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Dental Health Education to Prevent Speech Delay among Children with Special Needs in West Bandung

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ABSTRACT

Speech delay is one of the developmental disorders that frequently occurs in children with special needs, such as autism, Down syndrome, and intellectual disabilities. One of the factors influencing children's speech ability is oral and dental health. Poor dental conditions may hinder sound articulation, cause pain during speech, and impair oral motor function. Health education for parents of children with special needs has been proven effective in improving their ability to recognize and manage child development issues, as demonstrated in the service activity on identifying emotional problems in autistic children at SLB Kota Cimahi. This activity showed an increase in parental understanding and involvement after counselling was provided. This community service activity aimed to improve the knowledge and skills of parents and teachers in maintaining dental health as an effort to prevent speech delay among children with special needs. The activity was carried out at a Special Needs School in West Bandung Regency in September 2025, involving 74 students and 47 parents. The methods included interactive lectures, discussions, tooth-brushing demonstrations, dental examinations using the Child Dental Examination Checklist – WHO Oral Health Survey (2013), and speech development screening based on ASHA Speech and Language Development Milestones (2020). The results showed that 68% of the students had active dental caries, while only 16% had healthy teeth. Most children with healthy teeth demonstrated better communication abilities compared to those with oromotor disturbances. Post-test results indicated an improvement in parents' knowledge, with 60.4% achieving a good category after the educational session compared to before the activity. This program proved effective in raising awareness and is recommended for periodic implementation in collaboration with schools and health centers.

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INTRODUCTION

Speech delay is one of the most common developmental disorders experienced by children, particularly those with special needs such as autism, Down syndrome, and intellectual disabilities. This condition is characterized by speech and language abilities that do not correspond to the child's developmental age (Rossetti, 2020). According to the American Speech-Language-Hearing Association (ASHA, 2020), speech and language development consists of two main aspects: receptive language (the ability to understand language) and expressive language (the ability to express language through words and sentences). Disturbances in either aspect can affect a child's overall communication skills, social interactions, and learning processes.

The causes of speech delay may be organic, such as hearing impairment, oral anatomical abnormalities (malocclusion, tongue-tie), and neurological disorders, or non-organic, such as limited verbal stimulation and low social interaction (Paul, R., & Norbury, 2019); (Kemenkes RI, 2023). One often-overlooked organic factor is oral and dental health. Poor oral conditions such as caries, malocclusion, or tooth loss can interfere with sound articulation and reduce a child's ability to pronounce phonemes clearly (Ramos-Gomez et al, 2021). Recent studies by Lee, Y.-J., & Kim (2022) further confirmed that dental caries and reduced oral-motor control have a significant impact on speech intelligibility in early childhood. According to the American Academy of Pediatric Dentistry (AAPD, 2023), children with special needs are at higher risk of developing oral and dental problems due to motor and sensory limitations, which make it difficult for them to maintain oral hygiene independently. Several factors can contribute to speech delays, such as neurological developmental disorders, oral health conditions, and nutritional status. (Kulsum, D. U, et al, 2023) research indicates a significant relationship between stunting and speech delay in toddlers at Posyandu X Cimahi, where children with stunting have a higher risk of experiencing language development delays.

Poor oral health can exacerbate articulation, phonation, and oral motor control disorders, which are essential for speech production. Therefore, proper dental care from an early age plays an important role in supporting children's speech development. However, in practice, the awareness of parents and teachers regarding the importance of oral health as part of speech stimulation remains low. Most children in special schools (Sekolah Luar Biasa or SLB) have not received regular dental check-ups or integrated speech development screenings (WHO, 2020)

Promotive and preventive efforts, such as providing oral health education to parents and teachers, are therefore crucial to improving their understanding and ability to maintain children's oral hygiene and to recognize early signs of speech delay. The Health Belief Model (HBM) approach can serve as an effective strategy because it encourages behavioral change by increasing perceptions of risk and the benefits of maintaining oral health (Zhou et al, 2021). Thus, oral health education integrated with dental examinations and speech stimulation can help reduce the risk of speech delay among children with special needs.

This community service activity aimed to enhance the knowledge and skills of parents and teachers in special schools in West Bandung Regency regarding the importance of maintaining oral and dental health as a preventive effort against speech delay. Through educational sessions, dental examinations, and speech development screenings using the ASHA Speech and Language Development Milestones (2020) (ASHA, 2020) and the WHO Oral Health Survey (2013) (WHO, 2013), this program seeks to foster awareness and healthy behaviors in maintaining children's oral hygiene, as well as strengthen collaboration between schools, families, and health professionals to support optimal child development.

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METHODS

This community service activity is being carried out in person (face-to-face) at two Special Schools (SLB) in West Bandung Regency, namely SLB Al-Hikmah in Ngamprah District and SLB Hanjuang Jaya in Parongpong District, until October 2025. The target audience for the activity is parents and teachers of children with special needs. The activity implementation methods include several educational and practical approaches.

