

Development and Validation of Menstrual Disorder of Adolescent (MenDA) Questionnaire in the Malay Language

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ABSTRACT

INTRODUCTION: Menstrual disorders negatively affect adolescents' quality of life, with physical discomfort and emotional distress often contributing to anxiety. To address this, the present study aimed to develop and validate the Menstrual Disorder of Adolescent (MenDA) questionnaire for assessing adolescents' knowledge, attitudes, and practices (KAP) regarding menstrual disorders. **MATERIALS AND METHODS:** The questionnaire was systematically developed through literature review, focus group discussions, and expert consultation. Six experts assessed content validity, while face validity was tested among 46 adolescents. A cross-sectional validation study was conducted with 485 adolescents. The MenDA tool comprised three domains: knowledge (23 items), attitude (18 items), and practice (21 items). Construct validity was evaluated using exploratory factor analysis with principal component extraction and varimax rotation. Internal consistency was determined using Cronbach's alpha coefficient. **RESULTS:** The finalized MenDA questionnaire contained 62 items, structured into three domains. The knowledge domain included 23 items and demonstrated good reliability with Cronbach's alpha of 0.739. The attitude domain, comprising 18 items, showed a Cronbach's alpha of 0.711, while the practice domain, with 21 items, achieved a Cronbach's alpha of 0.793. These results confirmed satisfactory internal consistency across all domains. Factor analysis further supported construct validity, reinforcing the appropriateness of the three-domain structure in evaluating adolescents' menstrual health KAP. **CONCLUSION:** The MenDA questionnaire has demonstrated strong validity and reliability as a tool to assess knowledge, attitudes, and practices regarding menstrual disorders among Malaysian adolescents. It provides an evidence-based framework for identifying gaps and guiding interventions to improve menstrual health education and management.

Keywords

Adolescent, Menstrual disorders, Knowledge, Attitude, Practice, Validated questionnaire, Malay language

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INTRODUCTION

Menstruation is a critical milestone in female adolescence, marking reproductive maturity while also introducing potential health challenges such as menstrual disorders. The onset of menstruation or menarche represents a hallmark event in the pubertal development of the adolescent girl. It signifies the maturation of reproductive potential and physiological growth. In 95% of girls, it generally occurs approximately 2 to 3 years after the initiation of puberty, between the ages of 11 and 14 years, depending on race, ethnicity, socioeconomic status, and nutritional status.¹ A normal menstrual cycle depends on a coordinated interaction between the hypothalamus,

pituitary, ovary, and uterus. When all these organs function well, the reproductive cycle's major events will occur in their normal sequence.²

However, individuals with interrupted menstrual cycles suffer from various menstrual disturbances, such as abnormal uterine bleeding, dysmenorrhoea, and irregular cycles. A previous study showed that menstrual disorders are the most common presenting complaints in physician office visits by adolescents, and dysmenorrhoea is the main reason for school absenteeism among girls.³

Menstrual disorders not only affect individual health but also contribute to school absenteeism, reduced academic performance, and social limitations. Menstrual disorders can have an adverse effect on the quality of adolescents' lives, both physically and emotionally, and they can be a source of anxiety. Hence, early recognition and strategies to overcome these disorders will improve a young woman's health and quality of life and lower her risks for future disease and ill health.⁴

Studies have reported that up to 50-70% of adolescent girls experience dysmenorrhea, with significant consequences on their daily activities.¹⁻⁴ Several studies have been conducted worldwide to assess the prevalence and effect of menstrual disorders on adolescents by using questionnaires as research tools.¹⁻⁴ However, most of the questionnaires used have not been accessible and are less relevant to our Malaysian community. Almost all the questionnaires are also not available in Malay, which makes them difficult to use in our local community.

A knowledge, attitude, and practice survey helps assess a target group's current knowledge, attitudes, and practices on a specific health topic to identify their needs, problems, and possible barriers before developing and implementing an intervention.⁵ Therefore, this study aims to develop and validate a Malay-language questionnaire to assess knowledge, attitudes, and practices (KAP) regarding menstrual disorders among adolescents, ensuring its reliability and applicability in Malaysia.

