

ORIGINAL ARTICLE

DEVELOPMENT AND CONTENT VALIDATION OF THE AMOHS-Q: ASSESSMENT TOOL FOR ORAL HEALTHCARE UTILISATION AMONG ANTENATAL MOTHERS

Suhaila Mat Said^{1,2}, Mohd Zulkarnain Sinor^{1*}, Basaruddin Ahmad¹ and Noorneza Abdul Rahman³

¹Department of Dental Public Health, School of Dental Sciences, Universiti Sains Malaysia, Kubang Kerian, Malaysia

²Pejabat Kesihatan Pergigian Daerah Pontian Johor, Malaysia

³MSU Medical Centre, Shah Alam, Selangor, Malaysia

Corresponding author: Mohd Zulkarnain Sinor

Email: zulkarnainsinor@usm.my

ABSTRACT

Utilisation of oral health care services is still low in Malaysia. A reliable and validated tool is required to assess the factors influencing this low utilisation. This study aimed to develop and validate the content of the Antenatal Mothers' Oral Healthcare Services Questionnaire (AMOHS-Q). A mixed-methods design was employed. Qualitative data were obtained through seven focus group discussions (FGDs) with antenatal mothers in Selangor, Malaysia. Themes derived from the FGDs, and existing literature informed the development of questionnaire items, guided by AMEE Guide No. 87. Experts assessed the instrument's relevance and comprehensibility using a four-point Likert scale. Microsoft Excel was used to compute the Content Validity Index (CVI) and Content Validity Ratio (CVR). Following content validation, 66 items across 10 domains were retained from the initial 71, with I-CVI and CVR values ranging from 0.75 to 1.00. The content validation process indicated that the AMOHS-Q was valid for identifying factors that may influence the low utilisation of antenatal mothers in oral health care. Most items were considered relevant, clear, simple, and necessary.

Keywords: Utilisation, Antenatal mothers, Oral Healthcare, Questionnaire, Content Validity.

INTRODUCTION

Antenatal mothers play an important role as agents of change by disseminating knowledge and encouraging positive attitudes towards oral health within their families. Through this influence, they indirectly serve as agents of change, shaping household health behaviours and norms. Antenatal mothers with good oral health have the potential to improve their overall health status, reduce complications related to dental diseases during pregnancy, and lower the risk of early childhood caries.

Kazeminia et al. (2020)¹ reported a high incidence of dental caries in both primary and permanent teeth among children across different continents. Maternal dental problems during pregnancy may have significant adverse effects on foetal health, underscoring the importance of maintaining optimal oral health throughout the antenatal period. Periodontal inflammation during pregnancy has been linked to adverse outcomes such as pre-eclampsia, gestational diabetes, and low-birth-weight deliveries^{2,3}. Deferred dental care may also negatively affect postpartum oral health-related quality of life⁴.

In recognition of the importance of maternal oral health, the Ministry of Health Malaysia has been implementing the Antenatal Oral Healthcare Programme since the 1970s⁵. Efforts have increasingly focused on strengthening quality assurance, particularly through the expansion of

oral screening coverage among antenatal mothers. Complementary strategies include enhancing service utilisation through opportunistic screenings at Health and Maternal Clinics, implementing community-based outreach activities, and providing free and accessible care within public facilities. In addition, structured pathways for immediate registration and treatment during the initial visit, supported by timely follow-up appointments, have been established to ensure continuity of care and the maintenance of optimal oral health throughout pregnancy.

Despite these initiatives, the attendance and utilisation of dental services among antenatal mothers remain low, both locally and internationally. In developed countries, reported attendance rates range from 23% to 35% in the United States, 33% to 64% in the United Kingdom, approximately 30% in Australia, and 27% in Greece. A systematic review conducted in 2018 which summarised findings from eleven studies, similarly, reported utilisation rates between 16.7% and 37.0%⁶. In Malaysia, a study conducted in 2010 at a teaching hospital in Kelantan documented an attendance rate of only 29% among antenatal mothers⁷.

Despite these initiatives, the attendance and utilisation of dental services among antenatal mothers remain low, both locally and internationally. In developed countries, reported attendance rates range from 23-35% in the United States, 33-64% in the United Kingdom,

approximately 30% in Australia, and 27% in Greece. A systematic review conducted in 2018, which summarized findings from eleven studies, similarly reported utilization rates between 16.7% and 37.0⁶. In Malaysia, a study conducted in 2010 at a teaching hospital in Kelantan documented an attendance rate of only 29% among antenatal mothers⁷.