The media used in this activity includes PowerPoint (PPT) presentations containing educational material and short educational videos demonstrating the correct steps for brushing teeth, serving as audio-visual aids to support learning. Supporting equipment consists of a projector, laptop, and sound system for delivering the material, as well as chairs and carpets prepared to support participant comfort throughout the activity. During the examination session, various supporting tools were used, such as a mouth phantom and a large toothbrush for demonstration purposes, simple dental examination tools, and examination forms with used screening and instrument tools.

The screening instruments and tools are:

- Oral Health Examination: Conducted by dentists using the WHO Oral Health Survey: Basic Methods (5th edition, 2013) checklist to assess caries, oral hygiene, and structural abnormalities.
- Speech and Language Screening: Conducted by nursing lecturers using the ASHA Speech and Language Development Milestones (2020) to evaluate articulation, phonation, and verbal communication stages.
- General Health Assessment: Included measurement of body mass index (BMI), blood pressure, and vital signs to identify nutritional and general health status.

Additionally, supplementary health equipment such as a weight scale, height measurer, blood pressure monitor, oximeter, and thermometer gun is provided for general health checks of the participants. The activity evaluation is conducted by comparing pre-test and post-test results to measure the participants' knowledge improvement after attending the educational activity. The activity is considered successful if at least 80% of the participants actively participate in the entire series of activities and show a minimum 25% increase in post-test scores compared to pre-test results.

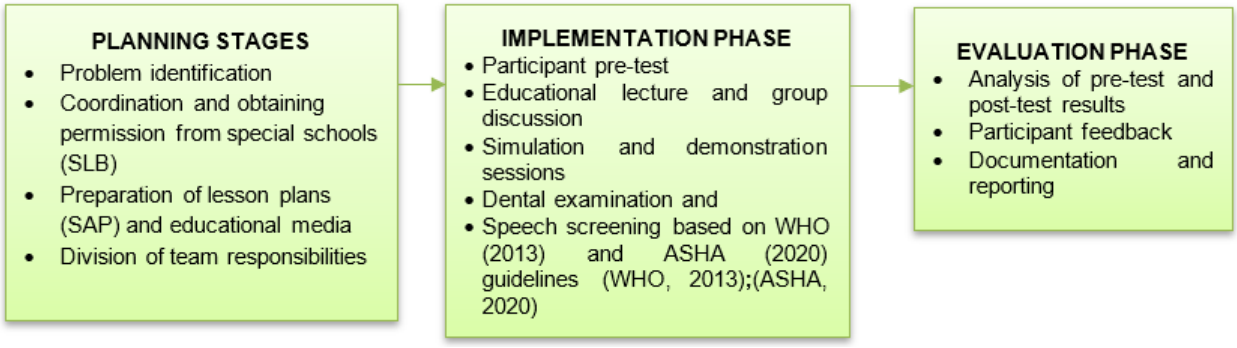

FIGURE 1. Stages of Community Service Implementation

Planning Stage

The planning phase for this community service activity began in early August 2025 by a team of lecturers and students from the Professional Nursing Study Program, Faculty of Health Sciences and

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Technology, Jenderal Achmad Yani University. At this stage, the implementing team is conducting a series of preparations to ensure the activities are carried out effectively and meet the needs of partners in the field.

The planning process began with problem identification through initial observation and interviews with school principals and teachers at several special schools in West Bandung Regency. The search results identified four special schools (SLB) with the highest number of issues related to dental problems and language communication: SLB Bina Widya, SLB Gumilang, SLB Al-Hikmah, and SLB Hanjuang Jaya. The identification results show that most children have less than optimal dental hygiene, and there is a speech delay that has not been systematically addressed. Additionally, the knowledge of parents and teachers regarding the relationship between dental health and speech development is still limited. These findings serve as the basis for setting the activity's objectives, namely increasing the awareness and skills of parents and teachers in maintaining children's dental health as a preventive measure against speech delay.

The next step, the team conducted a literature review and internal discussions to formulate an activity approach suitable for the partner's conditions. The main references used are the WHO Oral Health Survey (2013) (WHO, 2013) for dental examinations, the ASHA Speech and Language Development Milestones (2020) (ASHA, 2020) for assessing children's speech development, and the educational intervention guidelines from the Indonesian Ministry of Health (2023). Based on the results of the study, an activity plan was developed that included dental health education, simple examinations, and evaluation of participants' knowledge.

This community service activity was carried out at two Special Schools (SLB) in West Bandung Regency, namely SLB Al-Hikmah in Ngamprah District and SLB Hanjuang Jaya in Parongpong District. The activities will be carried out in September and October 2025. The community service participants included 74 students and 48 parents, with active support from accompanying teachers and school staff. Written informed consent was obtained from all participating parents before examination and data collection.

