Original Article

JHSMR Journal of Health Science and Medical Research

Content and Face Validation of the Malay Questionnaire on Facilitators and Barriers for Primary Caregivers During Toothbrushing of Their Children with Cerebral Palsy

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Received 22 March 2025 ● Revised 14 June 2025 ● Accepted 27 June 2025 ● Published online 18 November 2025

Abstract:

Objective: This study aimed to assess the content and face validity index of the newly developed Malay language questionnaire on the facilitating factors and barriers for primary caregivers during the toothbrushing of their children with Cerebral Palsy (TB-CCP questionnaire).

Material and Methods: The development of the TB-CCP questionnaire was conducted in 2 stages. In stage 1, the items of the instrument were developed, and in stage 2, the items were performed by judgement and quantification. The content validity index (CVI) and face validity index (FVI) were evaluated by 6 experts and 10 caregivers of children with CP, respectively. Each index was analysed using Microsoft Excel.

Results: The TB-CCP (Draft 1) consisted of 29 items across 2 domains (environmental context and behaviour regulation) under both facilitating factors and barriers to toothbrushing. Content validation confirmed the acceptability of all domains, with the scale-level CVI (S-CVI/Ave) above 0.9, leading to TB-CCP Draft 2. Face validation results showed I-FVI values exceeding 0.83 and scale-level FVI (S-FVI/Ave) above 0.9, confirming its acceptability. Following these validation analyses, the final 29-item TB-CCP questionnaire was established.

Conclusion: The process of developing the questionnaire, along with ensuring content and face validity, was lengthy and involved multiple iterations. Content experts and respondents evaluated the items in order to confirm the instrument's validity. The newly developed TB-CCP questionnaire achieved acceptable content and face validation. This version of the TB-CCP is ready for the next stage of validation through Exploratory and Confirmatory Factor Analysis.

Keywords: toothbrushing, cerebral palsy, caregivers, content validity, face validity

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J Health Sci Med Res 2026;44(3):e20251283
doi: 10.31584/jhsmr.20251283
www.jhsmr.org

Introduction

Cerebral palsy (CP) is a group of disorders caused by abnormal brain development or damage, affecting muscle control, movement, balance, and posture[1]. It is classified as a physical disability often accompanied by sensory, cognitive, communication, perceptual, behavioural disturbances, and/or seizure disorders[2]. Globally, the incidence of CP ranges from 1.5 to over 4 per 1000 live births[3]. In Malaysia, 674,548 Persons with Disabilities (2.0% of the population) were registered as of 2022, with physical disabilities, including CP, being the most common (245,015 cases)[4]. In 2017, 5,840 CP cases were reported[5], and the Ministry of Health (MOH) recorded 215 CP cases among 2,766 children with special needs in 2012[6]. The lack of specific data on children with CP hinders both research efforts and effective service planning for them and their caregivers.

Children with CP are especially susceptible and frequently demonstrate compromised oral health and systemic health repercussions directly stemming from their disability[7]. The most common oral manifestations found in children with CP are periodontal disease, dental caries, occlusion problems, dental trauma, bruxism, and problems with saliva control[8]. These children face challenges performing daily tasks, including brushing their teeth and flossing, as they are partially or fully dependent on caregivers[9,10]. This dependence can arise from a variety of limitations caused by their disability, such as difficulty with motor skills, coordination, or even a lack of awareness of the importance of oral hygiene[10].

Toothbrushing presents significant challenges for the primary caregivers of children with CP, who rely entirely on them for daily oral hygiene. However, few studies have explored the factors that facilitate or hinder this task, and none have been conducted in Malaysia. Campanaro et al. (2014)[11] explored these issues in a U.S. context, but differences in population, item design, and measurement tools limit the applicability of their findings elsewhere. In Malaysia, Ahmad et al. (2020)[12] examined oral health and nutritional status among children with CP, but did not examine behavioural facilitators or barriers to oral hygiene. Furthermore, no validated Malay-language instrument currently exists to assess these factors from the caregiver's perspective. Developing a culturally and contextually appropriate tool is crucial to accurately capture the unique challenges faced by Malaysian caregivers of children with CP, particularly in promoting effective oral hygiene practices. In this context, the creation of a new questionnaire tailored to the Malaysian cultural landscape is not only necessary but foundational for designing targeted and meaningful interventions. Establishing content validity is a critical step in this process, ensuring that the instrument faithfully represents the intended constructs while upholding methodological rigor[13].

Following the establishment of content validity, face validity is assessed to determine whether respondents perceive the questionnaire items as relevant and appropriate within their specific cultural and contextual setting. A validated Malay-language TB-CCP questionnaire will enable the reliable identification of the facilitators and barriers Malaysian caregivers face during toothbrushing routines for children with CP. Therefore, this study aimed to conduct both content and face validation of the TB-CCP questionnaire to ensure its suitability for the Malaysian context and to support future initiatives aimed at enhancing oral healthcare for children with CP.

Material and Methods

The TB-CCP Questionnaire was developed and validated in 2 stages as depicted in Figure 1. Stage 1 consisted of the development of the instrument's items, and Stage 2 assessed the items' validation.

Stage 1: development of the questionnaire

After a thorough review of the literature[11,14–17], the research team comprising three (3) dental public health (DPH) specialists, conducted a structured expert meeting using a guided item selection from the literature and professional experience. These discussions aimed to ensure the items were conceptually relevant and contextually appropriate for the Malaysian setting. These observations led to the development of a conceptual framework (Figure 2), which resulted in the development of an early draft of the TB-CCP Draft 1 questionnaire that had 2 domains: behaviour regulation and environmental context. The materials were created in Malay to cater to the intended audience and were made to be simple, straightforward, and easy for parents of children with CP to understand[18,19]. To minimize response bias, the design also eschewed double-barrelled questions, mixed positively and negatively phrased items, and included demographic or clinical questions at the conclusion to keep participants interested and avoid boredom[20].