The 2021 Annual Report on Oral Health confirmed that only 43.4% of Malaysian antenatal mothers obtained any professional oral-health service in 2021, with coverage dipping below 35% in populous states such as Selangor, Terengganu and Johor⁸. More recent monitoring paints a similarly troubling picture: a verification audit in Johor Bahru showed that screening coverage among antenatal mothers declined from 50.2% in early 2022 to 46.7% by year-end⁹.

There is a pressing need for a valid and reliable instrument to assess factors influencing oral healthcare utilisation among antenatal mothers. The previous questionnaire has been used to assess barriers to oral healthcare utilisation among antenatal mothers in Malaysia⁷. However, its domains may no longer fully capture contemporary issues and emerging factors influencing service utilisation. Therefore, this study aimed to develop and validate the content of the Antenatal Mothers' Oral Healthcare Services Questionnaire (AMOHS-Q).

METHODS

The development of the self-administered Malay version of the Antenatal Mothers' Oral Healthcare Services Questionnaire (AMOHS-Q) was guided by a seven-step framework proposed by Artino et al. (2014)¹⁰. The first four steps focus on item development, and the next 3 steps focus on the validation process, cognitive interview and pilot testing. For this study, the process was structured into two phases.

Phase 1: Items Development

First, a comprehensive literature review was performed to identify key constructs, theoretical definitions, and existing instruments measuring the utilisation of oral healthcare services among antenatal mothers. The review also examined existing questionnaires to understand item structure, number of items per domain, response scales, validation methods, and analysis approaches. This process provided an empirical and conceptual foundation for drafting preliminary open-ended questions and initial questionnaire constructs.

Second, a qualitative study with seven focus group discussions (FGDs) was conducted to explore antenatal mothers' experiences and perceptions of oral healthcare utilisation. Eligible participants were Malaysian citizens aged 18 years and above who were able to communicate in Malay.

Individuals with significant medical conditions or without mobile phone access were excluded. Purposive sampling recruited participants from selected housing areas and Maternal and Child Health Clinics in Petaling and Kuala Selangor. Of the 35 antenatal mothers recruited, 28 participated in the study. FGDs were conducted in private rooms to encourage engagement and were moderated by a trained facilitator using a semi-structured interview guide. Sessions lasted 46 to 70 minutes. Data collection ceased once thematic saturation was reached, which occurred when no new factors emerged during the sixth and seventh sessions^{11,12}. All discussions were transcribed verbatim with the assistance of AURIS AI¹³, and subsequently reviewed by the researchers for accuracy.

Third, a literature search was conducted using ScienceDirect and Google Scholar, applying keywords such as 'oral healthcare utilisation,' antenatal mothers,' and 'questionnaire development.' The domains and sub-domains identified from both the literature review and qualitative findings were then synthesised and categorised based on conceptual similarities. Finally, draft items were developed in simple Malay to accommodate varying literacy levels among participants.

Phase 2: Content Validation

Setting

This cross-sectional study was conducted from December 2024 to January 2025. The content validation process was conducted quantitatively, focusing on the analysis of responses through the item content validity index (I-CVI) and content validity ratio (CVR) of each item in the questionnaire. This allowed researchers to assess how well the items represented the intended constructs and whether any modifications were necessary.

Participants

A total of eight dental public health specialists seven from the Ministry of Health (MOH) and one from the Ministry of Higher Education (MOHE), Malaysia were invited to participate in the content validation process. They were selected for their recognised expertise in oral healthcare and extensive experience in maternal health.

Variables

To ensure the quality and representativeness of the scale items, both the Content Validity Index (CVI) and Content Validity Ratio (CVR) were employed¹⁴. The CVI was utilised to assess the relevance of each item to the intended construct, as well as to evaluate the clarity and simplicity of the items. This was done using a four-point Likert scale, where 1 indicated 'poor', 2 indicated 'fair', 3 indicated 'good', and 4 indicated 'very good'. Meanwhile, the CVR, based on the approach

proposed by Lawshe (1975),¹⁵ was applied to determine the necessity of each item. A three-point Likert scale was used for this purpose: 1 denoted 'not necessary', 2 'useful but not necessary', and 3 'essential'. This method facilitated decisions regarding the inclusion or exclusion of individual items to enhance the overall quality and construct validity of the instrument.

In addition, expert panels were provided with free text comment sections to allow for detailed qualitative feedback on each item and domain, as recommended by Polit, Beck, and Owen (2007)¹⁶. These sections invited suggestions on individual items, the number of items within each domain, the overall layout of the instrument, the appropriateness of response scales, and general observations. This qualitative input could lead to substantive refinement of both the items and the overall domain.