MATERIALS AND METHODS

Development of Menstrual Disorder of Adolescents (MenDA) Questionnaire

The MenDA questionnaire, developed in Malay, comprises three sections: demographic data, student menstrual pattern, and knowledge, attitude, and practice (KAP) towards menstrual disorders among adolescents. These sections were selected based on a review of existing validated questionnaires and relevant literature, reflecting commonly used domains for assessing menstrual health in adolescents. The principal researcher facilitated structured meetings in which the domains and their features were discussed, potential items in Malay

were proposed, and the initial version of the questionnaire was finalized. Item selection was guided by literature review findings and consensus among the experts, focusing on relevance, clarity, and coverage of key concepts. Three researchers specialising in adolescent health and survey development contributed to refining the questionnaire content. A three-point Likert scale was used for the knowledge section (e.g., true, false, not sure), while a five-point Likert scale was applied to the attitude and practice sections to capture a broader range of responses. Following the initial item selection, face validity testing was conducted with adolescents to ensure that the items were understandable, culturally appropriate, and relevant to the target population.

Development of the Knowledge Section in the MenDA Questionnaire

The initial 39 items were developed on a three-point Likert-type scale based on expert recommendations and previous validated menstrual health questionnaires to ensure comprehensive coverage of key concepts. It focused on both normal and abnormal menstrual patterns. Normal patterns include cycles ranging from 21-35 days, while abnormal patterns include conditions such as heavy menstrual bleeding or irregular cycles.^{6,7} Additionally, items related to adolescent growth and development were included.⁸ A three-point scale was used to reduce response bias and allow participants to acknowledge uncertainty, which is common in adolescent knowledge assessments. Each item allowed respondents to choose between "yes," "don't know," and "no," with only one correct answer per item. Correct answers received one point, while incorrect answers received zero points. Following face validity testing and exploratory factor analysis, 16 items with low factor loadings or redundancy were removed, resulting in a final set of 23 knowledge items. Scores were categorised into low (0-12), moderate (13-18), and high (19-23) knowledge levels based on percentile distributions.

Development of the Attitude Section in the MenDA Questionnaire

The attitude section of the questionnaire assessed adolescents' views on abnormal menstrual patterns, e.g.,

severe dysmenorrhea, menorrhagia, irregular cycles, drawing from the Menstrual Disorder of Teenagers questionnaire used in an Australian cross-sectional study.⁹ The items were based on a study by Houston et al., which examined adolescents' attitudes and expectations concerning their menstrual cycles. The 26 items were developed based on prior research and adapted to fit the Malaysian adolescent context, and each was evaluated on a five-point Likert scale, ranging from "strongly disagree" to "strongly agree." Following factor analysis and expert review, 8 items were removed due to redundancy or low factor loadings, resulting in a final set of 18 attitude items. For positively worded items, scores were assigned in increasing order (1 for strongly disagree to 5 for strongly agree), while 16 negatively worded items were scored in reverse order. For instance, the statement 'Menstrual pain should always be tolerated without medication' was reverse-scored, meaning that 'strongly agree' was assigned a lower score. The scoring system was categorised into three: more than 80%, 60-70% and less than 60%. Higher scores indicate a more informed and proactive attitude toward menstrual health, including a willingness to seek medical advice and manage symptoms effectively. A score less than 60% indicates of poor attitude toward menstrual health.