Facilitating factors towards toothbrushing among primary caregivers of children with CP

Two questions, developed in Malay based on literature reviews, addressed 2 identified domains from Campanaro et al. (2013), Aliakbari et al. (2021), and Poornima et al. (2022)[11,14,16]. The two domains of facilitating factors: environmental context and behaviour regulation, capture critical elements influencing oral health practices. The first domain for facilitating factors is environmental context (1F), which focuses on factors such as parental influence, where parents with good oral health practices and regular dental visits set a family norm for oral care, acting as role models for children. Positive attitudes from surrounding individuals, community support, school involvement, and empathetic health professionals create a social norm encouraging good oral health. Practical factors, such as the availability of appropriate toothbrushes and the development of self-skills in toothbrushing, also play a vital role. Additionally, raising awareness of the consequences of poor oral health and the benefits of adhering to recommendations is essential, often driven by parental experiences or dental visits. Meanwhile, the second domain of behaviour regulation (2F) focuses on children with CP. It addresses their positive attitudes toward the importance of toothbrushing, cooperation, and factors that facilitate the brushing process. The daily habits of family members and the role modelling of caregivers also influence children's behaviour in performing toothbrushing.

Barriers to toothbrushing among primary caregivers of children with CP questionnaire

This questionnaire consists of 2 questions developed from Aliakbari et al. (2021), Poornima et al. (2022), and Zaihan et al. (2015), which were then sent for content validation and the face validation process[14,16,17]. First domain: environmental context (1B) was explored regarding lack of access, cost of dental services, parents' lack of time and availability to brush their children's teeth, and the tiredness of children to brush. Other than that, how parents managed their children's behaviour while toothbrushing was a key barrier, with ineffective parenting strategies leading to poorer toothbrushing outcomes. Meanwhile, the second domain: behaviour regulation (2B) explored children's temperament and behaviour, how children were resistant to having their teeth brushed due to uncooperativeness, children's teeth anatomy, the unpleasant taste of toothpaste, and due to specifically resisting parental involvement during brushing.

Stage 2: Validation of the questionnaire

Two evaluations were included in this stage. Firstly, the assessment by the expert panel focused on the content validity (based on the relevancy) of the items in the questionnaire, followed by the assessment of the face validity (based on the clarity and comprehensiveness) of the items by the caregivers of children with CP[13,21].