Validation Process

The content validation process involved the distribution of validation forms and accompanying documentation via email to ensure that all expert panel members had the necessary materials to evaluate the questionnaire. Two weeks after the initial distribution, follow-up reminders were conducted through phone calls and WhatsApp messages to encourage timely responses.

Data Analysis

The responses from the experts were analysed using I-CVI and CVR. The analysis expert ratings of 1 and 2 were recoded as invalid (0), whereas ratings of 3 and 4 were recoded as valid (1). The data were analysed using Microsoft Excel, focusing on the computation of multiple content validity indices. These included the I-CVI, the Scale-Level Content Validity Index using the Universal Agreement method (S-CVI/UA), and the Scale-Level Content Validity Index using the Averaging method (S-CVI/Ave). Each index was computed separately for the dimensions of relevance, clarity, simplicity, and overall item quality.

The S-CVI/UA was calculated by identifying the number of items that achieved unanimous agreement among all experts and dividing this by the total number of items within the respective domain¹⁷. In contrast, the S-CVI/Ave was

obtained by averaging the I-CVI values across all items, representing the mean proportion of agreement among expert raters. According to Lawshe's table, as referenced by Madadzadeh and Bahariniya (2023)¹⁸ and established guidelines, a minimum CVI score of 0.83 was applied for item retention, particularly when the number of experts was eight or more. This benchmark ensured that only items with high levels of consensus were retained for further evaluation.

The degree of necessity for each item was assessed using a three-point Likert scale, following the approach established by Lawshe (1975)¹⁵. For the purpose of CVR calculation, expert ratings of 1 and 2 were recoded as not essential (0), while ratings of 3 were recoded as essential (1). CVR values were then computed for each item using Lawshe's formula, and the average CVR across all items was calculated to determine the overall content validity of the questionnaire. According to Lawshe's (1975)¹⁵ critical value table, the minimum acceptable CVR for a panel of eight experts is 0.75. In this study, the expert panel comprised eight members and items with CVR scores below this threshold were flagged for removal or revision.

Finally, items that scored below the established minimum score were subjected to review and discussion by three members of the research team to determine whether they should be revised or removed.

Ethical Consideration

This study was registered with the National Medical Research Registration (NMRR) and approved by the Medical Research and Ethics Committee (MREC) (NMRR ID-24-01748-DON [IIR] and the Human Research Ethics Committee of Universiti Sains Malaysia (USM/JEPeM/KK/23110852).

RESULTS

Table 1 summarises the analysis of the literature review and qualitative findings, outlining the identified domains and sub-domains influencing oral healthcare utilisation among antenatal mothers

Table 1: Summarises the domains and sub-domains

No	Domains	Sub-Domains
1.	Underlying medical condition	Systemic diseases Pregnancy Induced Condition
2.	Perception Towards Oral Health during Pregnancy	Attitude
3.	Perception Towards Dental Treatment	Myths about dental treatment
4.	Oral Health Knowledge/ Literacy	Awareness Information
5.	Quality of Oral Health Services	Communication Waiting time Referral system Appointment system Treatment provided
6.	Infrastructure	Facility provision Distance
7.	Financial	Cost-related concerns Medical reimbursement
8.	Work commitment	Work responsibility Work procedure
9.	Social support	Caregiving responsibility Family support
10.	Psychological	Fear Trauma

The AMOHS-Q Version 1.0 initially comprised 71 items across 10 domains. Following content validation, the instrument was refined to 66 items across the same domains, as detailed in Table 2a and 2b. Several items were revised to improve clarity,

relevance, simplicity, and necessity, including refinements in phrasing and restructuring of questionnaire sections to enhance comprehension and usability. Following these revisions, the instrument was designated AMOHS-Q Version 2.0.

Table 2a: Summary of domains and number of items in the AMOHS-Q Version 2.0 after content validation

Section	Domains	Number of items	Scale response
1	*Sociodemographic/ Obstetric profile	-	-
2	Underlying Medical Illness/ Morning Sickness during Pregnancy	6	Yes/No/Not applicable
3	Perception Towards Oral Health during Pregnancy	9	Strongly disagree to strongly agree
4	Perception Towards Dental Treatment	5	Strongly disagree to strongly agree
5	Knowledge Towards Oral Health	13	True/False/Don't Know
6	Quality of Oral Health Services	8	Strongly disagree to strongly agree

*Section 1 was excluded from the content validation process.

