

ORIGINAL ARTICLE

Linguistic Validation and Adaptation of a Malay Language Questionnaire to Measure Knowledge, Attitude and Behaviour Regarding Toothpaste Use and Toothbrushing for 12-Year-Old Children

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ABSTRAK

Pengetahuan, sikap dan tingkah laku terhadap penggunaan ubat gigi dan memberus gigi merupakan faktor penyumbang dalam mengekalkan kesihatan mulut yang baik. Kajian ini dijalankan untuk menterjemah dan mengadaptasi soal-selidik tentang pengetahuan, sikap dan tingkah laku terhadap penggunaan ubat gigi dan memberus gigi untuk kanak-kanak Malaysia berumur 12 tahun. Soal-selidik asal dalam Bahasa Inggeris yang menilai pengetahuan, sikap dan tingkah laku terhadap penggunaan ubat gigi dan memberus gigi digunakan dalam kajian ini. Proses terjemahan soal-selidik melibatkan terjemahan ke hadapan, terjemahan ke belakang serta penyatuan untuk menghasilkan versi pra-akhir soal-selidik dalam Bahasa Melayu. Pra-ujian menggunakan soal-selidik pra-akhir tersebut telah dijalankan dengan melibatkan 10 kanak-kanak berumur 12 tahun di Tawau, Sabah. Hasil pra-ujian dibincangkan dan disemak oleh jawatankuasa pakar sebelum menghasilkan versi akhir soal-selidik dalam Bahasa Melayu. Satu ujian rintis bagi kebolehpercayaan uji semula menggunakan soal-selidik versi Melayu akhir telah dijalankan dalam kalangan 30 responden kanak-kanak berumur 12 tahun di Tawau. Analisis kebolehpercayaan uji semula dilaksanakan berdasarkan skor pekali korelasi antara kelas (ICC). Soal-selidik versi Melayu terdiri daripada domain pengetahuan (3 item), domain sikap (5 item) dan domain tingkah laku (16 item). Aspek semantik, pengalaman dan konsep soal-selidik versi Melayu mencapai kesetaraan yang sama dengan soal-selidik asal. Isu kesahan linguistik dan kesahan muka berjaya ditangani. Analisis kebolehpercayaan uji semula bagi domain pengetahuan (0.836), domain sikap (0.826) dan domain tingkah laku (0.864) menunjukkan tahap persetujuan yang sangat baik berdasarkan skor ICC. Soal-selidik versi Melayu telah diterjemahkan dan diadaptasikan untuk kegunaan tempatan bagi menilai pengetahuan, sikap dan tingkah laku terhadap penggunaan ubat gigi dan memberus gigi.

Kata kunci: Kanak-kanak; soal-selidik; memberus gigi; ubat gigi; terjemahan

ABSTRACT

Knowledge, attitude and behaviour towards toothpaste use and toothbrushing are contributing factors for maintaining good oral health. This study was conducted to translate and adapt a questionnaire on the knowledge, attitude and behaviour of toothpaste use and toothbrushing for 12-year-old Malaysian children. The original questionnaire in English that assesses knowledge, attitude and behaviour on toothpaste use and toothbrushing was used in this study. The questionnaire translation process involves

forward translation, backward translation and consolidation to establish the pre-final Malay version questionnaire. A pre-test using the pre-final Malay version questionnaire was conducted among 10 participants of 12-year-old children in Tawau, Sabah. The expert committee discussed and reviewed the pre-test results to produce the final Malay version questionnaire. A pilot test for the test-retest reliability using the final Malay version questionnaire was then conducted among 30 respondents of 12-year-old children in Tawau. The test-retest reliability was analysed based on the intraclass correlation coefficient (ICC) score. The Malay version questionnaire consisted of knowledge domain (3 items), attitude domain (5 items) and behaviour domain (16 items). The Malay version questionnaire semantic, experiential and conceptual aspects achieved the same equivalence as in the original questionnaire. The linguistic and face validity issues were successfully resolved. The test-retest reliability results of the knowledge domain (0.836), attitude domain (0.826) and behaviour domain (0.864) achieved an excellent ICC score. The Malay version of the questionnaire has been translated and adapted for local use to assess knowledge, attitude and behaviour of toothpaste use and toothbrushing.

Keywords: Children; questionnaires; toothbrushing; toothpastes; translations

INTRODUCTION

Dental caries affects children's oral health, general health and quality of life (Dolah et al. 2020; Eid et al. 2020). Preventing and controlling dental caries is vital to maintaining good oral health and general well-being (Mills et al. 2023). Brushing teeth using fluoridated toothpaste is an ideal public health approach to preventing and controlling dental caries that is affordable, convenient and widely used. Fluoride effectively controls and prevents dental caries by the fluoride mode of action that reduces enamel demineralisation, promotes enamel remineralisation and inhibits bacterial metabolism (Kanduti et al. 2016). Effective toothbrushing is the main plaque control method that effectively removes plaque, thus preventing dental plaque accumulation (Patil et al. 2014; Toshniwal et al. 2022).