This activity is the result of collaboration between the faculty and student team from the General Achmad Yani University Nursing Professional Study Program, dentists from the Parongpong Public Health Center, and the service team from Kulzum Care. This cross-sector collaboration aims to strengthen the implementation of dental health checks while providing comprehensive education on the importance of oral health in supporting the speech abilities of children with special needs. Additionally, intensive coordination was carried out with the school and faculty to determine the schedule, location, and division of roles in the implementation of the activity. The implementation team is divided into several functions, including the implementation chairman, resource persons, moderators, media operators, documentation, and inspection officers.

Tim also prepared various educational activity instruments, such as Lesson Plans (SAP), educational media (PowerPoint, educational pocket books, and toothbrushing simulation videos), and pre-test and post-test questionnaires to measure knowledge improvement. Before the activity began, technical coordination and a dress rehearsal were conducted to ensure the venue's readiness. Various other screening support tools, such as mouth phantoms, simple dental examination tools, anthropometric tools, and examination forms based on WHO and ASHA guidelines, were fully prepared, and multimedia devices such as projectors, laptops, and sound systems were well-prepared to ensure the activities could proceed without hindrance. Activities at each school began with an official opening attended by the school principal, a dentist from the Parongpong Community Health Center, and the community service team. After the opening, the participants, who were parents of children with special needs, filled

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out the attendance list and a pre-test questionnaire to assess their initial level of knowledge about dental health and its relationship to speech development.

The first session consisted of dental health education and prevention of speech delay, delivered through an interactive lecture method by a team of lecturers and healthcare professionals. The material focused on the correct tooth brushing technique, the relationship between dental hygiene and a child's speech ability, the importance of early dental care, simple steps for preventing caries, and efforts to prevent speech delay. This activity is combined with discussions and Q&A sessions to explore the experiences, obstacles, and perceptions of parents and teachers in maintaining the oral hygiene of children with special needs. Parents were provided with pocket books related to early screening for language communication problems and how to practice good tooth brushing.

The second session was a simulation and demonstration of the correct tooth brushing technique. Before the practice began, the children first watched an educational video on how to brush their teeth properly as an audio-visual learning tool to aid their understanding. Afterward, the speaker demonstrated the tooth brushing technique from six tooth surface areas according to WHO recommendations, using a mouth phantom and a large toothbrush as visual aids. Next, the participants (students) performed a live redemonstration or re-practice directly with the guidance of teachers, the implementation team, and healthcare professionals. This participatory approach aims to improve children's oral motor skills, foster independence in maintaining dental and oral hygiene, and establish healthy behavioral habits that can be applied in daily life.

The third session focused on anthropometric examination, dental and oral health, and speech development screening. The anthropometric examination focused on nutritional status, body mass index (BMI), and vital signs, conducted by the FITKes and Kulzum Care teams. The oral and dental health examination was performed by dentists with the assistance of the facilitator team and the FITKes Nursing Professional Student team. This examination uses the WHO Oral Health Survey (2013) Child Dental Examination Checklist to assess oral hygiene, caries condition, and oral anatomical abnormalities that could potentially affect the child's speech articulation and oral motor function (WHO, 2013). Next, speech development screening was conducted based on the ASHA Speech and Language Development Milestones (2020), which was carried out by a team of lecturer facilitators and FITKes Nursing Professionals (ASHA, 2020). This activity aims to identify the stages of phonation, articulation, and communication skills in children, providing an initial overview of the relationship between dental health and speech development in children with special needs.

At the end of the activity, participants completed a post-test questionnaire to assess their knowledge improvement after the education, followed by direct feedback from dentists and the Kulzum Care team for children who needed follow-up dental examinations. Overall, the activity was carried out smoothly and received a positive response from the school and participants. The parents' enthusiasm was evident in their active participation in discussions and hands-on practice. The collaboration between academics, dentists from the Parongpong Community Health Center, and the Kulzum Care team proved effective in increasing knowledge and awareness of the importance of maintaining dental health as part of efforts to prevent speech delays in children with special needs.

The entire series of community service activities not only focuses on increasing participants' knowledge but also integrates practical aspects and early detection as part of a comprehensive educational approach. Through this activity, participants gained hands-on experience in applying clean and healthy living behaviors in the field of dental health, while also understanding the link between oral hygiene and the development of speech abilities in children with special needs. An analysis of citing and referencing habits across all scholarly disciplines: approaches and trends in bibliographic referencing and citing practices (dos Santos et al, 2022).

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RESULTS

This community service activity has been carried out according to the planned location and time. This activity provides education on dental hygiene, conducts general health checks including nutritional status (BMI) and vital signs, performs oral health examinations, and screens for speech delays. The examination was conducted on 74 students aged 5–18 years. The collected data were analyzed to obtain results used to support more comprehensive health intervention planning for students with special needs.

