

**DEVELOPMENT AND VALIDATION OF
MENSTRUAL DISORDER OF ADOLESCENT
(MENDA) QUESTIONNAIRE IN MALAY
LANGUAGE**

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1.3 ABSTRAK

OBJEKTIF:

Untuk menghasilkan dan mengesahkan borang soal selidik mengenai pengetahuan, sikap dan amalan golongan remaja tentang permasalahan haid di kalangan mereka (MenDA).

KAEDAH KAJIAN:

Borang soal selidik ini dihasilkan merangkumi lima peringkat iaitu identifikasi domain, pembentukan item, pengesahan kandungan, pengesahan permukaan dan penilaian struktur dalaman.

Identifikasi domain menerusi sorotan kajian telah dijalankan oleh penyelidik utama, pembentukan item menerusi sorotan kajian dan perbincangan antara pasukan kajian, pengesahan kandungan melibatkan enam pakar obstetrik dan ginekologi dan pengesahan permukaan melibatkan 46 pelajar dari sekolah menengah di Kelantan. Kemudian, versi akhir borang soal selidik MenDA yang terdiri daripada 81 item diedarkan secara dalam talian kepada 485 pelajar bagi penilaian struktur dalaman. Analisis Faktor Penerokaan (EFA) dijalankan menggunakan putaran Varimax untuk pengesahan konstruk. Kebolehpercayaan telah disemak menggunakan nilai Cronbach Alpha.

KEPUTUSAN:

Borang soal selidik MenDA yang mengandungi 62 item di bawah tiga domain pengetahuan, sikap, dan amalan telah dihasilkan dan dikembangkan. Bahagian KAP masing-masing mempunyai 23, 18, dan 21 item. Nilai Cronbach's alpha untuk domain KAP masing-masing adalah 0.739, 0.711, dan 0.793, menunjukkan konsistensi dalaman yang baik.

KESIMPULAN:

Borang soal selidik MenDA telah dibuktikan kesahihan dan kebolehpercayaan untuk digunakan bagi menilai pengetahuan, sikap dan amalan golongan remaja Malaysia terhadap permasalahan haid.

KATA KUNCI:

Remaja, gangguan haid, pengetahuan, sikap, amalan, pengesahan borang kaji selidik, Bahasa Melayu

1.4 ABSTRACT

OBJECTIVE:

To develop and validate the Menstrual Disorder of Adolescent (MenDA) Questionnaire to assess knowledge, attitude, and practise (KAP) of adolescents towards menstrual disorder.

STUDY METHOD:

The questionnaire was developed following a standardised protocol that consisted of literature review, focused group discussions, and expert opinion. It was subjected to content validity by six experts and face validity by 46 adolescents before a revised final version was drafted. Then, a cross-sectional survey on 485 adolescents was carried out to validate the tool. The MenDA questionnaire was administered using Google form and consist of three domains: Knowledge (35 items), attitude (23 items), and practice (23 items). Exploratory factor analysis (EFA) was performed using a principal component with varimax rotation to establish the construct validity of the questionnaire. The internal consistency of the questionnaire was tested using Cronbach's alpha coefficient.

RESULT:

MenDA questionnaire with 62 items categorised under three domains knowledge, attitude, and practices was developed. The knowledge , attitude and practice (KAP) sections have 23, 18, and 21 items, respectively. Independent Cronbach's alpha for KAP domains were 0.739, 0.711, and 0.793, respectively, indicating good internal consistency.

CONCLUSION:

Evidence of validity and reliability of the MenDA questionnaire has been obtained and can be used to assess KAP on menstrual disorders among Malaysian adolescents.

KEYWORDS:

Adolescent, menstrual disorders, knowledge, attitude, practice, validated questionnaire, Malay language

2.0 INTRODUCTION

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. It generally occurs approximately 2.3 years after the initiation of puberty, between the ages of 11 and 14 years in 95% of girls depending on race, ethnicity, socioeconomic and nutritional status (1).