Table 2b: Summary of domains and number of items in the AMOHS-Q Version 2.0 after content validation

Section	Domains	Number of items	Scale response
7	Infrastructure of the Dental Clinic	6	Strongly disagree to strongly agree
8	Financial Issues	5	Yes/No/Not applicable
9	Work Commitment	3	Strongly disagree to strongly agree
10	Social Support and Access to Dental Care	4	Strongly disagree to strongly agree
11	Psychological	7	Not afraid to be extremely afraid
Total		66	

**Section 1 was excluded from the content validation process*

Table 3a-3f presents the findings of the content validation process, which employed the I-CVI and CVR to evaluate items across all domains. Overall,

I-CVI and CVR values ranged from 0.75 to 1.00, and Scale-CVI/Average (S-CVI/Ave) values ranged from 0.86 to 1.00.

Table 3a: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

No item	Item Content	Scores				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 2: Underlying medical illness/ Morning sickness						
1a	I have experienced the following medical conditions during pregnancy:					
	i.Diabetes Mellitus	1.0	1.0	1.0	1.0	1.0
	ii.Hypertension	1.0	1.0	1.0	1.0	1.0
	iii.Obesity	1.0	0.88	0.88	0.92	1.0
	iv.Asthma	1.0	0.88	0.88	0.92	1.0
	v.Anemia	1.0	0.88	0.88	0.92	1.0
	vi.Others:Please specify: _____	1.0	1.0	1.0	1.0	1.0
1b	These conditions hindered me from seeking dental care.	1.0	0.88	0.88	0.92	1.0
1c	Medical appointments during pregnancy make me less interested in seeking dental check-ups or treatment.	1.0	0.88	0.88	0.92	1.0
2a	I experienced the following during pregnancy:					
	i.Nausea or vomiting	1.0	1.0	1.0	1.0	1.0
	ii.Emotional Instability	1.0	1.0	1.0	1.0	1.0
	iii.Smell sensitivity	1.0	1.0	1.0	1.0	1.0
	iv.Frequent urination	1.0	1.0	1.0	1.0	1.0
	v.Others: Please specify: _____	1.0	1.0	1.0	1.0	1.0
2b	These conditions hindered me from seeking dental care.	1.0	1.0	1.0	1.0	1.0
3	Emotional stress during pregnancy affected my decision to receive dental treatment.	1.0	0.88	0.88	0.92	0.88
S-CVI/Average		1.0	0.95	0.95	0.97	0.99

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

** The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements*

Table 3b: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

Table 3B: Relevancy, clarity, simplicity, CVI, and CVR scores of AMONS-Q items						
No. Items	Item Contents	Score				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 3: Perception Towards Oral Health During Pregnancy						
1	I feel my oral health is currently good.	1.0	1.0	1.0	1.0	1.0
2	Dental problems make it difficult for me to eat.	1.0	1.0	1.0	1.0	1.0
3	I think I should get a dental check-up at least once a year.	1.0	0.88	1.0	0.96	1.0
4	I think it is important to get a dental check-up during pregnancy.	1.0	1.0	1.0	1.0	1.0
5	I believe I should see a dentist only when I have dental problems.	1.0	1.0	1.0	1.0	1.0
6	I feel embarrassed about the condition of my teeth/mouth, which prevents me from seeing a dentist.	1.0	1.0	1.0	1.0	1.0
7	I believe seeing a dentist is important to have healthy and beautiful teeth.	0.88	1.0	1.0	0.96	1.0
8	I find it difficult to schedule dental appointments during pregnancy.	1.0	1.0	1.0	1.0	1.0
9	I think it is better to delay dental check-ups until after childbirth to avoid risks.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		0.99	0.97	1.0	0.99	1.0
Section 4: Knowledge/Literacy Towards Oral Health						
1	The risk of dental caries is high among pregnant women.	1.0	1.0	1.0	1.0	1.0
2	The risk of gum disease is high among pregnant women.	1.0	1.0	1.0	1.0	1.0
3	Dental plague can cause gum disease.	1.0	0.88	1.0	0.96	1.0
4	Frequent intake of sweet food during pregnancy can cause tooth decay.	1.0	1.0	1.0	1.0	1.0
5	Hormonal changes during pregnancy increase the risk of gum disease.	1.0	1.0	1.0	1.0	1.0
6	Vomiting due to morning sickness has no effect on dental health.	1.0	0.88	1.0	0.96	1.0
7	Brushing at least twice a day is important for good dental health.	1.0	1.0	1.0	1.0	1.0
8	Dental floss should be used to clean between teeth.	1.0	1.0	1.0	1.0	1.0
9	Fluoride toothpaste helps prevent dental caries.	1.0	1.0	1.0	1.0	1.0

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

* The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements.