Overview of the Characteristics

Based on the results of the initial examination of 74 students from Special Schools (SLB) in West Bandung Regency, a general overview of the respondents' characteristics was obtained, as presented in the following table. This data serves as the basis for developing dental health education strategies tailored to the students' demographic conditions.

TABLE 1. General Overview of Student Characteristics (N = 74)

Characteristic	Category	Number of Students	Percentage (%)
Gender	Male	45	60
	Female	29	40
Age	5–10 years	28	38
	11–14 years	30	41
	15–18 years	16	21

Out of a total of 74 students examined, the majority were male (60%), while the rest were female (40%). The age range of the participants is quite diverse, from 5 to 18 years old, divided into three main groups: elementary school children (38%), middle school students (41%), and teenagers (21%). This distribution shows that educational activities involve students from various developmental stages, both in terms of physical growth and communication skills. Therefore, the method of delivering dental health information needs to be adjusted based on the understanding and motor skills of children in each age group.

Nutritional Status Analysis (BMI)

A child's nutritional status plays an important role in cognitive development, motor skills, and speech function. Malnutrition can lead to delayed development of oral muscles, while being overweight can affect respiratory function and body posture, which support the speech process. BMI calculation uses the formula:

$$\text{BMI} = \frac{\text{Body Weight (kg)}}{\text{Height (m)}^2}$$

From the results of weight (19–84.6 kg) and height (115–178 cm) measurements, the BMI range obtained was between 14.0 and 26.7 kg/m². The distribution of student BMI results is as follows:

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TABLE 1. Distribution of Nutritional Status (BMI) of Students (N = 74)

Category	BMI Range (WHO)	Number of Students	Percentage (%)	Remarks
Underweight	< 14.5	6	8	Requires nutritional attention and growth monitoring
Normal	14.5 – 22.9	59	80	Indicates good and proportional nutritional status
Overweight	23.0 – 24.9	7	9	Needs a balanced diet and lifestyle guidance
Obese	≥ 25.0	2	3	High risk of metabolic disorders

Interpretation:

Most of the students (80%) were classified as having a normal nutritional status, indicating a balance between nutrient intake and the body's energy needs. Meanwhile, 8% of students were underweight, requiring attention to dietary patterns and nutritional fulfillment to prevent impacts on oral motor development and speech ability. Additionally, 12% of students (classified as overweight or obese) may be at risk of metabolic problems due to high-calorie dietary habits and low physical activity levels. Regular monitoring is recommended to maintain optimal nutritional balance.

Vital Signs Analysis

Vital signs assessment was conducted to evaluate the general health condition of the students, as it may influence immunity, physiological function, and oral–motor coordination involved in speech production. The results showed that all vital sign parameters were within normal physiological limits for children and adolescents aged 5–18 years.

TABLE 3. Vital Signs Assessment Results of Students (N = 74)

Parameter	Normal Range	Mean Result	Normal Percentage	Interpretation
Body temperature	36.5 – 37.5 °C	36.7 °C	100%	All students within normal limits
Respiratory rate (RR)	18 – 30 breaths/min	22 breaths/min	100%	Normal respiratory function
Pulse rate	60 – 118 beats/min	92 beats/min	100%	Stable circulation and cardiac activity
Blood pressure	90/60 – 120/80 mmHg	104/72 mmHg	100%	No cases of hypertension or hypotension

Interpretation:

All students showed stable vital signs, indicating no acute health issues such as infections, fever, or cardiovascular abnormalities. This condition supports the success of dental health education activities, as students are in good health and able to receive optimal learning. The results of the activity show that the general health status of special needs students is good, with the majority of students having a Body Mass Index (BMI) within the normal category and vital signs within the physiological range.

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Dental Health Analysis (dmf-t and DMF-T Index Analysis)

Out of a total of 74 students examined, the majority (approximately 68%) showed active dental caries in both primary and permanent teeth. Around 20% of the students were found to have healthy or good oral conditions, while 12% were categorized as having poor oral hygiene requiring immediate treatment. These findings indicate that most special school (SLB) students still face significant dental and oral health problems. The high prevalence of dental caries may be attributed to several factors, including limited fine motor skills, lack of supervision during tooth brushing, and frequent consumption of sugary foods. The table below presents the distribution of students based on caries index categories according to WHO criteria.

TABLE 2. Caries Index Distribution (dmf-t and DMF-T) of Students (N = 74)

Category	WHO Criteria	Number of Students	Percentage	Interpretation
Low	0–3 active caries	23 students	31%	Teeth well maintained, good hygiene control
Moderate	4–6 active caries	28 students	38%	Needs education and improved oral hygiene
High	>6 active caries	18 students	24%	Requires medical intervention (filling/extraction)
Healthy (no caries)	0 caries	5 students	7%	Ideal dental condition, routine check-ups recommended

Most students were in the moderate to high category, indicating a high prevalence of dental caries among SLB students. This condition underscores the need to strengthen oral hygiene habits through regular health education and supervision by teachers and parents.