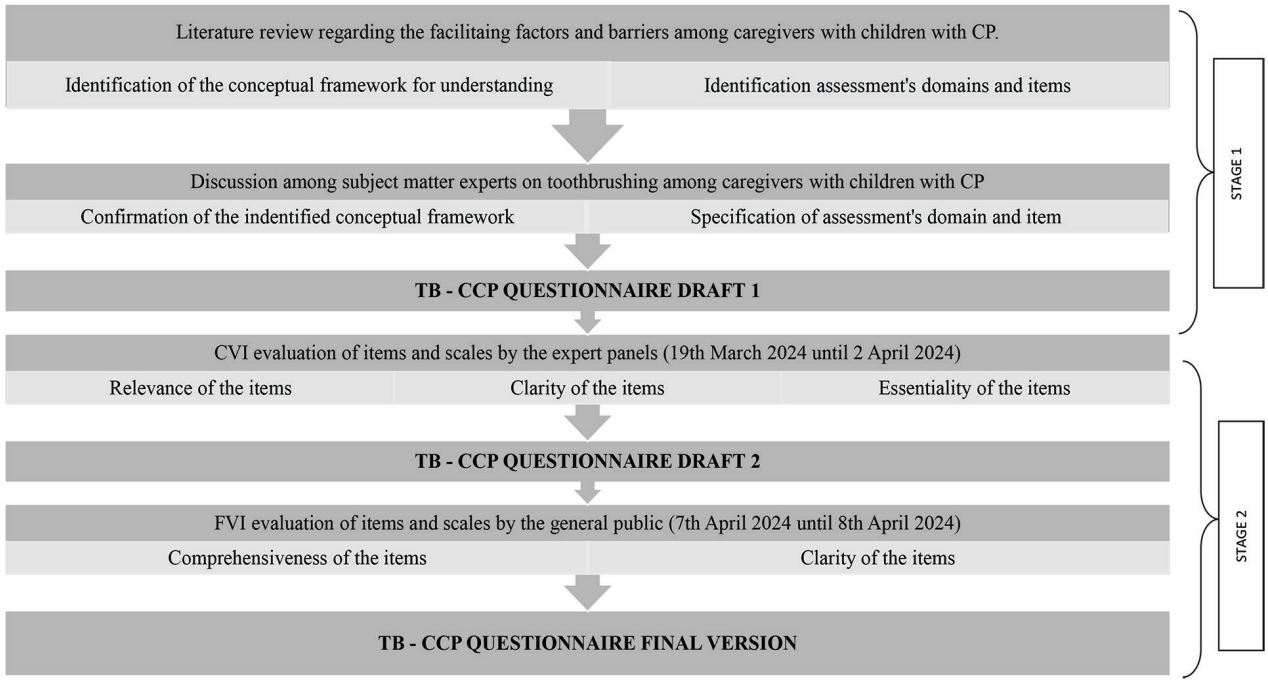

Figure 1 Stages of development and validation of the TB – CCP questionnaire

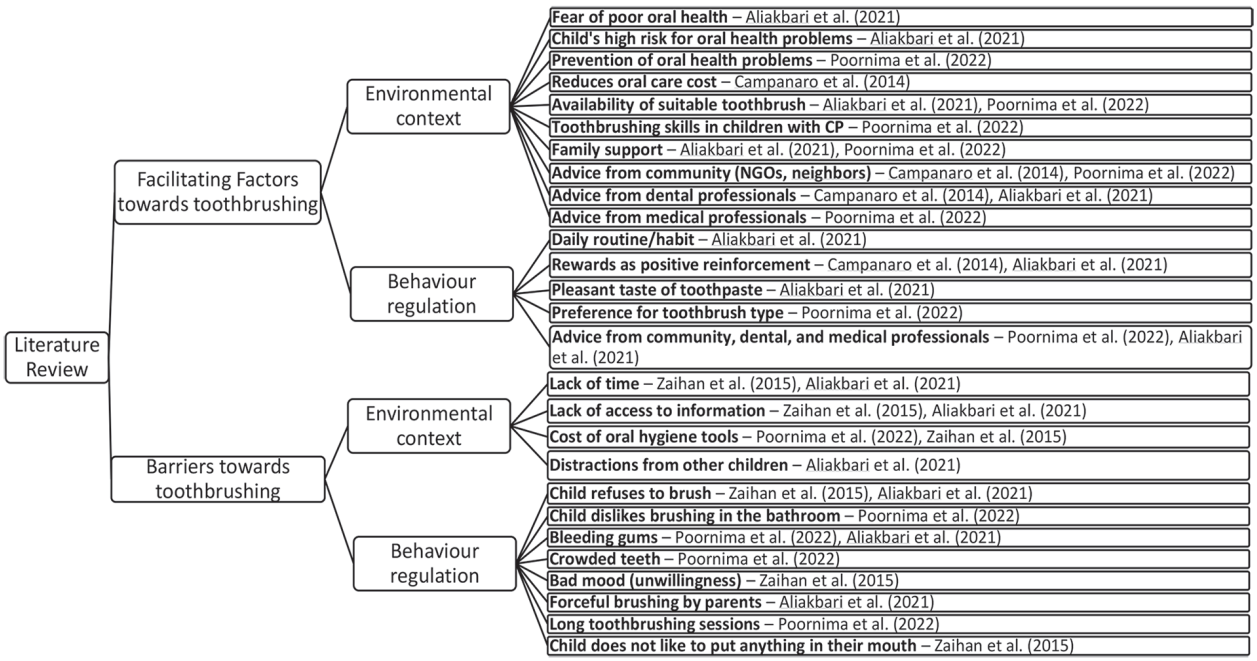

Figure 2 Conceptual Framework on literature review and discussion among the research team on item's development

Content Validation

The content validation process involves 6 key steps: preparing for validation, selecting an expert review panel, conducting the validation, reviewing domains and items, assigning scores, and calculating the Content Validity Index (CVI)[13].

The initial step in the process was creating a content validation form. This form ensures that the expert review panel understands its roles and responsibilities. It provides clear instructions, a relevance rating scale, and definitions for each domain to guide the experts during scoring. Next, select the expert review panel. According to Yusoff (2019a)[13], the ideal panel size ranges from 6 to 10 members, chosen based on relevant expertise. While most studies recommend at least 6 experts, Davis (1992)[22] suggests a minimum of 2. In this study, purposive sampling was done to select these 6 experts to ensure a balanced representation of perspectives: 2 paediatric dentists who regularly treat CSNs before the age of 18 years old, 2 public health specialists who offer broader healthcare insights, 1 dental public health specialist to align the findings with population-based dental practices, and 1 dental officer from the Special Care Dentistry (SCD) clinic with hands-on experience treating individuals with special needs. This composition ensures that the panel reflects both clinical and public health considerations essential for managing children with CP.

The third step involves conducting the content validation. Practical considerations such as cost, time, and response rates influence the mode of engagement with experts. In this study, non-face-to-face methods, such as WhatsApp and email, were utilized. Experts who consented to participate were sent an official appointment letter along with an online validation form after being briefed on the study's objectives. They were encouraged to seek clarification if needed and asked to return the completed forms within 2 weeks.

In the fourth step, the expert panel reviewed the domains and items in the TB-CCP Draft 1 questionnaire, providing written feedback to improve the relevance of each item to the intended domain. Feedback focused on clarity, representativeness, relevance, and critical elements affecting how well items reflect the intended construct[20]. The fifth step involves scoring each item. Experts independently evaluated each item's relevance using a 4-point rating scale: 1 (not relevant), 2 (needs revision), 3 (moderate revision), and 4 (very relevant)[23]. They were given 2 weeks to complete and return the content validation form. Finally, in the sixth step, the Content Validity Index (CVI) is calculated, including both item-level (I-CVI) and scale-level (S-CVI) measures. The S-CVI is determined either by calculating the percentage of items rated as relevant by all experts or by averaging the I-CVI ratings for all items. Based on the CVI results, the TB-CCP Draft 2 questionnaire was finalized.

Face Validation

Yusoff (2019b)[21] outlines 6 key steps in the face validity process: preparing the validation form, selecting a panel of raters, conducting the validation, reviewing items for clarity and comprehension, scoring each item, and calculating the Face Validity Index (FVI).

