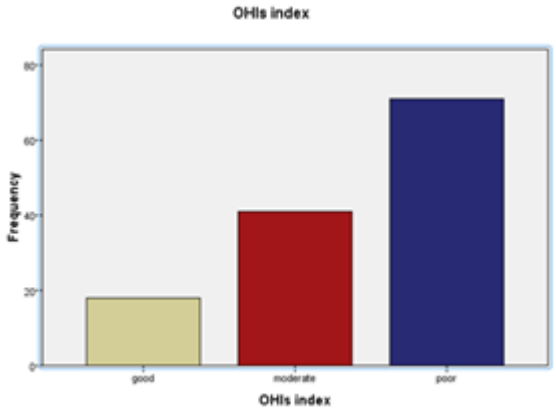

Figure 3. Average frequency of oral hygiene index using OHI-S from the 2 Special Schools

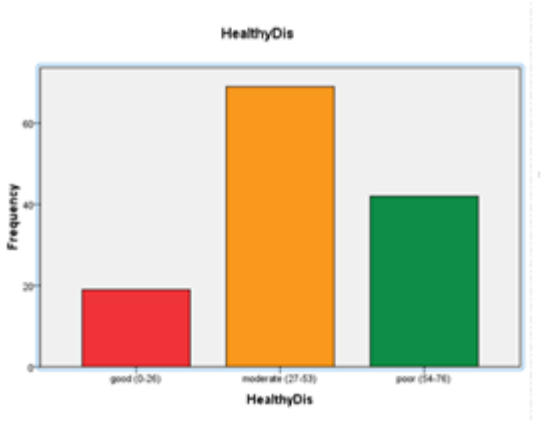

Figure 4. Average Oral Health-related Quality of Life Using Healthy-Dis

Regarding OHRQoL, more than half (53.1%) reported a moderate level, while 32.3% reported poor quality of life (Figure 4).

Table 2. Levene test results on DMF-t/ def-t index, OHI Index, and Quality of Life Using Healthy-Dis

Variable	F	Significance
DMF-t / def-t index	0.503	0.606
OHI-S Index	3.028	0.052
Healthy-Dis	0.500	0.600

All variables were normally distributed and homogenous (p>0.05), allowing the use of a parametric test.

Table 3. Pearson Correlation Test Results between Age, Gender, Type of Disability, School, Caries Severity, Dental Hygiene, and Oral Health-related Quality of Life of Children with Disabilities Using Healthy-Dis

Variable	Oral Health-Related Quality of Life	
	Pearson correlation value	p
Age	-0.160	0.068
Gender	-0.270	0.020*
Type of Disability	0.031	0.723
School	0.169	0.054
DMF-t / def-t index	-0.221	0.012*
OHI-S Index	0.446	0.000*

*significant at p<0.05

Table 3 shows that gender, caries severity, and oral hygiene level were significantly correlated with the quality of life of children with disabilities ($p < 0.05$). The correlation is very significantly positive only at the level of oral health ($r = 0.446$). Meanwhile, the severity of caries and gender show a negative correlation with the quality of life of children with disabilities (gender = -0.270; DMF-t / def-t index = -0.221).

The correlation coefficient (r) ranges between -1 and 1 ($-1 \leq r \leq 1$). A value of 1 indicates a perfect positive linear correlation, –1 indicates a perfect negative linear correlation, and 0 denotes no correlation. The positive relationship between oral hygiene and quality of life suggests that improved dental and oral health is associated with better OHRQoL. Conversely, greater caries severity and poorer oral hygiene are associated with lower quality-of-life scores among children with disabilities.

DISCUSSION

Table 1 shows that the 15-17-year-old age group (26.9%) constituted the largest group of research subjects. This occurred because the age range of students enrolled in the two special schools involved in this study, which spanned from 6 to 23 years. Grouping in these schools is determined by children's intellectual levels and the availability of school levels from elementary to high school. The study sample was predominantly male (54.6%). This finding is consistent with Tefera et al.,[13] who reported that most children with disabilities participating in similar studies were aged 13–18 years.

The high prevalence of caries observed among children with disabilities in this study supports previous research showing that individuals with special needs face considerable challenges in maintaining oral hygiene. The results of this study are consistent with Yani et al.,[14] who reported that the average DMF-t/def-t index in SLB children in Sidoarjo is 4.51, falling within the high category. The factors contributing to the high caries rate in children with disabilities include limited ability to maintain dental and oral hygiene, decreased salivary flow rate and pH, history of drug consumption, cariogenic diet, and low parental awareness r.[14–21] The primary determinants of the compromised oral health status observed in children with special needs include cognitive impairments, behavioral difficulties, physical limitations, congenital craniofacial anomalies, and the adverse effects of pharmacological interventions.[22]