Oral Hygiene and Cavity Condition Status

Oral hygiene status examination is an important part of supporting dental and oral health, which in turn impacts speech development. This hygiene behavior aims to improve daily dental care habits and prevent the formation of new plaque and caries.

TABLE 3. Oral Hygiene and Cavity Condition Status of Students (N= 74)

Condition	Number of Students	Percentge	Description
Healthy	12 students	16%	No caries or inflammation detected
Poor (low hygiene)	26 students	35%	Plaque visible, early caries, mild gingival inflammation
Moderate	28 students	38%	Multiple caries and mild calculus
Severe (requires treatment)	8 students	11%	Large cavities, tooth loss, swollen gums

From the table above, only 16% of students have healthy teeth and mouth conditions, while the majority (73%) show low to moderate oral hygiene. This indicates the need for regular dental health interventions in schools. Based on the results of the dental health examination conducted on all students, it was found that the majority require follow-up to maintain and improve the condition of their oral cavity. A total of 42 students (57%) were recommended for referral to a dentist for further treatment, such as fillings, extractions, or scaling. This indicates that more than half of the student population has active caries or tooth decay requiring medical intervention. Additionally, 20 students (27%) were

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educated on improving personal hygiene, particularly regarding the correct way to brush their teeth and the use of fluoride toothpaste.

Analysis of Verbal Communication Questionnaire Results

This questionnaire was used to assess the students' verbal communication abilities based on 19 indicators of speech and language development. The aspects evaluated included responsiveness to sounds, babbling, comprehension of simple commands, use of words and sentences, and ability to sing or narrate.

TABLE 4. Results of Verbal Communication Ability Questionnaire among Students (N = 74)

No	Verbal Communication Aspect	Number of "YES"	Number of "NO"	Percentage "YES" (%)
1	Responds to loud sounds (startle reflex)	65	9	88
2	Turns head toward the sound	63	11	85
3	Begins babbling (ba-ba, da-da)	60	14	81
4	Uses simple gestures	58	16	78
5	Cries differently based on needs	62	12	84
6	Says first word	55	19	74
7	Names common objects	51	23	69
8	Uses 2–3-word sentences	47	27	64
9	Speech understandable to parents	44	30	59
10	Speech understandable to others (non-parents)	41	33	55
11	Shows interest in singing/storytelling	38	36	51
12	Uses question words ("what", "where", "why")	35	39	47
13	Mentions colors, numbers, or simple concepts	33	41	45
14	Speech almost fully intelligible (100%)	29	45	39
15	Names letters or sings simple songs	27	47	36

Based on the questionnaire results, it is evident that most students are already able to respond to loud noises, turn toward the source of the sound, and engage in babbling as an early sign of speech development. However, more complex language abilities, such as using 2–3-word sentences, asking questions, and speaking with full clarity (100%) are still relatively low, with percentages below 60%. Singing and storytelling abilities were only present in about half of the students (51%), indicating that verbal expressive abilities are still limited. These findings indicate that the development of verbal communication in special education students still varies, with most being at the early and intermediate stages of speech development.

Analysis of Verbal Communication (Speech Delay) Questionnaire Results

The verbal communication questionnaire was used to assess the oral language abilities of children with special needs at special education schools (SLB) in West Bandung Regency. The assessment covered six key aspects of speech and language development: the ability to follow simple commands, use long sentences, narrate experiences, apply complex grammar, follow two- to three-step instructions, and tell simple stories in sequence. The purpose of this questionnaire was to determine the extent of

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students' verbal communication development and to identify potential speech delays. These findings serve as an important foundation for designing appropriate educational and therapeutic interventions.

TABLE 5. Results of Verbal Communication (Speech Delay) Questionnaire among Students (N = 74)

Assessed Aspect	YES	NO	Percentage YES (%)
Follows simple commands	57	14	77.0
Uses long sentences (≥4 words)	23	47	31.1
Narrates simple experiences	25	46	33.8
Uses complex grammar	16	55	21.6
Follows 2–3 step instructions	45	26	60.8
Tells a simple story in sequence	23	48	31.1

Based on the questionnaire results, students' verbal communication abilities showed considerable variation across indicators. Most students (77%) were able to follow simple commands, indicating that their receptive language comprehension was relatively good. However, more advanced expressive language skills—such as using long sentences (31.1%), narrating simple experiences (33.8%), and applying complex grammar (21.6%)—were still limited. A total of 60.8% of students were able to follow two- to three-step instructions, suggesting an emerging understanding of sequential and contextual verbal information. Meanwhile, only 31.1% could tell a simple story in sequence, reflecting limited narrative and verbal organization abilities. Overall, the results indicate that while receptive language comprehension is relatively developed, most students still experience difficulties in expressive language, particularly in constructing longer and grammatically structured sentences.