In maintaining good oral hygiene, effective toothbrushing using fluoridated toothpaste is paramount (Featherstone 2006; Toumba et al. 2019). Correct knowledge, positive attitude and good behaviour towards toothpaste use and toothbrushing among schoolchildren are crucial for maintaining good oral hygiene (Al-Samadani et al. 2017; Cui et al. 2023; Weik et al. 2022). Studies have reported that children with low knowledge, negative attitude and poor behaviour towards toothpaste use and toothbrushing were more predisposed to dental caries (Al-Samadani

et al. 2017; Kaur et al. 2015; Suprabha et al. 2013). This shows that the knowledge, attitude and behaviour towards toothpaste use and toothbrushing are important factors that need to be assessed to understand children's oral hygiene care and indirectly provide important information on their risk for dental caries.

There is a need for a tool to assess the factors of knowledge, attitude and behaviour on schoolchildren's oral hygiene care. The most widely used tool to assess this factor is a questionnaire (Ahmad et al. 2019; Al-Samadani et al. 2017; Hashemipour et al. 2024; Verma & Jain 2018). Using an existing valid and reliable questionnaire is the simplest and least time-consuming measure (Bettie et al. 2015; Eidenhardt et al. 2022). A few studies were done in Malaysia that used a questionnaire to assess oral hygiene care among schoolchildren (Ahmad et al. 2019; Kaur et al. 2015; Lian et al. 2010; Misran et al. 2022; Samosir et al. 2018). However, the available questionnaires used in those studies in Malaysia assessed oral health or oral hygiene care in general and did not focus on toothpaste and toothbrushing factors (Ahmad et al. 2019; Kaur et al. 2015; Lian et al. 2010; Misran et al. 2022; Samosir et al. 2018).

There is currently no questionnaire in the Malay version on knowledge, attitude and behaviour that mainly focuses on toothpaste

and toothbrushing in the existing literature. Most available questionnaires focusing on toothpaste and toothbrushing for schoolchildren were available in English and other languages (Goodwin et al. 2025; Hashemipour et al. 2024; Jensen et al. 2012; Martignon et al. 2012; Nordström & Birkhed 2017; Verma & Jain 2018). The questionnaire from Jensen et al. (2012) was more comprehensive in assessing knowledge, attitude and behaviour on toothpaste use and toothbrushing, as this questionnaire included items for post-toothbrushing behaviour that were not available in other questionnaires. The questionnaire by Jensen et al. (2012) has also been adapted into a few studies for schoolchildren (Hashemipour et al. 2024; Verma & Jain 2018).

Therefore, a questionnaire in the Malay version focusing on toothpaste use and toothbrushing is needed. A questionnaire in Malay will have advantages over the English version (Harzing 2005). As Malay is the national language in Malaysia and the main medium of instruction in national schools, children are assumed to have a better understanding of the Malay language. A Malay language questionnaire may provide a better understanding and remove language limitations. This will contribute to more concise and precise questionnaire responses. The use of this questionnaire is not only for research but will also be beneficial as a tool in assessing the effectiveness of the schoolchildren's toothbrushing program implemented in Malaysia. For example, the BEGIN program (*Latihan Memberus Gigi Berkesan*) by the Ministry of Health Malaysia.

Linguistic translation of a valid and reliable existing questionnaire is able to adapt instruments that are relevant to local culture and have comprehensible forms that maintain the meaning and intent of the questionnaire's original items (Beaton et al. 2000; Cruchinho et al. 2024). Linguistic translation of valid and reliable existing questionnaires is also less demanding, less time-consuming and less costly than developing a new questionnaire (Beaton et al. 2000; Cruchinho et al. 2024; Epstein et al. 2015). Thus, this study was conducted to translate and adapt a questionnaire

on the knowledge, attitude and behaviour of toothpaste use and toothbrushing for 12-year-old Malaysian children.

MATERIALS AND METHODS

Research Tool

The research tool in this study was adapted from Jensen et al. (2012), in which the original questionnaire was available in English and Swedish languages. Permission to adapt the questionnaire was obtained from the corresponding author of Jensen et al. (2012). The original questionnaire was constructed through qualitative and quantitative study stages, and underwent a validity and reliability process (Jensen 2013). The original questionnaire consisted of 24 items assessing knowledge, attitude, and behaviour towards toothpaste use and toothbrushing.

All items in the original questionnaire were categorised into three main domains. The knowledge domain had 3 items regarding toothpaste, fluoride and toothbrushing. For the attitude domains, there were 5 items on the attitude towards toothpaste use, toothbrushing and oral health. A visual analogue scale (VAS) was used to rate respondents' oral health in the attitude domain, with "good" at the left terminus and "bad" at the right terminus. Next, the behaviour domains consisted of 16 items that concerned the toothpaste use, toothbrushing and other oral hygiene aids. A graphic illustration was used to describe the items in the behaviour domain that asked for the amount of toothpaste use and the amount of water use for rinsing after brushing teeth.

Translation Process

This study was conducted from April to June 2023. The translation and adaptation of the original questionnaire into Malay version followed the guidelines by Beaton et al. (2000) with modifications. This study's process involved two phases: linguistic validation (Phase 1) and

pilot study (Phase 2). Figure 1 showed the flow chart of the questionnaire translation process involved in Phase 1 and Phase 2 of this study.

(i) Phase 1: Linguistic Validation

Phase 1 involved forward translation, backward translation, consolidation, synthesis with the expert committee and until the pre-test. The linguistic validation and face validation of all items in the questionnaire were reviewed by the expert committee in the synthesis, consolidation and pre-test among the same age group of the intended target population (12-year-old children). The first step was the forward translation of the

original questionnaire in English into Malay by two English teachers who qualified with a Bachelor of Education [Teaching English as a Second Language (TESL)] and one Dental Public Health Specialist (DPHS) from the Ministry of Health Malaysia. Translators were informed to ensure that the translation could be understood by 12-year-old children. In the second step, an expert committee synthesised the three forward translations to produce a reconciled Malay version of the questionnaire. The expert review committee members involved in this Phase 1 were a nutritionist specialist from Universiti Sains Malaysia (USM) and a DPHS from USM.