In order to have the normal menstrual cycle, a coordinated interaction between the hypothalamus, pituitary, ovary, and uterus is needed. When these organs all function well, the major events of the reproductive cycle will occur in their normal sequence (2).

However, those with interrupted menstrual cycles will suffer various menstrual disturbances like abnormal uterine bleeding, dysmenorrhea, and irregular cycle. A study has shown that menstrual disorders are the commonest presenting complaints about physician office visits by adolescents and dysmenorrhea is the leading reason for school absenteeism among girls (3).

Not only that, menstrual disorders can adversely affect the quality of the adolescents' lives physically and emotionally and, therefore, can be a source of anxiety for them.

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).

2.1 Literature Review

2.1.1 Menstrual disorders among adolescent

Many studies had been conducted on menstrual disorders among adolescents worldwide. However, we have limited local data in Malaysia, particularly in Kota Bharu. In order to conduct the study on menstrual disorder among adolescents in our community, a reliable set of questionnaire that is relevant to our society and culture should be used.

Based on the Australian cross-sectional study involving 1051 participants, approximately 25% of girls had marked menstrual disturbance affecting life activities and resulting in school absence. The menstrual disorder of teenagers (MDOT) questionnaire, which was designed specifically for this study, was used to establish the typical experience of menstruation for senior high school girls and to determine how many experiences considerable menstrual disturbance that could require further investigation and management of underlying pathology(5). Although the questionnaire was accessible, some of the items were not relevant to our community and were not available in the Malay language.

Disturbance of menstruation, which includes dysmenorrhea, irregular menses, and excessive menstrual bleeding, is the main reason for seeking medical attention. This is because the prevalence of each of the menstrual disorders was relatively high among teenagers. A study done by Eryilmaz et al. in Eastern Turkey involving 1959 participants reported that the prevalence of dysmenorrhea among female adolescents was about 68.1% to 72.2 %. They found that 45.8% of menstrual pain began at the onset of menstrual flow, and 56.6% lasted for one to three days. The study also revealed that more than half of the adolescents (55.7%) agreed that dysmenorrhea had an adverse effect on their school performance (6). Questionnaire used in this study is inaccessible to be use as reference as no reply from the author.

A study by Houston et al. in Washington, the USA, on the other hand, reported that premenstrual syndrome (PMS) was the most prevalent (84.3%) menstrual disorders in their population, followed by dysmenorrhea (65%), abnormal cycle lengths (13.2%) and excessive bleeding (8.6%). Overall, the study showed that 43% of adolescents with menstrual disorders refused to participate in school activities, and 21% were absent from school (7). The questionnaire for the study assesses the knowledge and perceptions of menstruation and the nature of the subjects' menstrual experience, which was very much similar to what we want to achieve; however, it was not accessible and was conducted in the English language.

Although the prevalence of excessive menstrual bleeding among teenagers was relatively low in most studies, its negative impact on daily activities was still significant. A study done in Hong Kong by Chan et al. involving 5609 girls reported the prevalence of heavy menstrual flow was about 16.4% and prevalence of very heavy menstrual flow was about 1.5% among Chinese girls. From these subjects, about 33.6% of menstruating girls reported reduced daily activity because of menorrhagia (8). The study used a questionnaire in the Chinese language hence not suitable for our community.

According to Williams and Creighton, the relative immaturity of the hypothalamic-pituitary-ovary axis in the first two years following menarche may lead to more than half of the anovulatory cycle. This will result in irregular cycles among adolescents where cycle frequency can vary from less than 20 days to more than 90 days. After 1-2 years post menarche, the menstrual cycle usually become regular due to the capacity of estrogen positive feedback on the anterior pituitary develops with the subsequent mid-cycle LH surge and ovulation (9). According to a study done by Sulayman et al. in Northern Nigeria involving 535 girls, the average age of menarche was 12.53 $\pm$ 1.33 years, with a range of 10-17 years. Most of the respondents (69.0%) already experience regular menses. Only 28% menstruated once in 35

days or more, and 3% menstruated once in 21 days or less (2). The study also did not provide accessible questionnaire hence we are unable to review their questionnaire.