Results and Analysis of the Parental Questionnaire

The questionnaire was designed to assess parents' knowledge and behaviors related to their children's verbal communication skills and the prevention of speech delay. Responses were obtained from 48 parents, representing 65% of the total 74 students. Overall, the findings indicate that parents' knowledge levels were in the moderate category, with an average score of 56.5%. This suggests that most parents understood the importance of verbal communication and home-based stimulation, yet further improvement is needed in recognizing early signs of speech delay and understanding when to seek professional consultation.

TABLE 6. Results of the Parental Knowledge Questionnaire on Verbal Communication and Speech Delay Prevention among Students (N = 48)

No	Assessed Aspect	Percentage "YES"	Category
1	Awareness of speech ability milestones at age 2	60.8%	Fair
2	Awareness that speech delay may indicate a developmental disorder	63.5%	Good
3	Recognition of non-responsiveness to sound before age 1 as a warning sign	47.3%	Low
4	Awareness that children with special needs are at risk of speech delay	56.7%	Fair
5	Experience consulting a doctor or therapist	41.9%	Low
6	Awareness that oral health affects speech ability	62.2%	Good
7	Regularly providing verbal stimulation at home	66.2%	Good
8	Ability to distinguish between normal and pathological speech delay	44.6%	Low
9	Awareness of the importance of developmental evaluation	52.7%	Fair
10	Awareness of the importance of early detection and intervention for speech delay	68.9%	Good

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Based on the table above, the highest scores were found in the aspects of early detection importance (68.9%) and home verbal stimulation (66.2%), indicating that most parents are aware of the significance of early communication stimulation. Another well-understood aspect was the relationship between oral health and speech ability (62.2%), reflecting the success of integrating oral health education within the speech delay prevention program.

Conversely, the lowest scores were observed in consultation behavior with professionals (41.9%) and the ability to distinguish between normal and pathological speech delay (44.6%). These results highlight the need for continuous education and parental empowerment to enhance early recognition and appropriate intervention for children at risk of speech delay.

Parental Knowledge Outcomes

As the final stage of the oral health education program for the prevention of speech delay among children with special needs in Special Schools (SLB) of West Bandung Regency, a pre-test and post-test were administered to evaluate parents' understanding before and after the educational session. The instrument consisted of 20 multiple-choice questions with predetermined correct answers. A total of 48 parents (65% of all students) participated in both sessions. Each correct response was scored as one point, and the results were converted into percentages to assess the improvement in knowledge levels.

TABLE 7. Pre-Test Results of Parental Knowledge on Oral Health and Speech Delay Prevention among Students (N = 48)

No	Number of Correct Answers	Frequency (Persons)	Percentage (%)	Knowledge Category
1	16–20 correct answers	10	20,8%	Good
2	11–15 correct answers	10	27,1%	Fair
3	≤10 correct answers	28	52,1%	Low
Total	**48**	**100%**		

Based on the pre-test findings, over half of the participants (52.1%) exhibited a limited understanding of oral health and speech delay prevention. Meanwhile, 27.1% demonstrated a satisfactory level of knowledge, while only 20.8% were classified as having a high level. These findings suggest that before the educational intervention, parents possessed limited knowledge regarding the connection between oral health and children's verbal development.

TABLE 10. Post-Test Results of Parental Knowledge on Oral Health and Speech Delay Prevention among Students (N = 48)

No	Number of Correct Answers	Frequency (Persons)	Percentage (%)	Knowledge Category
1	16–20 correct answers	29	60.4%	Good
2	11–15 correct answers	15	31.3%	Fair
3	≤10 correct answers	4	8.3%	Low
Total	**48**	**100%**		

Based on the post-test results, most respondents (60.4%) demonstrated a good level of knowledge, indicating that the educational intervention successfully improved parents' understanding of the importance of oral health in supporting children's speech ability. Meanwhile, 31.3% showed a fair level of knowledge, and only 8.3% remained in the low category. The mean post-test score increased by 25.8%, with 60.4% of parents reaching the "good" category after education. The effect size (Cohen's d =

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0.65) indicated a moderate impact of health education on knowledge improvement.

The most well-mastered aspects among parents included:

- Understanding the importance of early detection and intervention for speech delay (68.9%),
- Knowledge of the relationship between oral health and speech articulation (62.2%), and
- Awareness of the importance of regular speech stimulation at home (66.2%).

However, the aspects that still required improvement were:

- The behavior of consulting healthcare or therapy professionals (41.9%), and
- The ability to differentiate between normal and pathological speech delay (44.6%).