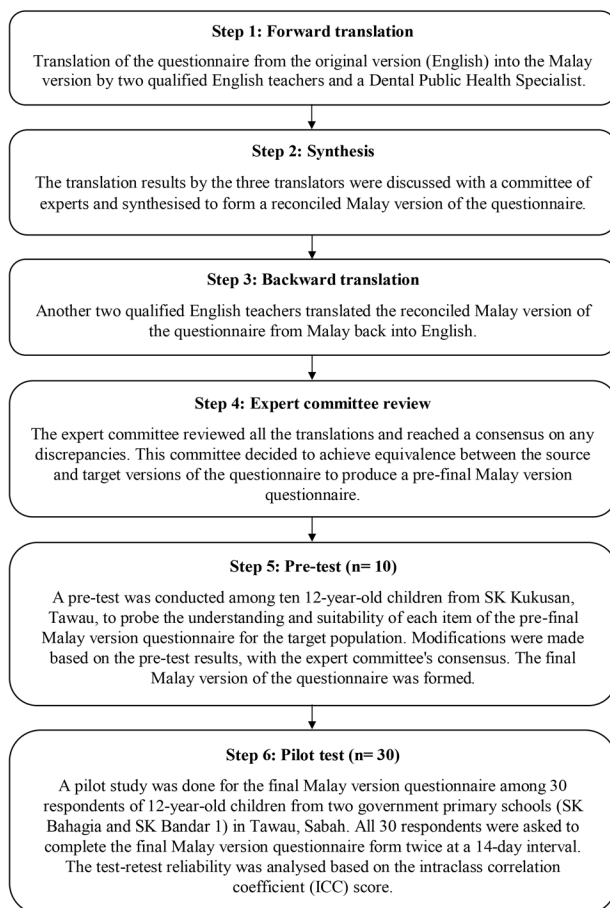


FIGURE 1: Linguistic translation process of the questionnaire involved in Phase 1 and Phase 2 of the study

In the third step, two English teachers [both qualified with a Bachelor of Education (TESL)] translated the reconciled Malay version of the questionnaire from Malay back into English. This step was a backward translation process. The qualified translators involved in the backward translation process differed from those involved in the previous forward translation process. This ensured that both the forward and backward translation processes were valid and biases among the translators were prevented. The same expert committee consolidated all versions of the questionnaire to produce a pre-final Malay version of the questionnaire in the fourth step.

Next, in the fifth step, the pre-final Malay version of the questionnaire was pre-tested among ten 12-year-old children. The sample size ($n = 10$) used in the pre-test followed the process of translation and adaptation guidelines recommended by Efsthathiou (2019). Ten participants in the pre-test were selected through purposive sampling from one of the government primary schools [Sekolah Kebangsaan (SK) Kukusan] in Tawau, Sabah. In this sampling, participants were selected from each Standard 6 class available in the selected school and a mix of different ethnicities and sexes. The inclusion criteria were Malaysian citizens, children born in 2011 attending government primary schools, children using toothpaste and able to read and write in Malay.

The selected schoolchildren were invited for a face-to-face interview conducted by the principal investigator. The pre-test was conducted at the participant's school. The principal investigator informed the study's purpose and procedure. The participants' opinions, suggestions and comments were asked regarding the pre-final Malay version of the questionnaire. Any word or graphic illustrations in this questionnaire that were difficult for participants to understand, unclear or inappropriately used were probed in detail. Then, the pre-test result discussion was conducted by the principal investigator with the same expert committee and modifications were

made to the questionnaire items. The corrected version was considered the final Malay version of the questionnaire.

(ii) Phase 2: Pilot Test

The final Malay version of the questionnaire from Phase 1 underwent a pilot study among 30 respondents of 12-year-old children. This pilot testing was done in June 2023. The number of sample sizes ($n = 30$) used for the pilot test in this study followed the recommendations by Bujang et al. (2024). The respondents in the pilot test were selected through purposive sampling from two government primary schools SK Bahagia and SK Bandar 1 in Tawau, Sabah. In this sampling, children were selected from each Standard 6 class available in the selected two schools. The inclusion criteria were Malaysian citizens, children born in 2011 attending government primary schools, children using toothpaste and able to read and write in Malay. The respondents in the pilot test were 12-year-old children who were not involved in the pre-test in Phase 1 of the study.

The principal investigator explained the process of the pilot study before the respondents answered the questionnaire. The questionnaire in the pilot study was self-administered by the respondents and conducted physically by the principal investigator. The test-retest reliability was assessed during the pilot test. The respondents were asked to complete the final Malay version questionnaire form twice, with a 14-day interval between the first and second administration of the questionnaire. The time interval of 14 days between tests was the most frequently used for the test-retest reliability test (Streiner et al. 2015). Appointments set with the school authority ensured that all respondents could participate in the questionnaire's first and second administration. The first questionnaire administration involved 30 respondents, and all 30 of these respondents completed the second questionnaire administration.