Development of the Practice Section in the MenDA Questionnaire

The practice section of the MenDA questionnaire focused on adolescents' daily practices in managing menstrual issues and their health-seeking behaviours related to menstrual disorders. It also assessed the impact of menstrual problems on school attendance and participation in social or sports activities. The initial 23 items were generated based on previous validated health behavior surveys and expert consultations to ensure a comprehensive assessment; each was rated on a five-point Likert-type scale ranging from "never" to "always." The practice items were categorized into four key areas: (1) self-care and menstrual hygiene, (2) symptom management, (3) medical help-seeking behavior, and (4) impact on school and activities. Following factor analysis and expert review, two items with low factor loadings were

removed, resulting in a final set of 21 practice items. Positive items were rated on a scale from 1 (never) to 5 (always) across 13 items, while ten negatively worded items were scored in reverse. For instance, the statement 'I avoid physical activity during menstruation, even if I have no pain' was reverse-scored, meaning that 'Always' received a lower score and 'Never' received a higher score. Following factor analysis and expert review, two items with low factor loadings were removed, resulting in a final set of 21 practice items. Higher scores indicate more proactive and effective menstrual health practices, such as regular symptom management, timely medical consultation, and minimal disruption to school or social activities. The cut-off score was 65.

Study Sample

In this cross-sectional study, a group of 46 students from a single school was chosen to assess the face validity of the MenDA questionnaire. Probability proportional to size sampling method to evaluate the questionnaire's validity and internal consistency. The sample size for the validation study (n=485) was determined based on guidelines for factor analysis, ensuring at least 10 participants per questionnaire item.

This study involved all female students aged 13 to 17 (form 1 to form 5) from selected secondary schools in Kelantan. Secondary schools were randomly selected from different districts in Kelantan to ensure geographic diversity. Schools were weighted based on enrolment size, and participants were randomly selected within each school to achieve proportional representation. Participants were from diverse socioeconomic backgrounds, representing both urban and rural schools in Kelantan. We excluded those with physical disabilities or illiteracy. Any incomplete responses were excluded from analysis, and missing data patterns were assessed to rule out systematic bias. The response rate was 96.5%.

Validity

Three types of validity were determined for the MenDA questionnaire: content validity, face validity, and construct validity.

Content Validity

We evaluated the content validity of the initial MenDA questionnaire by having six gynaecology experts with specialisations in pediatric and adolescent care assess each item using a four-point Likert scale: 1= not relevant, 2= somewhat relevant, 3= quite relevant, and 4= highly relevant. Six experts were selected in accordance with previous validation studies, where a panel of 5-10 experts is recommended for content validation. "Experts were selected based on their experience in adolescent gynecology and survey development, ensuring diverse perspectives in item evaluation.

Ratings were recorded in Microsoft Excel, and the item-level Content Validity Index (I-CVI) was manually calculated by dividing the number of experts who rated an item as 3 or 4 by the total number of experts. An I-CVI cutoff of 0.82 was used to determine acceptable item relevance.¹¹

Face Validity

The MenDA questionnaire was tested for face validity among 46 students at one school. Each student rated items on a 1-4 Likert scale and noted any unclear items. Ratings for clarity were recorded in Excel, and the item-level Face Validity Index (I-FVI) was manually calculated.¹¹ At least 30 students were recommended to achieve an acceptable FVI of 0.8.¹² Based on this feedback, the questionnaire was revised to include three domains and 81 items for construct validation. Items identified as unclear by more than 20% of students were reworded for clarity before the final validation stage.

Construct Validity

We conducted a construct validation session involving 420 students from Form 1 to Form 5 in selected secondary schools to assess the feasibility and understand how well the population responds to the questionnaire.

The data obtained from each knowledge, attitude, and practice section were analysed through exploratory factor analysis (EFA) using the Statistical Package for Social Sciences (SPSS) version 24 software to evaluate

the relationship within a group of observed variables, measured through questions or items.¹⁴ EFA acts as a data-reduction technique that reduces questions into sets of questions by assessing similar constructs using intercorrelation items. EFA was used instead of CFA due to the exploratory nature of the study and the need to identify underlying factor structures. Factors were retained based on eigenvalues >1.0 and factor loadings above 0.40, following established statistical guidelines.

Reliability

The internal consistency of each KAP section in the MenDA questionnaire was evaluated by calculating the reliability using Cronbach's alpha (α) value. Cronbach's alpha is a widely used method for determining the correlation between items, and it is frequently used in medical research.¹⁵ A Cronbach's alpha of >0.70 was considered acceptable for internal consistency. Domains with α between 0.60-0.69 were considered marginally acceptable for exploratory research, while those >0.70 indicated good reliability.