Table 3c: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

No items	Item Contents	Score				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 4: Knowledge/Literacy Towards Oral Health						
10	Pregnant women only need dental treatment in emergencies.	1.0	1.0	1.0	1.0	1.0
11	Gum disease in pregnant women is linked to premature birth and low birth weight.	1.0	0.88	1.0	0.96	1.0
12	The antenatal health record book contains a section for dental check-up records.	1.0	0.88	1.0	0.96	0.88
13	Dental treatment is free for pregnant women at government clinics.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		1.0	0.96	1.0	0.99	0.99
Section 5: Attitude Towards Oral Health Concept						
1	I believe all painful teeth should be extracted.	1.0	1.0	1.0	1.0	1.0
2	I believe dental extractions or treatments are safe during pregnancy.	1.0	0.88	1.0	0.96	1.0
3	I believe that dental treatment should be postponed until after childbirth because it poses a risk to the unborn baby.	0.88	0.75	0.88	0.84	0.88
4	I believe that dental treatment can cause miscarriage.	0.88	0.75	0.88	0.84	0.88
5	I believe tooth extraction can cause vision problems like blurred vision.	0.88	0.75	0.88	0.84	0.88
6	I believe pregnancy can lead to tooth loss.	1.0	1.0	1.0	1.0	1.0
7	I believe that dental check-ups during pregnancy are not important.	1.0	1.0	1.0	1.0	1.0
8	I believe dental anaesthesia is safe to use during pregnancy	1.0	0.75	1.0	0.92	1.0
S-CVI/Average		0.95	0.86	0.95	0.93	0.95

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

** The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements.*

Table 3d: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

No Item	Item Contents	Score				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 6: Quality of Oral Health Services						
1	I received good service from the dentist.	1.0	1.0	1.0	1.0	1.0
2	I received good service from other dental clinic staff.	1.0	0.88	1.0	0.93	0.88
3	The dentist explained my oral health status clearly.	1.0	1.0	1.0	1.0	1.0
4	I was given priority through a special lane (Fastlane) during the registration process.	0.88	1.0	1.0	0.93	0.88
5	I was satisfied with the immediate treatment.	1.0	1.0	1.0	1.0	1.0
6	Not being given specific appointment times made it difficult for me to attend.	1.0	0.88	1.0	0.93	1.0
7	The waiting time to receive dental treatment is quite long.	1.0	0.88	1.0	0.93	1.0
8	The doctor/nurse from the Health Clinic/Maternal and Child Health Clinic referred me to the dental clinic.	1.0	0.88	1.0	0.93	0.88
9	Overall, I was satisfied with dental services during pregnancy.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		0.99	0.94	1.0	0.96	0.96
Section 7: Infrastructure of Dental Clinic						
1	Signage and directions made it easy to find the dental clinic.	1.0	0.88	1.0	0.96	1.0
2	Dental clinics located on upper floors made access difficult.	1.0	0.88	1.0	0.96	0.88
3	I felt comfortable with available facilities (e.g. parking, waiting area, clean toilets).	1.0	1.0	1.0	1.0	1.0
4	I was more likely to attend dental visits due to a comfortable and attractive environment.	1.0	1.0	1.0	1.0	1.0
5	The distance to clinic made it difficult to receive dental care during pregnancy.	1.0	0.88	1.0	0.96	1.0
6	I had transportation issues when attending the dental clinic.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		1.0	0.93	1.0	0.98	0.98

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

* The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements

Table 3e: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

No	Item Contents	Scores				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 8: Financial Issues						
1	High transportation costs prevented me from attending dental clinic.	1.0	0.88	0.88	0.92	1.0
2	I used personal health insurance for dental expenses.	1.0	0.88	1.0	0.96	1.0
3	Dental claims from employer made it easier to seek treatment.	1.0	0.88	1.0	0.96	0.88
4	Dental treatment at private clinics is affordable.	1.0	0.88	1.0	0.96	0.88
5	I prefer government clinics over private due to cost factors.	1.0	0.88	0.88	0.92	0.88
S-CVI/Average		1.0	0.88	0.94	0.94	0.93
Section 9: Work Commitment						
1	My family helps me get dental check-ups/treatment.	1.0	1.0	1.0	1.0	1.0
2	Difficulty in getting employer's leave made it hard to visit the clinic.	1.0	0.88	0.88	0.91	0.88
3	My working hours did not match the operating hours of government dental clinics.	0.88	0.75	0.88	0.81	0.75
S-CVI/Average		0.96	0.83	0.88	0.88	0.83
Section 10: Social Support and Access to Dental Care						
1	My family helps me get dental check-ups/treatment.	1.0	1.0	1.0	1.0	1.0
2	My family encourages me to get dental treatment during pregnancy.	1.0	1.0	1.0	1.0	1.0
3	Family issues hinder my dental visits.	1.0	1.0	1.0	1.0	1.0
4	Housework and responsibilities prevent me from going to the dentist.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		1.0	1.0	1.0	1.0	1.0