Statistical Analysis

All data in this study were entered and analysed using the Statistical Package for the Social Science (SPSS) software version 27 (IBM Corp., Armonk, NY, USA). The test-retest reliability was analysed based on the intraclass correlation coefficient (ICC) score. The ICC score was analysed using a two-way mixed model with an absolute agreement type option. The significance *p*-value was set at less than 0.05. The strength of test-retest agreement for the ICC scores greater than 0.81 was almost perfect agreement; 0.61 to 0.80 was substantial agreement; 0.41 to 0.60 was moderate agreement; 0.21 to 0.40 was fair agreement; and a score below 0.20 was poor (Streiner et al. 2015).

The scoring was based on the total score of items for each domain. For the item that allowed multiple answers, each answer option was counted in the scoring. In the knowledge domain, score 1 for correct knowledge and score 0 for incorrect knowledge. In the attitude domain, score 1 for a positive attitude and score 0 for a negative attitude. As item 4 was using a VAS scale in the attitude domain, the scoring was categorised into three groups based on the distance of the marking measured in millimetres (mm) using a ruler from the left "Good" terminus, either good (0-35 mm), fair (36-64 mm) or bad (65-100 mm). For the behaviour domain scoring, score 1 for appropriate behaviour and score 0 for inappropriate behaviour.

Ethical Consideration

Ethical approval to conduct this study was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (Reference No.: USM/JEPeM/KK/23010090). This study also obtained permission from the Ministry of Education Malaysia [Reference No.: KPM.600-3/2/3-eras (15066)]. Written parental consent and participant assent were secured prior to the participation of 12-year-old children in the pre-test and pilot test of this study.

RESULTS

Phase 1: Linguistic Validation

All 24 items from the original questionnaire were selected. Following the subdivision of the original questionnaire, the 24 items were subdivided into three domains. The first domain contained 3 items that assessed knowledge of toothpaste, fluoride and toothbrushing. In the second domain, 5 items assessed attitudes towards the use of toothpaste and toothbrushing. The third domain consisted of 16 items that assessed behaviour regarding the use of toothpaste, toothbrushing and other oral hygiene aids. The original questionnaire answer option design was maintained for this study, resulting in the translated questionnaire having items with answer options that allowed for multiple answers and items that only allowed one answer.

Table 1 showed the result of the translation from English (original version) into Malay for the knowledge domain of the questionnaire. The answer options from the two items (item 2 and item 3) in the knowledge domain were modified. In item 2, the answer option of "toothbrush and toothpaste equally important" was modified by substituting the term "toothpaste" with "fluoridated toothpaste". For item 3, a "flyer" term was added to the "advertisement and brochure" answer option.

Table 2 showed the translation result for the attitude domain of the questionnaire. No modifications were made to the questions or answer options in the attitude domain. An item that used a VAS for self-rated oral health was maintained from the original questionnaire (item 4). This self-rated oral health used a 100 mm VAS horizontal line.

Further, Table 3 showed the translation result for the questionnaire's behaviour domain. A few modifications were made to the question and answer options for the items in the behaviour domain of the questionnaire. Firstly, a modification was made by using the term "before bedtime" to refer to "evening" from the original questionnaire (item 4). Secondly, a graphic illustration was added for the interdental

TABLE 1: Questionnaire items on the English and Malay versions for the knowledge domain

Items	Original version questionnaire	Malay version questionnaire	Justification of modification
1	What is the effect of fluoride on toothpaste? (Tick for one or more options) Whiten teeth Strengthens teeth Makes teeth cleaner Makes your mouth feel fresh Do not know	Apakah kesan ubat gigi berfluorida? (Tandakan satu atau lebih pilihan) Memutihkan gigi Menguatkan gigi Menjadikan gigi lebih bersih Menjadikan mulut berasa segar Tidak tahu	No modification
2	Which do you think is the most important against tooth decay? Cleaning with the toothbrush The fluoride in the toothpaste Toothbrush and toothpaste equally important	Yang manakah anda rasa paling penting untuk mencegah kerosakan gigi? Membersihkan gigi menggunakan berus gigi Kandungan fluorida dalam ubat gigi Berus gigi dan ubat gigi berfluorida adalah sama penting	Term modification of the "toothpaste" in "toothbrush and toothpaste equally important" answer option to refer to "ubat gigi berfluorida" (expert consensus)
3	Have you had any toothpaste instructions before? No instruction From parents or family members From dental personnel From advertisement and brochure From school personnel Other, answer	Pernahkan anda mendapat arahan mengenai penggunaan ubat gigi sebelum ini? Tiada arahan Daripada ibu bapa atau ahli keluarga Daripada kakitangan klinik pergigian Daripada iklan dan risalah "flyer" Daripada kakitangan sekolah Lain-lain, sila nyatakan	Modification by adding the "flyer" term next to the "Daripada iklan dan risalah" answer option (expert consensus)

TABLE 2: Questionnaire items on the English and Malay versions for the attitude domain

Items	Original version questionnaire	Malay version questionnaire	Justification of modification
1	Do you think brushing your teeth is important? Yes, very important Yes, quite important Not important Do not know	Adakah anda fikir memberus gigi anda adalah penting? Ya, sangat penting Ya, agak penting Tidak penting Tidak tahu	No modification
2	Do you think it is important to brush your teeth with toothpaste? Yes, very important Yes, quite important No, not important Do not know	Adakah anda fikir penting untuk memberus gigi menggunakan ubat gigi? Ya, sangat penting Ya, agak penting Tidak penting Tidak tahu	No modification