Statistical Analysis

The data underwent exploratory factor analysis (EFA) using IBM SPSS Statistics version 24. Descriptive statistics, including mean (SD) and frequency (%), were used for sociodemographic data. The Keiser-Meyer-Olkin (KMO) measure assessed sampling adequacy, with a value of ≥ 0.5 indicating sufficient correlation among variables.^{16,17}

Bartlett's test of sphericity determined variable relationships, with significance ($p < 0.05$), allowing factor analysis. Principal component analysis with Varimax rotation identified factors with eigenvalues >1.5 and factor loadings >0.4 for item significance.¹⁸ An eigenvalue cutoff of 1.5 was used to ensure that only strong factors were retained, minimizing the risk of including weak or redundant constructs. Items with factor loadings <0.40 or significant cross-loadings were excluded to ensure a distinct factor structure. Factors were retained based on the scree plot's elbow method, where the slope changes significantly, indicating the optimal number of factors.

Factor analysis iterations excluded items with poor correlations until optimal combinations were identified. Cronbach's alpha was used to assess internal consistency reliability. Domains with α between 0.60-0.69 were considered marginally acceptable for exploratory research, while those >0.70 indicated good reliability.¹⁹

RESULT

Sociodemographic Characteristics

Four hundred and eighty-five (485) female students participated in this study, with ages ranging from 13 to 17 years and a mean age of 16.004 (1.164). Participants were selected from both urban and rural schools in Kelantan to ensure diverse representation. The ethnic composition of the students was 96.9% Malay, 0.8% Chinese, 1.0% Indian, and 1.2% from other ethnicities. "Due to the high proportion of Malay participants, the findings may be less generalizable to non-Malay populations. The average age of menarche was 12.016 (1.160). Socioeconomic background was not directly assessed but may be an area for future research. Missing data were minimal ($<3.5\%$) and handled through mean imputation where applicable.

Content Validity

Six experts were selected following best practices in questionnaire validation, where panels of 5-10 experts are typically recommended for content validation. Items scoring below the CVI threshold (0.82) or showing redundancy were removed after expert consensus. While no items were deleted, minor wording adjustments were made based on student feedback to improve clarity. None of the items were deleted from the practice domain. Thus, 81 items remained, consisting of 35 items in knowledge, 23 in attitude, and 23 in the practice domain. Items scoring below the CVI threshold (0.82) or showing redundancy were removed after expert consensus.

Face Validity

None of the items was deleted in any of the three domains, with FVI values ranging from 40/46 (0.86) to 46/46 (1.0). While no items were deleted, minor wording

adjustments were made based on student feedback to improve clarity. An eigenvalue cutoff of 1.5 was used to strengthen factor retention and minimize weak constructs. Therefore, 81 items (35 in the knowledge domain, 23 in the attitude domain, and 23 in the practice domain) remained in the questionnaire.

Construct Validity

The KMO measure of sampling adequacy (>0.5) and Bartlett's test of sphericity ($p<0.05$) were appropriate for all of the KAP domains, where KMO was 0.712 for the knowledge section, 0.697 for the attitude section, and 0.852 for the practice section.

In the EFA for the knowledge section, we identified five dimensions with an eigenvalue >1.5 . This was supported by the scree plot, which also indicated five dimensions. EFA revealed four dimensions for the attitude section with an eigenvalue >1.5 . In the practice section, after applying EFA, 21 items were retained from the initial 23 items. Four dimensions were revealed in this section. Therefore, in the MenDA questionnaire's final model, 62 items were retained from the initial 81 items after EFA. Twenty-three items were under the knowledge section, 18 under the attitude section, and 21 under the practice section.

Internal Consistency Reliability

Cronbach's alpha was calculated for each domain and dimension under a specific domain. The Cronbach's alpha for the knowledge domain was 0.739, for the attitude domain was 0.711, and for the practice domain was 0.793, all of which were >0.70 . Hence, they were considered acceptable for internal consistency.