The first step is to create the face validation form, which ensures that raters understand their roles and expectations. This form includes a clarity and comprehension rating scale to help raters effectively evaluate the items. Next, select a panel of raters to review the questionnaire. The raters should represent the tool's target audience, such as students or caregivers. While Yusoff (2019b)[21] recommends a minimum of 10 raters, other studies suggest at least 30[24,25]. For this study, 10 primary caregivers of children with CP attending Community-Based Rehabilitation (CBR) programs were chosen through purposive sampling based on their availability and their role as the main

caregiver, i.e., those who were actively involved in managing their child's daily toothbrushing routine.

The third step involves conducting the validation. In this study, the process was carried out in person to accommodate the raters' preferences. Sessions were held at CBRs in Kota Bharu, where raters were briefed on the process and informed about their role in future questionnaire revisions. In addition to the interview data, demographic information was collected from the primary caregivers, including their age, sex, race, household income, and relationship to the child. Demographic details of the children with CP, such as age and sex, were also obtained.

After that, the fourth step requires raters to review the items for clarity and comprehension. The validation form provided instructions and encouraged written feedback to improve clarity. All suggestions were considered when refining the questionnaire items. In the fifth step, raters independently scored each item using a 4-point clarity and comprehension scale (1=Not clear and understandable; 2=Somewhat clear and understandable; 3=Clear and understandable; 4=Very clear and understandable). The rating sessions lasted between 15 to 30 minutes. Finally, the Face Validity Index (FVI) is calculated in the sixth step, including both item-level (I-FVI) and scale-level (S-FVI) measures. The S-FVI can be determined by averaging the I-FVI scores or calculating the proportion of items rated as clear and comprehensible by all raters. Before calculating the FVI, clarity ratings were recoded for analysis. According to Polit et al. (2007)[23], an I-FVI greater than 0.78 is considered excellent, while a score of 0.5 or lower is deemed unacceptable.

Following the validation exercise, the research team held meetings to evaluate and refine the questionnaire based on FVI findings and caregiver input. Items with an I-CVI below 0.78 were revised, and those with low I-FVI values were deleted. The final version of the TB-CPP questionnaire was developed after these discussions.

Likert's scale was used to indicate respondents' level of agreement or disagreement regarding facilitating factors towards toothbrushing. Based on Likert (1932)[26], a 5-point scale was labelled as "Strongly Disagree," "Disagree," "Neutral," "Agree," and "Strongly Agree." The score ranged from the lowest (score 1 on strongly disagree) to the highest (score 5 on strongly agree) on the scale[26]. The frequency and percentages (%) were calculated for each answer. In this study, 2 categories on Strongly Agree/Agree represented the positive responses (Agree), and categories on Neutral and Disagree/Strongly Disagree represented the negative responses (Disagree).

Statistical analysis

Descriptive statistics were used to summarize the demographic characteristics of the primary caregivers of children with CP for face validation. Categorical variables were summarised in frequency and percentage (%), and the numerical variables were summarised in mean and standard deviation (S.D.) or median and interquartile range (IQR). These data were analysed using IBM SPSS version 27.0. Meanwhile, Microsoft Excel was used for data entry and the tabulation of CVI and FVI.

Results

Six experts participated in the content validation process, and the expert panel evaluated the items for relevance, clarity, and representativeness. Based on their feedback, several items were revised to improve wording and ensure alignment with the study objectives.

For face validity, 10 primary caregivers of children with CP were involved. Caregivers were selected based on their availability, status as the main caregiver, and involvement in the child's daily toothbrushing routine. Most caregivers were Malay females (n=9, 90.0%) with a mean (S.D.) age of 43.6 (9.34) years. The median (IQR) monthly household income was 1065.13 (1869.75) MYR. Meanwhile,

most children with CP were male (n=7, 70.0%) with a mean (S.D.) age of 10.3 (3.93) years.

Table 1 summarises the content validation, with scores of S-CVI/Ave=0.99 and S-CVI/UA=0.97. Table 2 presents the face validation results, with scores of S-FVI/Ave=0.99 and S-FVI/UA=0.97. According to Polit et al. (2007)[23], CVI and FVI above 0.83 indicate that the items are relevant to the domain, clear, and comprehensible for the use of target participants. Items with unclear terms were clarified through reconciliation with 2 dental public health specialists. Table 3 summarizes the final version of the TB-CCP questionnaire, which addresses facilitating factors and barriers to toothbrushing among children with CP.

Content validation summary

Table 1 displays the content validation summary for the questionnaire. Specific factors within these 2 domains were revised and retained. For facilitating factors (1F), the third item (1F3) on "Can prevent oral health problems" was retained despite expert feedback suggesting its similarity to the first item (1F1) on "Fear of poor oral health". The team decided to keep both, as "fear" reflects caregivers' understanding of oral health problems, while "prevent" pertains to practical actions addressing these concerns. Similarly, the fifth item (1F5) on "Availability of suitable toothbrushes" was retained, supported by the literature.

In the behaviour regulation domain (2F), the sixth item (2F6) on "Advice from dental professionals" was retained with unanimous support from the experts. Although Expert 4 suggested simpler terminology, such as "dental staff" or "dental nurse," the term "dental professionals" was maintained for broader inclusivity[27].

For barriers, all experts agreed that all items across both domains were clear and relevant, and thus no items were removed.

Face validation summary

Table 2 presents the face validation results. In facilitating factors, the first item of the environmental context domain (1F1) originally stated "high risk to develop oral health problems." It was revised to "child's high risk to develop oral health problems" after Rater 6 misinterpreted the item as relating to toothbrushing. The ninth item (1F9) on "Advice from dental professionals" was retained despite Rater 4's lack of clarity regarding whom "professionals" referred to. The research team decided to retain the term due to its inclusivity.