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Items	Original version questionnaire	Malay version questionnaire	Justification of modification
3	What determines which toothpaste you use? (Tick one or more options) The price The taste Advertisements Use what's at home Do not know	Apakah yang menentukan pilihan ubat gigi yang anda gunakan? (Tandakan satu atau lebih pilihan) Harga Rasa Iklan Guna apa sahaja yang ada di rumah Tidak tahu	No modification
4	How do you rate your oral health? (Mark with a cross on the scale below) Good Bad	Bagaimanakah anda menilai kesihatan mulut anda? (Tandakan dengan pangkah pada skala di bawah) Baik Teruk	No modification. VAS scale from the original questionnaire was retained.
5	What is most important to you? Healthy teeth White teeth No holes Other, answer	Apakah yang paling penting bagi anda? Gigi yang sihat Gigi yang putih Tidak berlubang Lain-lain, sila nyatakan	No modification

TABLE 3: Questionnaire items on the English and Malay versions for the behaviour domain

Items	Original version questionnaire	Malay version questionnaire	Justification of modification
1	How many times do you brush your teeth per day? Never 1 time 2 times 3 times or more	Berapa kali anda memberus gigi dalam sehari? Tidak pernah 1 kali 2 kali 3 kali atau lebih	No modification
2	When do you brush your teeth? (Pick one or more options) Before breakfast After breakfast Do not brush in the morning Before dinner After dinner Before I go to bed Do not brush in the evening	Bilakah waktu anda memberus gigi anda? (Tandakan satu atau lebih pilihan) Sebelum sarapan Selepas sarapan Tidak memberus gigi pada waktu pagi Sebelum makan malam Selepas makan malam Sebelum tidur Tidak memberus gigi pada waktu malam	No modification
3	Does it happen that you do not brush your teeth in the morning or the evening? Yes No If yes, when?	Pernahkah anda tidak memberus gigi pada waktu pagi atau malam? Ya Tidak Jika ya, sila nyatakan bila?	No modification

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Items	Original version questionnaire	Malay version questionnaire	Justification of modification
4	Do you drink or eat anything after you brush your teeth in the evening? Yes No If yes, what?	Adakah anda minum atau makan sesuatu selepas memberus gigi anda pada waktu malam sebelum tidur? Ya Tidak Jika ya, sila nyatakan apa yang anda minum atau makan?	Term modification of the "evening" to refer to "malam sebelum tidur" (expert consensus)
5	Do you use toothpaste with or without fluoride? With fluoride Without fluoride Do not know What is the name of the toothpaste you are using now? Name of toothpaste	Adakah anda menggunakan ubat gigi berfluorida atau tanpa fluorida? Ubat gigi berfluorida Ubat gigi tanpa berfluorida Tidak tahu Apakah jenama ubat gigi yang anda gunakan sekarang? Sila nyatakan	No modification
6	Do you always brush your teeth with toothpaste? Yes, mostly No, not every time	Berapa kerapkah anda memberus gigi menggunakan ubat gigi? Kerap Tidak kerap	No modification
7	How often does it happen that you do not brush your teeth with toothpaste? Once a day More than 2 times a week Once a week Sometimes a month Never	Berapa kerapkah anda memberus gigi tanpa menggunakan ubat gigi? Sekali sehari Lebih daripada dua kali seminggu Sekali seminggu Beberapa kali dalam sebulan Tidak pernah	No modification
8	Do you always brush with the same toothpaste? Yes, mostly No If yes, what is the name of the toothpaste?	Adakah anda kerap menggunakan ubat gigi jenama yang sama? Kerap Tidak kerap Jika kerap, sila nyatakan jenama ubat gigi	No modification
9	Do you use a regular toothbrush or an electric toothbrush? Regular toothbrush Electric toothbrush Both	Adakah anda menggunakan berus gigi biasa atau berus gigi elektrik? Berus gigi biasa Berus gigi elektrik Kedua-duanya	No modification
10	How do you clean between your teeth? (Tick one or more options) Toothbrush Dental floss Toothpicks Interdental brush Others, please specify Do not use anything other than a toothbrush	Bagaimanakah anda membersihkan celah-celah gigi anda? (Tandakan satu atau lebih pilihan) Berus gigi Flos gigi Pencungkil gigi Berus interdental Lain-lain, sila nyatakan Tidak menggunakan apa-apa selain berus gigi	Modification from face validation result by adding a graphic of an interdental brush next to "berus interdental" answer option