Overall, these findings indicate that family-based education effectively enhances oral health literacy and parental understanding of speech delay prevention. This aligns with the perspectives of the World Health Organization (WHO, 2021) and the Indonesian Ministry of Health (Kemenkes, 2022), both of which emphasize the critical role of the family as the primary environment for supporting children's growth, development, and communication skills.

DISCUSSION

The community service activities carried out at the AL-HIKMAH Special School (SLB) and the HANJUANG JAYA Special School (SLB) in West Bandung Regency focused on dental health education as one effort to prevent speech delay in children with special needs. This activity is based on the understanding that oral health is closely linked to speech ability. Unhealthy teeth can hinder sound articulation, cause pain when speaking or eating, and disrupt the development of oral motor skills essential for sound production. Therefore, in addition to providing education on dental hygiene, this activity also includes examinations of nutritional status and vital signs to gain a comprehensive picture of students' health conditions. A total of 74 students aged 5 to 18 participated in this activity. Based on the examination results, the majority of students are male (60%), and the rest are female (40%). The age range of the participants varies, with a distribution of 38% in the 5–10 year old group, 41% in the 11–14 year old group, and 21% in the 15–18 year old group. This age diversity indicates that dental health education needs to be delivered with different approaches according to the cognitive and motor abilities of each age group.

The results of the nutritional status analysis show that the majority of students (80%) have a Body Mass Index (BMI) within the normal category. A total of 8% are classified as underweight, and the remaining 12% fall into the overweight to obese category. This condition indicates that, in general, students have good nutritional status, although a small percentage require more attention to their eating patterns and nutrient intake. Good nutritional status plays an important role in supporting cognitive development and motor skills, including the coordination of oral muscles that affects speech ability. Vital sign checks showed that all students had stable physiological conditions. The average body temperature is 36.7°C, the respiratory rate is 22 breaths per minute, the heart rate is 92 beats per minute, and the blood pressure is 104/72 mmHg—all within normal limits for children and adolescents. This indicates that the students are in good health and ready to receive educational interventions. Good overall health is a key supporting factor for the success of educational programs, as healthy children have a more optimal learning capacity. Analysis of dental health conditions showed that 68% of students had active caries, affecting both primary and permanent teeth. Approximately 20% of students have healthy teeth, while 12% are in the low hygiene category and require immediate treatment. Based on the WHO caries index classification, 31% of students are in the low category (0–3 caries), 38% in the moderate category (4–6 caries), and 24% in the high

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category (>6 caries). This condition indicates that most students still face significant dental and oral health problems. Factors contributing to the high rate of caries include limited fine motor skills, lack of supervision while brushing teeth, and the habit of consuming high-sugar foods.

Oral hygiene and condition also show that only 16% of students have healthy mouths. The majority of students (73%) exhibited low to moderate oral hygiene, with the presence of plaque, multiple caries, or mild calculus. In fact, 11% of students required immediate intervention due to large cavities or gingivitis. From these results, 57% of students were recommended for further dental care, 27% received oral hygiene education, and 16% were advised to have regular checkups every six months. This finding confirms the need for ongoing interventions in the form of medical care and oral hygiene behavior education to prevent further damage. In addition to physical examinations, a questionnaire was also administered to assess the students' verbal communication skills.

Basic abilities such as responding to sounds and babbling have emerged well, but articulation and sentence structure still require advanced intervention. The results show that basic abilities such as responding to loud sounds, turning toward the source of the sound, and babbling are already possessed by most students, with percentages above 80%. However, more complex abilities such as speaking in 2-3 word sentences, using question words, or speaking with full clarity are still low, below 60%. This indicates that many students are still in the early and middle stages of speech development. This condition can be caused by limited verbal stimulation in both the home and school environment, as well as oral health disorders that affect articulation ability. On a deeper level, the speech delay questionnaire showed that 77% of students were already able to follow simple commands, but only 31–34% could use long sentences, recount simple experiences, or construct sequential stories. The ability to use complex grammar is possessed by only about 21.6% of students. This indicates that students' receptive language comprehension is quite good, but their expressive abilities still need improvement. This condition supports the assumption that dental and oral health problems and a lack of environmental stimulation contribute to speech delays. (Kulsum, 2025) also emphasized that physiological dysregulation in children with ASD, including sensory hypersensitivity and impaired oral-motor control, can interfere with sleep and articulation, which indirectly affects verbal communication development. Similar findings were reported by Alqahtani (2023), who found that poor oral hygiene and untreated dental caries significantly affect phonation and articulation abilities in children with developmental disabilities. Factors contributing to speech delays include dental and oral health conditions, nutritional status, and limited verbal environmental stimulation at home and school. The link between oral health and speech ability has been confirmed in the literature (WHO, 2021; Kemenkes, 2022), which states that disorders of the oral-motor organs, such as the tongue and teeth, can affect articulation clarity and speech fluency.