Although the prevalence of menstrual disorders is high among adolescents and may cause significant disruption to their lifestyle, school, and social activities, not many seek medical advice. A Malaysia cross-sectional school survey done in Negeri Sembilan involving 2411 participants reported that 88.9% of the secondary school girls had not consulted a medical doctor for problems relating to menstruation. Not only that, but the study also revealed that among 11.1% who sought help for problems related to menstruation, 29.4% went for alternative or complementary medicine (3). Up to date, this is the only study conducted in Malaysia that assesses the menstruation problem among adolescent girls, but the questionnaire is also not accessible as no reply from the author.

There is one study done by Nani et al (10) in the north-eastern state of Peninsular Malaysia assessing knowledge and attitudes towards menstrual disorder among 460 premarital courses' participants. However, the study only compares the knowledge and attitude of premarital men and women on the menstrual disorder and not focusing on adolescent.

For teenagers to seek expert advice regarding their menstrual problem, they need to know what is normal and abnormal menstruation. However, most of them only rely on the information from their mothers and family members. A study by Cakir et al. involving 480 participants in Turkey showed that 54% of the girls get the information from their mothers. Another source of knowledge comes from friends, magazines, newspapers and television. Only 4.6% were given a proper lecture about menstruation and menarche in secondary school (1). This is supported by the study from Chan et al., where 70% of girls preferred seeking advice from their family members and only 12.7% preferred advice from doctors. The study also revealed that the most common factors affecting the decision to seek medical attention were the severity

of the symptoms (85.2%) and the opinion of family members (75.7%). Other factors are the doctor's gender (68.7%), the anxiety facing embarrassing questions(65.3%), cost of consultation (57.4%), worry about physical examination (56.6%) and time constraints(52.9%) (8).

All in all, we can conclude that the prevalence of menstrual disorder among adolescents across the world is high, and their impact on adolescent life is significant. Therefore, it is crucial to create awareness among these young girls about their menstrual health to be offered early treatment. Hence, a relevant tool to assess knowledge, attitude, and practice (KAP) of adolescents on menstrual disorders suitable for our community needs to be developed and validated.

2.1.2 Knowledge, attitude and practice

KAP study was conducted to investigate a particular topic to identify what people know (Knowledge), how they feel (Attitude) and what they do (Practice) related to human behaviour(11). A KAP survey is a representative study to collect information on what is known, believed and done about a particular topic of a specific population (12). This research tool can help the researcher gather information about what people know about menstrual disorder, what they think about people with menstrual disorders and the health-seeking behaviour towards menstrual disorder. It will also help identify knowledge gaps, cultural beliefs, or behavioural patterns that may facilitate understanding and action of adolescents on menstrual health.

2.1.3 Domain identification and item generation:

The generation of items is the most important element of establishing sound measures (13). Items developed in the knowledge section will consist of questions regarding normal and abnormal menstrual patterns with reference to the journal article by Paula J. Adams Hillard (14) and the American College of Obstetricians and Gynaecologist (ACOG) (15). As recommended by ACOG, it is crucial to know about abnormal menstrual patterns in adolescents to improve early identification of potential health concerns for adulthood. Not only that, as adolescents are undergoing puberty, items on growth and development were included to test their knowledge on body changes based on the description in Williams's gynaecology textbook (16). Additionally, items on the source of knowledge about menstruation also will be asked in this section. As reported by Cakir et al., 54% of the girls get the information from their mothers. Another source of knowledge comes from friends, magazines, newspapers and television. Only 4.6% were given a proper lecture about menstruation and menarche in secondary school (1). From this question, we can identify other possible sources of knowledge besides the one mentioned previously, especially in this current generation where the internet can be a major source of knowledge among teenagers.