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Items	Original version questionnaire	Malay version questionnaire	Justification of modification
11	How much toothpaste do you put on your toothbrush? (Pick the option that applies to you) Size of a pea 0.5 cm 1 cm 2 cm Puts toothpaste once on my electric toothbrush Puts toothpaste twice on my electric toothbrush	Berapa banyakkah ubat gigi yang anda letakkan pada berus gigi anda? (tandakan pilihan yang berkenaan dengan anda) Saiz kacang pis - 1 cm 2 cm Letak ubat gigi sekali pada berus gigi elektrik Letak ubat gigi dua kali pada berus gigi elektrik	Modification was done by removing the 0.5 cm answer option (expert consensus). Graphics next to the answer options from the original questionnaire were retained.
12	How long do you brush your teeth? Less than half a minute Half a minute 1 minute Less than 2 minutes 2 minutes More than 2 minutes	Berapa lamakah anda memberus gigi anda? Kurang daripada setengah minit Setengah minit 1 minit Kurang daripada 2 minit 2 minit Lebih daripada 2 minit	No modification
13	How many times do you dip your toothbrush under running water when you brush your teeth? (Circle the correct number below)	Berapa kalikah anda mencelupkan berus gigi anda di bawah air mengalir semasa anda memberus gigi? (Bulatkan nombor yang betul di bawah)	No modification
14	Do you rinse your mouth with water after brushing your teeth? No, never Yes, occasionally Yes, often Yes, always Haven't thought about it	Adakah anda berkumur dengan air selepas memberus gigi? Tidak, tidak pernah Ya, kadang-kadang Ya, kerap Ya, sangat kerap Tidak pernah terfikir	No modification
15	If you rinse your mouth after brushing your teeth, how much water do you use? (Pick the option that applies to you) A handful Two handfuls Half a glass of water A full glass of water -	Jika anda berkumur selepas memberus gigi, berapa banyak air yang anda gunakan? (Tandakan pilihan yang berkenaan dengan anda) Penuh satu tangan Penuh dua tangan Separuh gelas air Satu gelas penuh air Tidak berkumur	Modification was made by adding the "tidak berkumur" answer option (expert consensus). Graphics next to the answer options from the original questionnaire were retained.
16	Do you rinse your mouth with any solution (mouthwash) after brushing your teeth? Yes No If yes, indicate with which solution Dentan® Listerine® Flux® SB12® Others, please specify Do not know	Adakah anda berkumur dengan sebarang cecair (ubat kumur) selepas memberus gigi? Ya Tidak Jika ya, sila pilih jenama cecair yang digunakan Oradex® Listerine® Colgate-Plux® Oral-B® Lain-lain, sila nyatakan Tidak tahu	Modifications were done by substituting the mouthwash brand (expert consensus)

brush answer option (item 10). Next, the “0.5 cm” answer option for the item on the amount of toothpaste use was removed from the translated questionnaire (item 11). The answer option for “not rinsing” was added to the item that asked for the amount of water use for rinsing (item 15). The graphic illustrations for the amount of toothpaste use and the amount of water use for rinsing were maintained from the original questionnaire. Changes were also made to the answer options for the brand name of mouthwash by substituting brands that are locally available in Malaysia, such as Oradex®, Listerine®, Colgate-Plux® and Oral-B® (item 16).

Phase 2: Pilot Test

Table 4 showed the respondents’ socio-demographic profile in the pilot test of this study. The total number of respondents in the pilot test was 30 respondents of 12-year-old children. All 30 respondents from the first administration of the questionnaire were completed until the second administration in the test-retest reliability test. A total of 16 respondents were female (53.3%) and 14 were male (46.7%). Most of the respondents’ ethnicity was Bumiputera Sabah (63.3%), followed by Malay (26.7%) and Chinese (6.7%). Most of the respondents’ parents’ education level came from a secondary education background. 60.0% of the respondents were from the B40 families.

Table 5 showed the test-retest reliability results for each questionnaire domain based on

TABLE 4: Socio-demographic characteristics of the respondents in the pilot test (n = 30)

Variables	Frequency (%)
Sex	
Male	14 (46.7)
Female	16 (53.3)
Ethnicity	
Malay	8 (26.7)
Chinese	2 (6.7)
Indian	0 (0.0)
Bumiputera Sabah	19 (63.3)
Others	1 (3.3)
Father education level	
No formal education	1 (3.3)
Primary education	6 (20.0)
Secondary education	14 (46.7)
Post-secondary education	3 (10.0)
Tertiary education	6 (20.0)
Mother education level	
No formal education	0 (0.0)
Primary education	4 (13.3)
Secondary education	18 (60.0)
Post-secondary education	3 (10.0)
Tertiary education	5 (16.7)
Monthly household income (MYR)	
B40 (≤4,849)	18 (60.0)
M40 (4,850-10,959)	11 (36.7)
T20 (≥10,960)	1 (3.3)

the ICC score. The ICC score for the knowledge domain was 0.836, the attitude domain was 0.826 and the behaviour domain was 0.864. The ICC score for all three domains showed excellent agreement between the test and retest.

TABLE 5: Intraclass correlation coefficient (ICC) score for the three domains of the Malay version questionnaire

Domain	Test-retest reliability (ICC) ^a	95% CI
Knowledge of toothpaste, fluoride, and toothbrushing	0.836*	0.720, 0.913
Attitude towards the use of toothpaste and toothbrushing	0.826*	0.718, 0.905
Behaviour on the use of toothpaste, toothbrushing, and use of other oral hygiene aids	0.864*	0.785, 0.925

^aICC was calculated using two-way mixed model with absolute agreement type option
*Significance level at p<0.05

DISCUSSION

Phase 1

Questionnaires in a foreign language need to be adapted and validated locally to ensure conceptual equivalence and acceptability (Beaton et al. 2000). The background and characteristics of the target population influence the factors regarding feasibility, readability, consistency and clarity of the language (Beaton et al. 2000; Chin et al. 2024). A questionnaire that uses a language that is not the primary language of the local population will affect all of these factors (Beaton et al. 2000; Chin et al. 2024). This explains why linguistic validation of a non-Malay version questionnaire is important, as local respondents may interpret that questionnaire's questions differently, which may lead to inaccurate responses.