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

* The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements

Table 3f: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items

Table 31: Relevancy, clarity, simplicity, CVI, and CVR scores of AMONIS-Q items						
No	Item Contents	Scores				
		Relevancy	Clarity	Simplicity	I-CVI	CVR
Section 11: Psychological						
1	I am afraid to visit the dentist during pregnancy.	1.0	1.0	1.0	1.0	1.0
2	I feel anxious when seeing a needle.	1.0	1.0	1.0	1.0	1.0
3	I feel anxious seeing dental drill equipment.	1.0	0.88	1.0	0.96	1.0
4	I fear the sound of dental equipment.	1.0	0.88	1.0	0.96	1.0
5	I am afraid of receiving dental treatment.	0.88	1.0	1.0	0.96	1.0
6	I am worried that dental treatment may harm my unborn baby.	1.0	1.0	1.0	1.0	1.0
7	I am afraid of pain during dental treatment.	1.0	1.0	1.0	1.0	1.0
8	I fear dental treatment due to past trauma.	1.0	1.0	1.0	1.0	1.0
S-CVI/Average		0.98	0.97	1.0	0.99	1.0

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

* The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements

Table 4a and 4b summarises the content validation findings for items removed from the AMOHS-Q. Five items were eliminated due to low clarity scores, redundancy with items in other sections, or terminology issues. Despite some items achieving high CVI and CVR values,

redundancy and linguistic clarity were the main reasons for their exclusion.

Table 4a: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items removed during content validation

No	Item Contents	Scores					Reason for removal
		Relevancy	Clarity	Simplicity	I-CVI	CVR	
S5(Q3)	I believe that dental treatment should be postponed until after childbirth because it poses a risk to the unborn baby.	0.88	0.75	0.88	0.84	0.88	Did not meet the requirement I-CVI (Clarity)
S5(Q4)	I believe that dental treatment can cause miscarriage.	0.88	0.75	0.88	0.84	0.88	Redundant in section 3

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

* The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements

Table 4b: Relevancy, clarity, simplicity, CVI, and CVR scores of AMOHS-Q items removed during content validation

No	Item Contents	Scores					Reason for removal
		Relevancy	Clarity	Simplicity	I-CVI	CVR	
S5(Q7)	I believe that dental check-ups during pregnancy are not important.	1.0	1.0	1.0	1.0	1.0	Redundant in section 3
S6(Q4)	I was given priority through a special lane (Fastlane) during the registration process.	0.88	1.0	1.0	0.93	0.88	It was removed after team discussion due to confusion over the term "Fastlane."
S11(Q6)	I am worried that dental treatment may harm my unborn baby.	1.0	1.0	1.0	1.0	1.0	Redundant in section 3

I-CVI: Item-Content Validity Index, CVR: Content Validity Ratio

** The English version has not been validated and is provided solely to facilitate understanding of the original Malay item statements*

DISCUSSION

This study developed and content-validated the AMOHS-Q, capturing both established and new factors, including medical illness and medical reimbursement, which influence oral healthcare utilisation among antenatal mothers. Those with gestational diabetes mellitus (GDM), diabetes, or hypertension often prioritise medical follow-ups over dental care. Frequent clinic visits and procedures led to appointment fatigue, resulting in the deprioritisation of oral health. The National Health and Morbidity Survey (NHMS) 2022 reported a sharp rise in GDM prevalence among Malaysian mothers, from 13.5% in 2016 to 27.1% in 2022, reflecting the growing burden of non-communicable diseases (NCDs) ¹⁹. These conditions create competing demands that reduce uptake of preventive dental services, underscoring the need to integrate oral health into antenatal care.

Medical reimbursement also emerged as a barrier unique to the Malaysian context. Unlike health insurance, it refers to company provided benefits for employees and dependents. FGDs revealed that when reimbursement schemes excluded dental services or required complex claims, antenatal mothers were less motivated to seek care, especially when out-of-pocket costs were high. This shows how employment-linked healthcare financing directly shapes service utilisation and access to oral healthcare. Expanding reimbursement coverage to include dental services, together with embedding routine

dental referrals into antenatal visits, could help overcome financial barriers and improve utilisation during pregnancy.