According to Figure 3, the average Oral Hygiene Index in both SLBs was classified as poor (54.6%). This result is consistent with the research conducted by Anggraini et al., which showed that the majority of the OHI-S scores in 36 students at Helen Keller SEND School were in the poor category (63.8%).[1] Inadequate and ineffective oral hygiene practices are potential etiological factors contributing to suboptimal dental and oral health.[23] The oral hygiene index in children with disabilities is influenced by low brushing frequency, limited oral health knowledge, impaired muscle coordination and hand dexterity when using dental and oral hygiene tools and materials, limited intellectual abilities, lack of parental attention to tooth cleaning, limited oral motor function, and differences in behavioral characteristics among various types of disabilities.[9,24,25] In addition, most previous studies agree that individuals with disabilities have poorer oral hygiene compared to those without disabilities. Children with intellectual disabilities show more extensive and severe periodontal damage and greater colonization of periodontal pathogens compared to age-matched healthy individuals.[9]

Based on Figure 4, the Average Oral Health-Related Quality of Life using Healthy-Dis in both SLBs was categorized as moderate. Oral health has a significant impact on a child's overall quality of life. Quality of life can be assessed using the COHIP-SF 19 index. The COHIP is an adaptation of OHIP intended for children. This instrument is used to measure the quality of life of children aged 7-17 years. The original version of COHIP consists of 34 questions, organized into five subscales, which were subsequently simplified into 19 questions with three subscales: oral health, functional well-being, socio-emotional well-being, and self-image. A critical characteristic of this scale is the addition of positive aspects of OHRQoL (eg, self-confidence and attractiveness). Convergent validity is evidenced by the positive relationship between the COHIP-SF 19 and self-assessed general health and oral health, indicating that if the quality of life is good, then the status of general and oral health is also good.[11,26–28]

The children's quality of life related to dental and oral health in the study was categorized as moderate (53.1%). This result aligns with the survey by Tefera et al., which reported that the quality of life of children in Amhara, Ethiopia, also falls within the moderate category.[27] Another study conducted by Aljameel et al. (2021) found that in general, poor oral health has a negative impact on children with different disabilities and their families.[28]

According to Table 3, the results of the Pearson correlation test between the caries severity index and quality of life showed a significant correlation ($p = 0.012$; $p < 0.05$), but the relationship had a negative influence on quality of life with a correlation value = -0.221 ($p < 0.05$). The higher the level of caries, the lower the quality of life of children with disabilities. This finding aligns with the research of Alwattban et al., which demonstrated that the more severe the level of caries, the greater the pain and the more negative impact on quality of life.[3] The factors that may explain this are the communication skills of the population in expressing pain from cavities, the intellectual limitations of the population involved in the study, and differences in research methodology.

The results of the Pearson correlation test between the oral hygiene index and quality of life revealed a strong correlation between oral hygiene status and quality of life (correlation coefficient = 0.446; $p < 0.001$). The lower the dental and oral hygiene status, the lower the quality of life. These results align with the research of Tefera et al., which found that 68.7% of children with dental and oral hygiene issues experience a poor quality of life.[29] The quality of life for children with disabilities improves as their dental care improves.[30] Factors that influence the oral hygiene status of students with special needs are associated with the mother's education level, frequency of carbohydrate intake, and type of disability. Parents and caregivers play a crucial role in the oral hygiene status of children with disabilities by controlling their eating habits, providing oral hygiene care, and offering necessary support.[29,30]

The Healthy-dis application demonstrated acceptable reliability and validity, confirming its feasibility for assessing oral health-related quality of life among children with disabilities. Its integration of the COHIP-SF 19 and RTI indices allows for more efficient data collection and immediate interpretation compared to conventional manual scoring methods. This digital innovation represents a step forward in making oral health assessments more accessible for special-needs populations. The effectiveness of the application on the oral health item was 81.5%, the functional well item was 83.1%, and the socioemotional item was 82.3%. Overall, these results indicate that the Healthy-Dis application is practical and efficient for assessing children's quality of life related to dental and oral health. Another advantage of this application is the time efficiency in measuring children's quality of life compared to manual assessment.

This study was limited by its relatively small and homogenous samples, as participants were drawn from only two special schools with limited variation. Future studies should involve a larger and more diverse population across different regions to enhance the generalizability of the findings. Further development of the Healthy-Dis application should also include interactive features such as tailored oral health education and caregiver guidance.

CONCLUSION

Oral health status—including caries severity and oral hygiene level—is significantly associated with the quality of life of children with disabilities. Efforts to promote better oral hygiene may enhance their daily functioning and well-being. The utilization of the Healthy-Dis Application appears promising to assist in assessing the quality of life for children with disabilities, and is expected to contribute to their overall quality of life.

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Data Availability Statement: "Data is unavailable due to privacy or ethical restrictions".
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