In this study, all items in the three domains achieved semantic, experiential and conceptual equivalences as in the original questionnaire through the proper linguistic validation process. The intended objectives and concepts of the original questionnaires were not compromised in the translation process of this study. This was achieved through proper forward and backwards translation, as well as proper linguistic and face validation that were assessed in Phase 1 of this study. This aligns with another study by Ngah et al. (2019). A few modifications to the questionnaire were made following the discussion with the experts and the feedback received from the participants in the pre-test.

(i) Linguistic validation

Experts' views were involved in the linguistic validation process of this study. In this study, the term "toothpaste" in the answer option "toothbrush and toothpaste equally important" in item 2 of the knowledge domain was modified to refer to "fluoridated toothpaste". With the consensus from the expert, the modification was made to align with other answer options in this item that highlight the fluoride content in the toothpaste. Current recommendations also

recommend brushing teeth using fluoridated toothpaste, highlighting that toothbrushing and fluoridated toothpaste are equally important for caries prevention (American Academy of Pediatric Dentistry 2024).

Other than that, the term "evening" was also modified to refer to "before bedtime" in item 4 of the behaviour domain. The term referring to time is important in oral health. Compared to the evening, before bedtime is a critical time for both diet and preventive behaviours regarding oral health (Baghlaf et al. 2018; Kitsaras et al. 2021). Consuming foods or drinks containing sugar before bedtime is a substantial risk factor for dental caries due to lower salivary flow, shifting the balance towards demineralisation rather than remineralisation (Baghlaf et al. 2018; Kitsaras et al. 2021). Therefore, the preventive behaviour related to dietary consumption and oral hygiene care before bedtime needs to be assessed due to the potential risk for oral health related to bedtime.

There was also a challenge in defining the Malay terms in this study, such as '*selalu*' (always or consistent) or '*kerap*' (frequent or often) and '*kadang-kadang*' (occasionally or sometimes). The same difficulty was encountered by Ngah et al. (2019) in translating terms related to the frequency measurement from English to the Malay language of oral health knowledge, attitude and practice questionnaire (OHKAPQ), such as 'some of the time', 'once in a while', 'rarely' and 'often'. Appropriate use of nouns, words and expressions in the translated tools version had to be done to improve understanding of the intended target group (Shinga-Ishihara et al. 2014). The expert committee in this study addresses and manages these issues using suitable local terms.

Further, the expert committee in this study had agreed to remove an answer option for an item that was unclear and could lead to confusion about the intended content of the questionnaire. The original questionnaire had an answer option of '0.5 cm' amount of toothpaste used for toothbrushing. The '0.5 cm' answer option had been omitted as a consensus by the expert committee (item 11), which identified

that the length of 0.5 cm was almost the same length as the 'pea-size' amount. In Malaysia, most toothpaste brands in the Malaysian market have a label that shows a 'pea-size' amount of toothpaste (Anis et al. 2019). Due to this, the expert committee measured and identified the label of 'pea-size' on the toothpaste as approximately 0.5 cm. However, up to date, no available literature has stated the exact length of a 'pea-size' amount of toothpaste. A pea-sized amount of toothpaste was approximately 0.25 g toothpaste, but the actual length of the pea-sized toothpaste amount is not reported (American Academy of Pediatric Dentistry 2024; Creeth et al. 2013).

Next, the original questionnaire had an item that asked about the amount of water use for rinsing after toothbrushing (Jensen et al. 2012). However, the answer options did not include an answer for those who were not rinsing. This item was interrelated with another item in the questionnaire that asked about the frequency of rinsing with water after toothbrushing and provided an answer option of "no, never". The study by Jensen et al. (2012) and Hashemipour et al. (2024) reported the presence of respondents who rinsed and never rinsed their mouths after brushing their teeth. This could lead to confusion and an invalid answer, as the respondents who never rinse after brushing their teeth tend to guess their response to this item. Due to this reason, a modification was made during the translation process with an addition to "not rinsing" for the answer options on the amount of water use for rinsing after toothbrushing (item 15).

In the present study, the answer options for item 16 in the behaviour domain were replaced with other answer options. The answer options of the original questionnaire for the item regarding mouthwash brand use were the available mouthwash brands that suited the Swedish population (Jensen et al. 2012). Therefore, to suit the local population in this study, the brand was replaced with a mouthwash brand readily available in the Malaysian market. A study done in Malaysia reported that most of the people were using Listerine® (47.3%), Colgate® (28.8%) and Oral-B® (11.3%) (Mitha et al. 2016). By replacing

the mouthwash brand name to suit the local context, this questionnaire item was relevant and appropriate to the Malaysian population as the target group.

(ii) Face validation

Face validation is the ability of the questionnaire to be understandable and relevant for the intended target population (Tsang et al. 2017). Through the pre-test in this study, face validation was conducted to assess whether all the items in the three domains were comprehensive and acceptable to the targeted group. The concepts, questions and response alternatives that were assessed during the face validation ensured the questionnaire's intended purpose was clearly conveyed and suited to the local target population (Laaksonen 2012; Tsang et al. 2017). Overall, the pre-test participants were able to understand each word, term and sentence used in all items of the three domains of the Malay version questionnaire without major difficulties. This positive result was supported by comprehensive linguistic validation before the pre-test (Connell et al. 2018; Ngah et al. 2019).