The AMOHS-Q was designed to comprehensively assess the factors influencing oral healthcare utilisation among antenatal mothers. The initial version (Version 1.0) comprised 71 items across 10 domains. Following the content validity assessment, five items were removed, and the structure and domain labels were refined through expert consultation and research team consensus. These revisions enhanced the instrument's construct clarity and content appropriateness, ensuring that it more accurately captures the multifaceted factors affecting oral healthcare utilisation during pregnancy. By improving alignment between item content and intended constructs, these modifications strengthen the tool's validity and readiness for face validation and pilot testing ²⁰.

A panel of content experts, consisting of specialists in Dental Public Health and District Dental Officers, was assembled to evaluate the questionnaire. Each expert possessed substantial professional experience and domain-specific knowledge in the delivery and management of oral healthcare services for antenatal mothers. This ensured that the assessment of each item was both informed and contextually relevant to the Malaysian healthcare setting ²¹. While this expert composition provided strong oral health-related perspectives, the inclusion of a more multidisciplinary panel such as midwives and

antenatal nurses might have offered additional insights into maternal care, psychosocial support, and behavioural influences.

The validation process focused on four core criteria: relevance, clarity, simplicity, and necessity of each item, in line with established framework^{15,18}. These criteria ensured that each item aligned with the intended constructs and was both comprehensible and appropriate for the target population in Malaysia. This approach is consistent with methods applied in other instrument-development studies, such as those evaluating infection control among dental assistants²², which also emphasise these criteria as benchmarks for establishing robust content validity.

In this study, both the Content Validity Index (CVI) and the Content Validity Ratio (CVR) were assessed. The use of multiple validation indices strengthens the overall quality of the instrument by evaluating different aspects of item adequacy, namely relevance, clarity, simplicity, and necessity¹⁴. Furthermore, CVI and CVR are considered sufficient measures for assessing content validity¹⁸. However, some researchers have recommended supplementing CVI with the kappa statistic to account for the possibility of chance agreement among raters²¹.

Feedback and comments from the expert panel served as a valuable supplement to the content validity indices, reinforcing the overall validation process¹⁷. In response to this expert input, several items were revised to improve their clarity, precision, and interpretability. Additionally, a number of items were removed based on their I-CVI and CVR scores, as well as expert recommendations, to ensure that only the most relevant, conceptually sound, and clearly articulated items were retained in the final version of the instrument. This validation process led to the refinement of multiple questionnaire items, including the rewording of statements for greater clarity, the consolidation of overlapping content, and the elimination of items with insufficient validity scores²³. Such a systematic and iterative approach ensured that the AMOHS-Q questionnaire achieved strong content validity and accurately captured the multidimensional and culturally appropriate factors influencing oral healthcare utilisation among antenatal mothers.

This study has several limitations. First, the use of convenience sampling in the qualitative phase involving only two of the nine districts in Selangor limits the generalisability of the findings, despite efforts to include diverse participants. Future studies should employ probability sampling and cover all districts to enhance the representativeness of findings. Second, the English version of the AMOHS-Q has not been validated. Although the instrument was developed and validated in Malay, its use in other cultural or linguistic contexts would require a

formal cross-cultural adaptation and linguistic validation process, including forward-backward translation, cognitive debriefing, and pilot testing.

CONCLUSION

The newly developed questionnaire was found to be effective in identifying the factors influencing oral healthcare utilisation among antenatal mothers. The high average scores for both the Content Validity Index (CVI) and Content Validity Ratio (CVR) reflect a strong consensus among the expert panel regarding the relevance, simplicity, and necessity of the items included in the AMOHS-Q. However, this validation pertained solely to content validity. Therefore, the next critical steps involve conducting a face validity assessment and pilot testing to further evaluate the questionnaire's reliability and construct validity. These steps are necessary to establish comprehensive psychometric validation before the instrument can be applied in practice.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to the Director General of Health Malaysia for granting permission to publish this article.

Funding Information

This study did not receive any financial support.

Conflict Of Interest

The authors have no conflicts of interest to declare

REFERENCES

1. Kazeminia M, Abdi A, Shohaimi S, et al. Dental caries in primary and permanent teeth in children's worldwide, 1995 to 2019: A systematic review and meta-analysis. *Head Face Med*. 2020;16(1):1-21.
2. Xiong X, Buekens P, Fraser WD, Beck J, Offenbacher S. Periodontal disease and adverse pregnancy outcomes: a systematic review. *BJOG*. 2006;113(2):135-43.
3. Machado V, Ferreira M, Lopes L, Mendes JJ, Botelho J. Adverse pregnancy outcomes and maternal periodontal disease: an overview on meta-analytic and methodological quality. *J Clin Med*. 2023;12(11):3635.
4. Fakheran O, Keyvanara M, Saied-Moallemi Z, Khademi A. The impact of pregnancy on women's oral health-related quality of life: a qualitative investigation. *BMC Oral Health*. 2020;20(1):1-11.