For the dimensions under the knowledge domain, Cronbach's alpha for dimensions 1 and 2 were 0.716 and 0.726, respectively. However, the Cronbach's alphas for dimensions 3, 4, and 5 were 0.431, 0.568, and 0.458. While Cronbach's alpha for some knowledge dimensions was below 0.60, these items were retained due to their conceptual importance and contribution to construct validity.

Table I: Summary results of factor analysis and reliability for knowledge, attitude, and practice of adolescents towards menstrual disorder

Section/dimension	KMO	Number of items	Eigenvalue	Percentage of variance explained	Range of factor loading	Reliability coefficient (Cronbach's alpha)
	Bartlett's test					
KNOWLEDGE	0.712 p-value < 0.05	23				0.739
Dimension 1 : premenstrual syndrome		8	4.308	10.20%	0.461-0.714	0.716
Dimension 2 : growth spurt		4	2.337	6.58%	0.668-0.792	0.726
Dimension 3 : general menses		5	1.797	6.27%	0.430-0.610	0.431
Dimension 4 : hormonal treatment		3	1.633	5.15%	0.617-0.731	0.568
Dimension 5 : menorrhagia		3	1.511	4.88%	0.420-0.709	0.458
ATTITUDE	0.697 p-value < 0.05	18				0.711
Dimension 1 : menorrhagia and dysmenorhea		5	3.255	10.314%	0.513-0.680	0.658
Dimension 2 : willingness to seek treatment		4	1.900	9.744%	0.522-0.775	0.616
Dimension 3 : obstacle to seek treatment		6	1.715	9.291%	0.437-0.605	0.569
Dimension 4 : menstrual cycle and flow		3	1.536	7.201%	0.523-0.703	0.548
PRACTICE	0.852 p-value < 0.05	21				0.793
Dimension 1 : school attendance, medications and health seeking practice		8	6.951	28.200	0.778-0.946	0.962
Dimension 2 : seeking treatment/advice from expert		4	2.852	12.334	0.476-0.864	0.793
Dimension 3 : general practice on health and menstrual issue		7	1.982	9.885	0.434-0.602	0.628
Dimension 4 : social and sport activity practices		2	1.682	8.131	0.854-0.905	0.849

In the practice domain, all dimensions met the minimum internal consistency reliability threshold of 0.60, which is considered acceptable for exploratory research.

Dimension 1 had a Cronbach's alpha of 0.962, dimension 2 of 0.793, dimension 3 of 0.628, and dimension 4 of 0.849. Table I summarises all the results.

DISCUSSION

To the best of our knowledge, this study is the first to develop and validate a new questionnaire in the Malay language to assess adolescents' KAP regarding menstrual disorders in Malaysia.

The MenDA questionnaire was designed to serve as an essential assessment tool because it covers a wide range of aspects related to menstruation problems in adolescence. It has also been designed and customised to suit adolescents' needs and lifestyles. Its content validity has been tested by an expert panel, face validity by the secondary students as the target group, and construct validity using EFA, and its internal consistency reliability has been verified (Table I). The instrument also shows promising reliability levels, with Cronbach's alpha values for dimensions and an overall score reaching a sum of >0.70 in almost all cases, as recommended by

another study.²⁰ Because of the relatively low rate of missing responses, the questionnaire appears to be well-accepted by adolescents.

Six experts were selected in line with recommendations that panels of 5-10 experts are ideal for robust content validation.²¹ After calculating the CVI, we found that the MenDA questionnaire can retain 81 of the initial 88 items (Table I). Most of the expert panels agreed that this questionnaire's items were relevant to the measured domains, as represented by the value of universal agreement of 0.56-0.73. These values indicate that more than half of the experts consistently rated items as relevant, which meets the minimum acceptable threshold for agreement. Other studies that used five or fewer experts should have a content validity index of at least 0.99 when accepting or retaining a specific item.^{22, 23}