Only one modification was made from the pre-test result, as most participants could not imagine or explain what an interdental brush is (item 10). Few studies reported that most schoolchildren were unaware of interdental cleaning, with most of them not using any tools to clean interdental space (Al-Samadani et al. 2017; Alshloul 2021; Multalib et al. 2024). This explained why the participants were unaware of the interdental brush. In resolving this issue, the principal investigator probed more on the interdental brush term, and most participants suggested adding a graphic of the interdental brush. The process of receiving recommendations from the participants to make modifications to the questionnaire items in this study was in line with other studies (Connell et al. 2018; Hammond et al. 2014). A few choices of interdental brush graphics were discussed and selected with an expert committee member. Then, that questionnaire item was tested again among the same participants of the previous pre-

test. Adding an interdental brush graphic results in the improvement of the understanding of the interdental brush term.

Phase 2: Pilot Test

The pilot test in this study assessed the test-retest reliability of the questionnaire for each domain. The test-retest reliability assesses the respondents' responses to the questionnaire items, and the responses remain relatively consistent across repeated administration of the same questionnaire (Tsang et al. 2017). The scoring method used to calculate the ICC score based on the total item score for each questionnaire domain in this study was aligned with other studies (Nilisha & Ranjan 2021; Sowtali et al. 2019).

In this study, the ICC scores for the knowledge domain, attitude domain and behaviour domain were 0.836, 0.826 and 0.864, respectively. This shows that all three questionnaire domains exhibit excellent agreement. This indicated that the translated questionnaires were stable in the ability to reproduce measures, in which the variables that were to be tested did not change over time (Streiner et al. 2015). The excellent agreement score for the test-retest reliability test in the present study was attributed to the Malay version questionnaire's acceptable linguistic and face validation (Vyas et al. 2016). This aligns with another study that shows high test-retest reliability results donated from acceptable linguistic and face validation (Ngah et al. 2019).

Other than that, the time interval of 2 weeks between the first administration and second administration of the questionnaire in the present study followed the recommendation and was commonly used for test-retest reliability (Streiner et al. 2015). If the time interval is too short, the respondents of the questionnaire may remember their responses in the first administration of the questionnaire, which may overestimate the ICC (Tsang et al. 2017). However, if there is a long period between questionnaire administrations, the respondent's response to the questionnaire may be affected by other factors that will underestimate or overestimate the ICC (Tsang et

al. 2017).

Limitations

The previous studies by Hashemipour et al. (2024) and Verma & Jain (2018) were the only previous reported studies that adapted the questionnaire by Jensen et al. (2012) into the Persian and Kannada languages. However, the two previous studies did not report on the questionnaire's linguistic translation process (Hashemipour et al. 2024; Verma & Jain 2018). Therefore, this study's findings cannot be compared with those of previous studies.

Next, this study only involved 12-year-old children in both the pre-test and pilot test of the translated questionnaire. This is because most of the target population in oral health studies for primary schoolchildren are 12-year-old (Baumgartner et al. 2022; Deinzer et al. 2019; Karim et al. 2020; Weik et al. 2022). This explains why this study targets 12-year-old children to ensure that future findings using this questionnaire are comparable to those of other studies. However, further studies on the validation and reliability test of this Malay version questionnaire targeting a wide range of school-aged children, including secondary schoolchildren are suggested for future studies.

CONCLUSION

This Malay version of the questionnaire on knowledge, attitude and behaviour of toothpaste use and toothbrushing for 12-year-old children achieved satisfactory linguistic and face validation in the translation process. This Malay version questionnaire's semantic, experiential and conceptual aspects successfully achieved equivalence to the original questionnaire. All three questionnaire domains achieved an excellent test-retest agreement with an ICC score of more than 0.8. The Malay version of the questionnaire has been translated and adapted for Malaysian schoolchildren to assess knowledge, attitude and behaviour regarding toothpaste use and toothbrushing.

This questionnaire has potential applications in both the research setting and clinical practice, especially in the local context of the Malaysian population. Other researchers are able to use this questionnaire to assess the knowledge, attitude and behaviour of their population of interest regarding toothpaste use and toothbrushing. In clinical practice, incorporating this questionnaire with the clinical oral examination could be beneficial in probing an association of dental caries with respondents' self-oral hygiene care. More crucially, by gaining information through the use of this questionnaire as a tool, the gaps in people's knowledge, attitude and behaviour regarding their toothpaste use and toothbrushing can be identified as an important factor.

As dental caries is a global public health issue for schoolchildren, this questionnaire will be greatly beneficial for dental public health to support the planning for effective oral health promotion and education in preventing and controlling dental caries. Few dental public health programs focus on toothpaste use and toothbrushing for schoolchildren in Malaysia at the district, state and national levels. This questionnaire will be beneficial as a tool in assessing the impact of those programs.

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Ethics statement: This study was registered with the National Medical Research Register (Reference No: NMRR ID-23-00691-SJ2). Ethical approval to conduct this study was obtained from the Human Research Ethics Committee of Universiti Sains Malaysia (Reference No.: USM/JEPeM/KK/23010090). This study also obtained permission from the Ministry of Education Malaysia (Reference No.: KPM.600-3/2/3-eras (15066)). Written parental consent and participant assent were secured prior to the participation of 12-year-old children in the pre-test and pilot tests of this study. The researchers adhered to the principles of the Declaration of Helsinki and the Malaysian Good Clinical Practice guidelines throughout the study.

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