For barriers, all raters agreed that the items in both domains were clear and relevant. All items were retained. After incorporating feedback and scoring from the face validation process, amendments were made, and the final version of the questionnaire (TB-CCP) is presented in Table 3.

Discussion

This study aimed to assess the content and face validity of the Malay language TB-CCP Questionnaire, which measures facilitating factors and barriers to toothbrushing among the caregivers of children with CP. The approach commonly used in healthcare research by Yusoff (2019a, 2019b)[13,21] was adopted.

Content validity ensures items accurately represent the intended constructs. To facilitate this content validation process, a panel of 6 experts was assembled. The selection of these panellists is crucial as they must possess a deep understanding of the content area, be familiar with assessment methodologies, and ideally have experience in related fields[13]. This study specifically sought experts with strong backgrounds in public health and oral health, given the focus on toothbrushing and CP.

The dental officers appointed as these professionals are experienced in clinical dental practice and understand the common issues faced in oral health care. Their insights

Table 1 Summary of Content Validity

Domain / Coding	Item	No of panel agree on the relevancy of item	I-CVI	UA	Comments	Decision	Remarks
	Facilitating factors to toothbrushing						
Environmental Context: 1F	The factors that ease parents to brush their child at home	6	1	1		Retained	
1F1	Fear of poor oral health	6	1	1		Retained	
1F2	Child's high risk to develop oral health problem	6	1	1		Retained	
1F3	Can prevent oral health problem	6	1	1	Expert 5 commented that 1F3 similar with 1F1	Retained	Team decided to retain as "fear" and "prevent" has different meaning
1F4	Can reduce oral care cost	6	1	1		Retained	
1F5	Availability of suitable toothbrush	5	0.83	0	Expert 6 suggested to remove 1F5 as it is not related	Retained	Team decided to retain as it is related based on literature
1F6	Toothbrushing skills on the children with CP–	6	1	1		Retained	
1F7	Family support	6	1	1		Retained	
1F8	Advice from community (neighbours, head village, NGO)	6	1	1		Retained	
1F9	Advice from dental professionals	6	1	1	Expert 5 suggested to combine with 1F10	Retained	Not suitable to combine
1F10	Advice from medical professionals	6	1	1		Retained	
Behaviour Regulation: 2F	The factors that encourage the children to brush at home	6	1	1		Retained	
2F1	Daily routine/ habit among the family members	6	1	1		Retained	
2F2	Giving rewards as positive reinforcement	6	1	1		Retained	
2F3	Pleasant taste of toothpaste	6	1	1		Retained	
2F4	Prefer the type of toothbrush used	6	1	1		Retained	
2F5	Advice from community (neighbours, head village, NGO)	6	1	1		Retained	
2F6	Advice from dental professionals	6	1	1	Expert 4 suggested to use simpler term such as dental staff or dental nurse etc	Retained	As dental professional is more general term instead of specifying to each role
2F7	Advice from medical professionals	6	1	1		Retained	

Table 1 Continued

Domain / Coding	Item	No of panel agree on the relevancy of item	I-CVI	UA	Comments	Decision	Remarks
		Barriers to toothbrushing					
Environmental Context: 1B	Difficulty during brushing child's teeth	6	1	1		Retained	
1B1	Lack of time	6	1	1		Retained	
1B2	Lack of access to oral health information	6	1	1		Retained	
1B3	Cost of oral hygiene tools	6	1	1		Retained	
1B4	Distractions due to other children	6	1	1		Retained	
Behavior Regulation: 2B	Child's reason for not brushing his/her their teeth	6	1	1		Retained	
2B1	Child don't want to brush	6	1	1		Retained	
2B2	Child don't like to brush in the toilet/ bathroom	6	1	1		Retained	
2B3	Bleeding gums	6	1	1		Retained	
2B4	Crowded teeth	6	1	1		Retained	
2B5	Bad mood (unwillingness)	6	1	1		Retained	
2B6	Forceful brushing by parents	6	1	1		Retained	
2B7	Long toothbrushing session	6	1	1		Retained	
2B8	Child does not like to put anything in their mouth	6	1	1		Retained	
		S-CVI/Ave	**0.99**				
		S-CVI/UA		**0.97**			

Ave=Average, I-CVI=Item-level Content Validity Index, S-CVI=Scale-level Content Validity Index, UA=Universal Agreement, 1F=First domain under facilitating factors (Environmental Context), 2F=Second domain under facilitating factors (Behavior Regulation), 1B=first domain under barriers (Environmental Context), 2B=second domain under barriers (Behavior Regulation), Each code represents the domain and sub-item number for ease of reference in the questionnaire.