Items developed in the attitude section will be focused on the attitudes of adolescent towards abnormal menstrual patterns and how they feel about it as addressed by Australian cross-sectional study through its Menstrual Disorder of Teenagers (MDOT) questionnaire, which was used to establish the typical experience of menstruation for senior high school girls (5). Not only that, reference for items in this section is also based on the study by Houston et al. to determine the attitudes and expectations adolescent have relating to their menstrual period (7).

Items included in the practice section will be about adolescent daily practice in overcoming their menstrual problems. In this section, we want to assess the adolescent health-seeking

behaviour with their menstrual disorders. As reported by Malaysia cross-sectional school survey, 88.9% of the secondary school girls had not consulted a medical doctor for problems relating to menstruation. This study revealed that among 11.1% who sought help for problems related to menstruation, 29.4% went for alternative or complementary medicine. (3) Not only that, the items in this section will reveal the proportion of adolescents who will be absent from school or refused to participate in any social or sports activity due to menstrual problems. According to a study among Hong Kong Chinese Girls, 33.6% of menstruating girls reported reduced daily activity because of menorrhagia, 12.1% reported absenteeism from school because of menstruation-related symptoms. However, only 6.4% had sought medical advice.(8)

2.1.4 Validation

Validation is a necessary step for model acceptance. Validity refers to the ability of an instrument to measure correctly what it is supposed to measure. There are three types of validity in medical research which are content, face and construct validity (17).

2.1.5 Content validity

Content validity is defined as the degree to which elements of an assessment instrument are relevant to and representative of the targeted construct for a particular assessment purpose. The relevance of an assessment tool refers to the appropriateness of its elements for the targeted constructs and functions of assessment. At the same time, the representativeness of an assessment tool refers to the degree to which its elements are proportional to the facets of the targeted construct (18). Establishing the content validity is vital to support the validity of an assessment tool such as questionnaires, especially for research purposes.

According to Yusof et al. (19), there are six steps of content validation

1. Preparing content validation form
2. Selecting a review panel of experts
3. Conducting content validation
4. Reviewing domain and items
5. Providing score on each item
6. Calculating Content Validity Index (CVI)

The selection of an individual to review and critique an assessment tool (e.g., questionnaire) is usually based on the individual's expertise with the topic to be studied. According to Polit et al. (20), at least six experts needed acceptable CVI values of at least 0.83.

2.1.6 Face validity

Face validity or response process validity measures the thought processes of users of the tested inventory as they respond to the assessment tool. These are commonly evaluated on the clarity of instructions, language and comprehension of the instruction used in the assessment tool.

According to Yusof et al. (21), there are six steps for face validity

1. Preparing response process validation form
2. Selecting a panel of raters
3. Conducting response process validation
4. Reviewing items for clarity and comprehension
5. Providing score on each item based on the clarity and comprehensibility rating scale
6. Calculating Face Validity Index (FVI)

The selection of raters to review and critique an assessment tool (e.g., questionnaire) is usually based on the target user of the tool, for example, students, the public and teachers. Previous studies proposed the minimum acceptable number of rater of 10 for acceptable FVI of 0.83 (22) , however, most studies administered at least 30 raters for FVI of 0.80 (23).

2.1.7 Construct validity

Construct validity has traditionally been defined as the experimental demonstration that a test measures the construct it claims to be measuring (24). It checks dimensionality (how well the item measures what it is supposed to measure), homogeneity (whether the item measures a similar characteristic) and overlap between latent variables (any more than a single item measuring the same characteristic) (25).

2.1.8 Factor analysis:

Brown et al. stated that one of the best ways to measure a test's construct validity is by using factor analysis (24). Factor analytic procedures are statistical methods used for examining the relationships within a group of observed variables, as measured through questions or items (26). It acts as one of the data reduction techniques that reduce the number of questions into sets of questions by assessing similar constructs using inter-correlation items. Principle component analysis (PCA) is the default method of extraction in many popular statistical software packages (27).