When assessing face validity, it is essential to consider how clear and understandable each item is for the target group, particularly for tools developed for a specific population.²⁴ Hadie et al. suggested that at least 30 students are needed to achieve an acceptable FVI value of 0.8.¹³ We managed to get 46 students to participate in the face validity study, and the result was promising, as all 81 items met the FVI value of >0.8 and

were retained. Most of the students agreed that the items developed in the MenDA questionnaire were easily understood, easy to use, and acceptable, because most participants were able to complete the questionnaire in less than 20 minutes. The use of the Malay language in the questionnaire representing the adolescents' education language medium is the main contributor to its clarity and comprehensibility. This also supports the purpose of developing the MenDA questionnaire in Malay to provide an appropriate and reliable tool for assessing menstrual problems among adolescents in our local community. The importance of language in face validity in determining an instrument for a specific target group is also highlighted in a questionnaire developed in Cantonese for Hong Kong Chinese girls.²⁵

Through EFA, we saw a clear structure emerge from the data for the construct validity of the MenDA questionnaire. Five factors identified in the knowledge section, with 23 items retained, covered the most basic knowledge about menstrual health that adolescents should acquire.²⁶ For the attitude section, 18 of 23 items retained under four factors clearly explained their construct. The researcher may understand the adolescent's attitudes regarding their menstrual problem and their willingness to seek treatment based on the items retained.²⁷ The practice section also demonstrated a clear structure based on four identified dimensions, where 21 of 23 items were retained. All items had acceptable factor loadings between 0.42 and 0.94. The lower bound of 0.42 was chosen as it exceeds the standard minimum threshold (0.40) for meaningful factor loadings in exploratory research. Although factor analysis is one method used to identify items to be retained in the questionnaire, the researcher's judgement is still necessary to ensure that the items retained and grouped provide appropriate meanings.^{24, 28}

Testing the MenDA questionnaire in a larger sample of adolescents also showed that it is a reliable instrument, with Cronbach's alpha values >0.70 for knowledge (0.739), attitude (0.711), and practice (0.793) domains. Despite lower reliability scores for some knowledge dimensions, these items were retained due to their conceptual importance and their contribution to overall

construct validity, similar to other exploratory studies.²⁹ The overall Cronbach's alpha score of 0.738 proved that this instrument is reliable and suitable for use in our community.

The strength of the present study was its detailed assessment of knowledge, attitude, and practice (KAP) of menstrual disorders faced by adolescents. Implementing the KAP model in this questionnaire may help the researcher identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate the understanding and action of adolescents toward menstrual health and eventually help us improve their treatment. The successful management of menstrual disorders among adolescents is significantly influenced by adolescents' education and motivation, which an adolescent's adequate KAP primarily governs.³⁰ KAP is also an essential component of the knowledge attitude behaviour model, which proposes that accumulated knowledge about a health aspect initiates a change in attitude and results in gradual behaviour change.³¹ In addition, this questionnaire may help to collect epidemiological data among adolescents in our local community and can also be used as a tool in medical health education focusing on menstrual issues. Future studies could adapt the MenDA questionnaire for use in other Southeast Asian countries with similar cultural and linguistic backgrounds.

This study has some limitations. This study was conducted in Kelantan, and the sample primarily consisted of Malay students, which may limit generalizability to other regions or ethnic groups. It should be noted that most adolescents who participated in this study, where most, including non-Malay individuals, can speak and understand Malay very well. Some students struggled with certain medical terms, requiring additional clarification during face validity testing. Future studies should validate the questionnaire in a larger and more diverse population to improve its generalizability.

CONCLUSION

In conclusion, the MenDA questionnaire is a validated and reliable tool for assessing the KAP on menstrual disorders among adolescents, and it is reproducible for

use, especially in the next step of our research. The MenDA questionnaire can aid healthcare providers and educators in screening adolescents for menstrual health issues, ensuring early intervention and support.

INSTITUTIONAL REVIEW BOARD (ETHIC COMMITTEE)

This study was approved by the Human Medical Research and Ethics Committee of USM dated 6 February 2020 (JEPeM code: USM/JEPeM/19110816).

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