Table 2 Summary of Face Validity

Domain / Coding	Item	No of panel agree on the clarity of item	I-FVI	UA	Comments	Decision	Remarks
	Facilitating factors to toothbrushing						
Environmental Context: 1F	The factors that ease parents to brush their child at home	10	1	1		Retained	
1F1	Fear of poor oral health	10	1	1		Retained	
1F2	High risk to develop oral health problem	9	0.9	0	Rater 6 misunderstood that the question as TB can worsen oral health	Revised	*Child's high risk to develop oral health problem*
1F3	Can prevent oral health problem	10	1	1		Retained	
1F4	Can reduce oral care cost	10	1	1		Retained	
1F5	Availability of suitable toothbrush	10	1	1		Retained	
1F6	Toothbrushing skills on the children with CP	10	1	1		Retained	
1F7	Family support	10	1	1		Retained	
1F8	Advice from community (neighbours, head village, NGO)	10	1	1		Retained	
1F9	Advice from dental professionals (e.g., dentists, dental therapists, or dental nurses)	10	1	1	Rater 4 did not really understand professional refer to whom	Retained	Team decided to retain the term
1F10	Advice from medical professionals	10	1	1		Retained	
Behavior Regulation: 2F	The factors that encourage the children to brush at home	10	1	1		Retained	
2F1	Daily routine/ habit among the family members	10	1	1		Retained	
2F2	Giving rewards as positive reinforcement	10	1	1		Retained	
2F3	Pleasant taste of toothpaste	10	1	1		Retained	
2F4	Prefer the type of toothbrush used	10	1	1		Retained	
2F5	Advice from community (neighbours, head village, NGO)	10	1	1		Retained	
2F6	Advice from dental professionals (e.g., dentists, dental therapists, or dental nurses)	10	1	1		Retained	
2F7	Advice from medical professionals	10	1	1		Retained	
	Barriers to toothbrushing						
Environmental Context : 1B	Difficulty during brushing child's teeth	10	1	1		Retained	
1B1	Lack of time	10	1	1		Retained	
1B2	Lack of access to oral health information	10	1	1		Retained	

Table 2 Continued

Domain / Coding	Item	No of panel agree on the clarity of item	I-FVI	UA	Comments	Decision	Remarks
1B3	Cost of oral hygiene tools	10	1	1		Retained	
1B4	Distractions due to other children	10	1	1		Retained	
Behavior Regulation: 2B	Child's reason for not brushing his/her their teeth	10	1	1		Retained	
2B1	Child don't want to brush	10	1	1		Retained	
2B2	Child don't like to brush in the toilet/ bathroom	10	1	1		Retained	
2B3	Bleeding gums	10	1	1		Retained	
2B4	Crowded teeth	10	1	1		Retained	
2B5	Bad mood (unwillingness)	10	1	1		Retained	
2B6	Forceful brushing by parents	10	1	1		Retained	
2B7	Long toothbrushing session	10	1	1		Retained	
2B8	Child does not like to put anything in their mouth	10	1	1		Retained	
		S-FVI/Ave	**0.99**				
		S-FVI/UA		**0.97**			

Ave=Average, I-FVI=Item-level Face Validity Index, S-FVI=Scale-level Face Validity Index, UA=Universal Agreement, 1F=First domain under facilitating factors (Environmental Context), 2F=Second domain under facilitating factors (Behavior Regulation), 1B=first domain under barriers (Environmental Context), 2B=second domain under barriers (Behavior Regulation), Each code represents the domain and sub-item number for ease of reference in the questionnaire.

Table 3 Final Version of the Questionnaire

Section	Number of items
Facilitating factors towards toothbrushing	
Domain 1: The factors that ease the parents to brush their child at home (environmental context)	10
Domain 2: The factors that encourage the children to brush at home (behaviour regulation)	7
Barriers towards toothbrushing	
Domain 1: Difficulty faced by caregivers to make sure their children with CP brush their teeth (environmental context)	4
Domain 2: Child's reason for not brushing their teeth (with or without assistance)	8

ensure that the items in the instrument are clinically relevant and address practical concerns in dental health. Meanwhile, the paediatric dental specialists were included due to their expertise in managing children's dental care, particularly for those with special healthcare needs[28]. At Hospital Pakar Universiti Sains Malaysia (HPUSM), paediatric dental care typically continues until just before age 18, in line with the American Academy of Paediatric Dentistry (AAPD) guidelines[29]. Children with CP are usually seen by paediatric dentists in early childhood, but they may be referred to SCD or Oral and Maxillofacial Surgery (OMFS) clinics between the ages of 6–12 due to their complex needs. While no fixed age for referral exists, the American Academy of Paediatrics (AAP) allows paediatric care to extend up to age 21 or beyond for patients with special needs[30], underscoring the need for flexible, individualised care planning.

Aside from that, public health specialists contribute essential perspectives on the social determinants of health and population-level strategies, ensuring that instruments account for community needs and systemic health disparities[31,32]. In the context of children with CP, they play a key role in promoting early intervention, prevention, and equitable access to care[32]. Their involvement in policy development and cross-sector collaboration supports socially just, economically feasible healthcare solutions that benefit both children and their families[31,32].

Moreover, dental public health specialists also play a crucial role in instrument development by ensuring it addresses both individual and community oral health needs, particularly for children with CP[33,34]. Their expertise supports the design of preventive programs, planning of accessible services, policy development, and training of dental professionals[33,34]. Their involvement also strengthens content validity by contributing a public health perspective during multidisciplinary panel evaluations[34].

To establish face validity, it is crucial to select a sample population that resembles the study's target group to guarantee that the items are clear and comprehensible, pertinent to them, and easy to respond to[35]. Face validity in this study was established by engaging the primary caregivers of children with CP, selected purposively based on their availability, primary caregiving role, and active participation in their child's daily toothbrushing routine. To assess sample representativeness, demographic data were collected, revealing that most participants were Malay females with varied caregiving experience. Their socio-economic background reflected that of the broader local caregiver population. These characteristics are consistent with the typical caregiver profile for children with CP in the region. The purposive sampling ensured that feedback came from relevant and informed individuals, thereby enhancing the instrument's validity. Involving the target population allowed for meaningful input on how accurately the items captured their real-life experiences and challenges[21]. Moreover, their feedback enhances the questionnaire's effectiveness by identifying ambiguities and improving usability and reliability. Respondents' perspectives are crucial in ensuring item validity and acceptability, as their preference for an item influences their ability and willingness to respond accurately, impacting the measure's validity and sensitivity[36]. Based on the FVI results, all domains demonstrated a high level of clarity and comprehensibility, indicating an effective response process. Qualitative feedback from respondents was also considered, and adjustments were made to the TB-CCP. These modifications included rewording and rephrasing statements to enhance clarity and understanding of the items. However, the validation sample consisted of 10 primary caregivers from CBR centers in Kota Bharu, Kelantan. While their feedback was valuable for assessing clarity and comprehension of the questionnaire, it is important to acknowledge that this sample may not represent the broader caregiver population in Malaysia.