5. Oral Health Division. *Garis Panduan Perkhidmatan Kesihatan Pergigian Ibu Mengandung 2023*. Putrajaya: Oral Health Program, MOH; 2023:1-35. Available from: https://hq.moh.gov.my/ohp/images/pdf/3.-klinikal/garis-panduan/gp_im_2023.pdf (accessed 5 May 2025).
6. Rocha JS, Arima L, Chibinski AC, Werneck RI, Moysés SJ, Baldani MH. Barriers and facilitators to dental care during pregnancy: a systematic review and metasynthesis of qualitative studies. *Cad Saude Publica*. 2018;34(8):e00060117.
7. Saddki N, Yusoff A, Hwang YL. Factors associated with dental visit and barriers to utilisation of oral health care services in a sample of antenatal mothers in Hospital Universiti Sains Malaysia. *BMC Public Health*. 2010; 10:75.
8. Oral Health Programme, Ministry of Health Malaysia. *Annual Report 2021* [Internet]. 2022. Available from <https://hq.moh.gov.my/ohp/ms/penerbitan-1/penerbitan-utama> (accessed 5 May 2025).
9. Nik Nurul N, Muhammad Rasydan R, Nur Fatin M, Aimi Liyana A. Increasing the Coverage Rate of Oral Screening among Antenatal Patients in Johor Bahru District [abstract]. In: National Quality Assurance (QA) Convention 2024; 2024 Oct 8-10; Negeri Sembilan, Malaysia. Available from https://qaconvention.nih.gov.my/download/2024_Poster/PP-06.pdf. (accessed 5 May 2025).
10. Artino AR, La Rochelle JS, Dezee KJ, Gehlbach H. Developing questionnaires for educational research: AMEE guide no. 87. *Med Teach*. 2014;36(6):463-74.
11. Wong LP. Focus group discussion: a tool for health and medical research. *Singapore Med J*. 2008;49(3):256-61.
12. Stalmeijer RE, McNaughton N, Van Mook WNKA. Using focus groups in medical education research: AMEE guide no. 91. *Med Teach*. 2014;36(11):923-39.
13. Rosenberg J. Automated transcription of Interviews in qualitative research using artificial intelligence a simple guide. *Journal of Surgery Research and Practice*. 2024; 24:1-6.
14. Yaghmaie F. Content validity and its estimation. *Journal of Medical Education*. 2003;3(1):25-27.
15. Lawshe CH. A quantitative approach to content validity. *Pers Psychol*. 1975;28(4):563-75.
16. Polit DF, Beck CT. The content validity index: are you sure you know what's being reported? Critique and recommendations. *Res Nurs Health*. 2006;29(5):489-97.
17. Polit DF, Beck CT, Owen S V. Focus on research methods: is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health*. 2007;30(4):459-67.
18. Madadzadeh F, Bahariniya S. Tutorial on how to calculate content validity of scales in medical research. *Perioper Care and Oper Room Manag*. 2023;31:100315.
19. Ministry of Health Malaysia. National Health Morbidity Survey 2022: Maternal and Child Health [Internet]. Putrajaya: Ministry of Health Malaysia; 2023. Available from: https://iku.gov.my/images/nhms-2022/4a.-infographic_nhms-mch_english_19.05.2023.pdf?t=1684481335 (accessed 31 May 2025).
20. Boateng GO, Neilands TB, Frongillo EA, Melgar-Quiñonez HR, Young SL. Best practices for developing and validating scales for health, social, and behavioral research: a primer. *Front Public Health*. 2018; 6:1-18.
21. Ahmad Najmee NA, Mohammed Z, Hassan R, Mohamad Fadzil N, Abd Rahman MH, Mohd Arif NN. The development and content validation of a needs assessment questionnaire for visual attributes profiling in students with visual impairment. *IJUM Med J Malaysia*. 2025;24(1):120-7.
22. Zahir Y, Mohd Adnan M, Abd Rahman N, Majdi Yaacob N. The content and face validity evaluation of an infection control knowledge, attitude and practice questionnaire among dental assistants. *Malays J Public Health Med*. 2024. 2024;24(3):81-103.

23. Zamanzadeh V, Ghahramanian A, Rassouli M, Abbaszadeh A, Alavi-Majd H, Nikanfar AR. Design and implementation content validity study: development of an instrument for measuring patient-centered communication. *J Caring Sci.* 2015;4(2):165-78.