The entire results of this examination are an important basis for supporting efforts to prevent speech delay, as general health and nutritional status are closely related to the development of speech muscles, oral coordination, and a child's articulation abilities. During the activity, dental health education was also provided, involving students, teachers, and parents. This education emphasizes the importance of maintaining oral hygiene through the habits of brushing teeth twice a day, using age-appropriate toothbrushes, and having regular dental checkups every six months. The purpose of this education is to get children accustomed to taking care of their dental health from an early age, as unhealthy oral conditions such as cavities, plaque buildup, or gum infections can hinder tongue and lip movements, which play an important role in sound formation and articulation clarity. This finding also reinforces the literature from the World Health Organization (WHO, 2021) and the Ministry of Health of the Republic of Indonesia (2022) (Kemenkes RI, 2023), which emphasizes that regular dental health interventions and nutritional status monitoring are important components in supporting children's speech development. This is especially true for children with special needs, who are generally at higher risk of speech delays due to

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both neuromotor and sensory factors. Therefore, oral health education activities integrated with nutrition and general health monitoring are a strategic step in preventing speech delay in special school environments.

Meanwhile, 12 students (16%) were advised to undergo routine monitoring every six months. This group has healthy teeth, but they are at high risk of developing problems later in life due to factors such as suboptimal diet or oral hygiene. Regular monitoring is expected to help maintain their dental health and prevent the onset of more serious disorders. Overall, these results highlight the importance of continuous follow-up through a combination of medical interventions, hygiene education, and regular check-ups to comprehensively maintain the dental and oral health of special needs students. Most students (about 70%) have active caries with moderate to high severity. Only about 16% of students have healthy teeth without significant abnormalities. The majority of students require follow-up dental care by a dentist. This finding confirms the importance of regular dental health education in special schools to support the prevention of speech delays.

From the parents' perspective, the questionnaire results indicate a notable improvement in knowledge following the educational intervention. During the pre-test, more than half of the respondents (52.1%) demonstrated a low level of knowledge. This shows that before the program, parents had a limited understanding of the relationship between oral health and children's speech development. After the post-test, there was a significant shift in knowledge categories. Most respondents (60.4%) achieved a good level of knowledge, 31.3% remained in the fair category, and only 8.3% were in the low category. This substantial increase demonstrates that the dental health education program effectively improved parents' awareness of how oral hygiene affects speech development and communication skills in children with special needs. The mean post-test score increased by 25.8%, and the calculated effect size (Cohen's d = 0.65) indicates a moderate yet meaningful educational impact.

These findings are consistent with the results of Zafar et al (2024), who reported that structured oral health education programs for caregivers of children with special needs significantly improved their oral hygiene practices and awareness, which in turn contributed to better oral and speech outcomes among the children. Overall, the results of this activity show that the general health of West Bandung Regency special school students is in good condition, with normal nutritional status and stable vital signs. However, dental health problems remain a major issue that requires serious attention because they directly impact a child's ability to speak and their quality of life. The dental health education provided not only offers physical benefits but also supports the development of verbal communication by improving oral-motor function. These findings are consistent with the literature (WHO, 2021) and the Indonesian Ministry of Health (2022) (Kemenkes RI, 2023), which emphasize that regular dental care and monitoring of nutritional status are important steps in preventing speech delay, especially for children with special needs. Thus, this activity successfully demonstrated that school and family-based interventions can be an effective strategy in holistically supporting children's communication development.

CONCLUSION

This community service project demonstrates that dental health education is an effective approach to preventing speech delay among children with special needs. The results showed that 68% of students had active caries, while those with healthy teeth exhibited better articulation and verbal communication. Parents' knowledge significantly improved after education, with 60.4% achieving a good understanding of oral health and speech delay prevention.

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The findings strengthen the evidence that oral health, nutritional status, and speech ability are interrelated. Children with good oral hygiene tend to have better articulation and self-confidence in communication. To ensure sustainability, a structured and collaborative program between families, schools, and healthcare professionals is essential.

As a follow-up, it is recommended that students with special needs have regular dental checkups every three months to maintain oral health and prevent cavities that can interfere with speech ability. Dental checkups and education should be conducted regularly in schools, at least twice a year, along with increased parental and teacher involvement in guiding children to brush their teeth twice a day using the correct technique and fluoride toothpaste. Collaboration with healthcare professionals, dentists, and speech therapists also needs to be strengthened so that speech stimulation and oral care can be provided in an integrated manner. Additionally, monitoring children's nutritional status and growth and development should be done regularly through school programs to maintain nutritional balance and oral-motor function. Going forward, it is recommended to develop further family and school-based programs that focus not only on dental health but also on fostering positive verbal communication habits in the home and school environment.

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