Regional, cultural, and socioeconomic differences such as language dialects, access to services, and caregiving practices could influence how caregivers interpret and respond to questionnaire items. Therefore, caution is advised in generalizing the findings, and further validation in diverse settings is recommended.

This study marks the first development of the Malay-language TB-CCP tool, which includes assessments of both content and face validity. Similar validation studies, such as those by Campanaro et al. (2013)[11] and Liu et al. (2017)[15], have assessed tools measuring oral health behaviours among caregivers of children with special needs. These studies demonstrated the importance of culturally relevant content and user feedback in tool development. Unlike those instruments, which were developed in Western or East Asian contexts, the TB-CCP questionnaire is tailored specifically to the Malaysian population, using the national language and accounting for local caregiving practices and healthcare structures. This enhances the tool's contextual relevance and practical utility in local oral health interventions. However, a notable limitation is the lack of psychometric evaluation, which could have provided stronger support for the tool's validity in assessing facilitators and barriers to toothbrushing among children with CP. Nevertheless, the tool's validity is supported by satisfactory CVI and FVI values, along with expert panel feedback. As the tool was developed exclusively in Malay, its applicability may be limited for non-Malay speakers. Furthermore, crucial behavioural variables like self-efficacy and cues to action from frameworks like the Health Belief Model and Theory of Planned Behavior[37,38] were not addressed; instead, the emphasis was solely on facilitating factors and barriers. This could prevent a thorough grasp of the larger variables affecting caregivers' actions, which can be considered for future studies. For a more interdisciplinary approach, future research should incorporate paediatricians and evaluate the confidence of caregivers, as well as outside stressors.

Conclusion

The development of the questionnaire and the establishment of its content validity was a lengthy and iterative process. Content and face validation analysis has led to the finalization of a 29-item version of the TB-CCP, which is now ready for the next phases of validation, including exploratory and confirmatory factor analyses. The 29-item TB-CCP has demonstrated a satisfactory level of content and face validation, as evidenced by its I-CVI, S-SCI/Ave, and S-FVI/Ave indices. This makes it a valuable tool for understanding the facilitating factors and barriers to effective toothbrushing practices among children with CP.

Acknowledgement

The authors would like to express their gratitude to all the participants and experts who contributed to the validation process of the questionnaire, especially for their support and valuable insights.

Funding sources

This study did not receive any financial support or sponsorship.

Conflict of interest

The authors declare no potential or existing conflicts of interest related to this study.

References

1. Dougherty NJ. A review of cerebral palsy for the oral health professional. Dent Clin N Am 2009;7;53:329–38. doi: 10.1016/j.cden.2008.12.001.
2. Bax M, Goldstein M, Rosenbaum P, Leviton A, Paneth N, Dan B, et al. Proposed definition and classification of cerebral palsy, April 2005. Dev Med Child Neurol 2007;47:571. doi: 10.1111/j.1469-8749.2005.tb01195.x.
3. Stavsky M, Mor O, Mastrolia SA, Greenbaum S, Than NG, Erez O. Cerebral Palsy—Trends in epidemiology and recent

development in prenatal mechanisms of disease, treatment, and prevention. Front Pediatr 2017;5. doi: 10.3389/fped.2017.00021.
4. Department of Statistics Malaysia. Person With Disability Statistics [homepage on the Internet]. Department of Statistics Malaysia; 2024 [cited 2025 Feb 7]. Available from: https://www.dosm.gov.my/portal-main/release-content/person-with-disability-2022
5. Bakar MAA, Samat N, Yaacob NS. Spatial accessibility to health care services among children with cerebral palsy in Johor, Peninsular Malaysia. Geospat Health 2021;16. doi: 10.4081/gh.2021.987.
6. UNICEF. Children with disability in Malaysia [hompage on the Internet]. UNICEF; 2014 [cited 2025 Jan 15]. Available from: https://www.unicef.org/malaysia/reports/children-disabilities-malaysia-2014
7. Cui S, Akhter R, Yao D, Peng XY, Feghali MA, Chen W, et al. Risk factors for dental caries experience in children and adolescents with cerebral palsy—a scoping review. Int J Environ Res Public Health 2022;19. doi: 10.3390/ijerph19138024.
8. Karaseridis K, Dermata A. Cerebral palsy: Oral manifestations and dental management. Balk J Dent Med 2023;27:1–7. doi: 10.5937/bjdm2301001k.
9. Hegde AM, Babu AA, Mohammed A, John A, Singh K, Shetty, S. Special needs of special children-parental view. NUJHS 2015;05:38–44. doi: 10.1055/s-0040-1703887.
10. Lansdown K, Smithers-Sheedy H, Coulton KM, Irving M. Oral health outcomes for people with cerebral palsy: a scoping review protocol. JBI Database System Rev Implement Rep 2019;17:2551–8. doi: 10.11124/jbisrir-2017-004037.
11. Campanaro M, Huebner CE, Davis BE. Facilitators and barriers to twice daily tooth brushing among children with special health care needs. Spec Care Dent 2013;34:185–92. doi: 10.1111/scd.12057.
12. Ahmad R, Rahman NA, Hasan R, Yaacob NS, Ali SH. Oral health and nutritional status of children with cerebral palsy in northeastern peninsular Malaysia. Spec Care Dent 2019;40:62–70. doi: 10.1111/scd.12436.
13. Yusoff MSB. ABC of content validation and content validity index calculation. Educ Med J 2019;11:49–54. doi: 10.21315/eimj2019.11.2.6.
14. Aliakbari E, Gray-Burrows KA, Vinall-Collier KA, Edwebi S, Salaudeen A, Marshman Z, et al. Facilitators and barriers to home-based toothbrushing practices by parents of young children to reduce tooth decay: a systematic review. Clin Oral Investig 2021;25:3383–93. doi: 10.1007/s00784-021-03890-z.
15. Liu HY, Chen JR, Hsiao SY, Huang ST. Caregivers' oral health knowledge, attitude and behavior toward their children with disabilities. J Dent Sci 2017;12:388–95. doi: 10.1016/j.jds.2017.05.003.
16. Poornima U, Luke AM, Mathew S. Parents' attitude toward assisted oral hygiene care for their children. J Glob Oral Health 2022;5:69–74. doi: 10.25259/jgoh_40_2020.
17. Zaihan O, Normastura AR, Azizah Y, Mohd Khairi M. Plaque maturity and problems encountered by mothers during toothbrushing among Down Syndrome children in the northeast of peninsular Malaysia. Int J Med Sci Public Healt Clin Sci 2015;2:159–73.
18. Gehlbach H, Brinkworth ME. Measure twice, cut down error: a process for enhancing the validity of survey scales. Rev Gen Psychol 2011;15:380–7. doi: 10.1037/a0025704.
19. Hinkin TR. A brief tutorial on the development of measures for use in survey questionnaires. Organ Res Methods 1998;1:104–21. doi: 10.1177/109442819800100106.
20. Artino A, Gehlbach H. Avoiding four visual-design pitfalls in survey development. Acad Med: J Assoc American Med Col 2012;87:1452. doi: 10.1097/ACM.0b013e31826a06b2.
21. Yusoff MSB. ABC of response process validation and face validity index calculation. Edu Med J 2019;11:55–61. doi: 10.21315/eimj2019.11.3.6.
22. Davis LL. Instrument review: getting the most from a panel of experts. Appl Nurs Res 1992;5:194-7. doi: 10.1016/s0897-1897(05)80008-4.
23. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Res Nurs Health 2007;30:459–67. doi: 10.1002/nur.20199.
24. Hadie SNH, Hassan A, Ismail ZIM, Asari MA, Khan AA, Kasim F, et al. Anatomy education environment measurement inventory: a valid tool to measure the anatomy learning environment. Anat Sci Educ 2017;10:423–32. doi: 10.1002/ase.1683.
25. Ozair MM, Baharuddin KA, Mohamed SA, Esa W, Yusoff MSB. Development and validation of the knowledge and clinical reasoning of acute Asthma Management in Emergency Department (K-CRAMED). Educ Med J 2017;9:1–17. doi: 10.21315/eimj2017.9.2.1.

26. Likert R. A technique for the measurement of attitudes. Arc Psychol 1932;22:5–55
27. Welie J. Is dentistry a profession? Part 1. Professionalism defined. J Canadian Dent Assoc 2004;70;529–32.
28. Hunter ML, Hunter B, Thompson SA, Mclaughlin WS. Special care dentistry: attitudes of specialists in paediatric dentistry practising in the UK to the creation of a new specialty. Int J Pediatr Dent 2004;14:246–50. doi: 10.1111/j.1365–263x.2004.00566.x.
29. Hardin AP, Hackell JM, AAP Committee on practice and ambulatory medicine. Age limit of pediatrics. Pediatrics. 2017;140. doi: https://doi.org/10.1542/peds.2017–2151.
30. Krol DM, Whelan K. Maintaining and improving the oral health of young children. Pediatrics 2023;151:1–8. doi: 10.1542/peds.2022–060417.
31. Inglis NJ, Malhotra N, Hothersall E, Fowler T. The public health specialist and access to public health advice. InnovAiT Educ Inspiration Gen Prac 2011;4:719–28. doi: 10.1093/innovait/inr177.
32. Hoagland A, Kipping S. Challenges in promoting health equity and reducing disparities in access across new and established technologies. Can J Cardiol 2024;40:1154–67. doi: 10.1016/j.cjca.2024.02.014.
33. Tomar S, Garcia A. Dental public health: the "big picture" specialty. J American Col Dent 2009;76:31.
34. Daly B, Watt RG, Batchelor PB, Treasure ET. Essential dental public health. 2nd ed. Oxford: Oxford University Press; 2013.
35. Allen MS, Robson DA, Iliescu D. Face validity. Eur J Psychol Assess 2023;39:153–6. doi: 10.1027/1015–5759/a000777.
36. Connell J, Carlton J, Grundy A, Buck ET, Keetharuth AD, Ricketts T, et al. The importance of content and face validity in instrument development: lessons learnt from service users when developing the Recovering Quality of Life measure (ReQoL). Qual Life Res 2018;27:1893–902. doi: 10.1007/s11136–018–1847–y.
37. Orji R, Vassileva J, Mandryk R. Towards an effective health interventions design: an extension of the health belief model. Online J Public Health Inform 2012;4. doi: 10.5210/ojphi.v4i3.4321.
38. Rozenkowska K. Theory of planned behavior in consumer behavior research: a systematic literature review. Int J Consum Stud 2023;47. doi: 10.1111/ijcs.12970.