There are two types of factor analysis: exploratory and confirmatory. Exploratory factor analysis (EFA) attempts to discover the nature of the constructs influencing a set of responses, while Confirmatory factor analysis (CFA) tests whether a specified set of constructs influences responses in a predicted way (27).

2.1.9 Reliability:

The term 'reliability' refers to the consistency or repeatability of such measurements (28). Variables derived from test instruments are declared to be reliable only when they provide stable and reliable responses over a repeated administration of the test (29). Reliability of the survey can be assessed by measuring the item reliability index, which indicates the internal consistency within the scale. Cronbach's alpha is an index of reliability associated with the variation accounted for by the true score of the "underlying construct."

The alpha coefficient ranges in value from 0 to 1 and may be used to describe the reliability of factors extracted from dichotomous (that is, questions with two possible answers) and/or multi-point formatted questionnaires or scales (i.e., rating scale: 1 = poor, 5 = excellent). The higher the score, the more reliable the generated scale is. Nunnally (1978) has indicated 0.7 to be an acceptable reliability coefficient, but lower threshold are sometimes used in the literature (32).

3.0 Study justification

Menstrual disorders remain one of the commonest problems involving teenagers; however not much have known about the menstrual problem of this often neglected group of women and also there are no accessible and reliable tools in the Malay language developed to study the problem in our local community.

Therefore, this study aims to develop and validate a new questionnaire in the Malay language to assess adolescents' knowledge, attitude, and practice on menstrual disorders. Not only that, this questionnaire may help practitioner to get unbiased answer directly from the adolescent with regards to their menstrual issues.

The outcome from this study can be used to help researchers determine the prevalence of menstrual disorder in adolescents and their health-seeking behaviour. It can also be used to assess the effect of menstrual disorder on adolescent life activities. Furthermore, problems such as heavy menstrual bleeding, dysmenorrhea and premenstrual syndromes (PMS) if tackled from early on may prevent problems at later age.

4.0 OBJECTIVES

4.1 GENERAL OBJECTIVE

To develop and validate the Menstrual Disorder of Adolescent (MenDA) Questionnaire to assess adolescents' knowledge, attitude, and practice towards menstrual disorder.

4.2 SPECIFIC OBJECTIVES

1. To develop Menstrual Disorder of Adolescent (MenDA) Questionnaire in the Malay language.
2. To assess the validity of Menstrual Disorder of Adolescent (MenDA) Questionnaire in terms of:
 - i. Content validity
 - ii. Face validity
 - iii. Construct validity
3. To assess the reliability of the Menstrual Disorder of Adolescent (MenDA) Questionnaire in terms of internal consistency.

5.0 METHODOLOGY

5.1 Study design, setting and duration

5.1.1 Study design

This study was a questionnaire development and validation where it involved five stages: domain identification, item generation, content validation, face validation, and construct validation. It was a mixed-methods study, where it involved qualitative data collection (literature review and research team meeting) during domain identification and item generation. In content validation and face validation, it involved quantitative and qualitative data collection, while in construct validation, quantitative data collection using cross-sectional study design was used.

5.1.2 Study period

It was performed for 12 months, from 1/3/2020 to 31/3/2021

5.1.3 Study location

This study was conducted in a selected secondary school in Kelantan. The secondary schools' involved were as listed:

- Sekolah Menengah Sains Pasir Puteh
- Sekolah Menengah Zainab 1
- Yahya Petra Satu Premier School, Kuala Krai
- Sekolah Menengah Kebangsaan Tumpat

5.2 Study population

5.2.1 Reference population:

All-female students in secondary school in Kelantan

5.2.2 Source population:

All-female students form 1 to form 5 in selected secondary schools in Kelantan.

5.2.3 Study participants:

Female students form 1 to form 5 present at the selected secondary school in Kelantan.

5.3 Vulnerability of the subject

Adolescent is a vulnerable group. Discussion regarding the menstrual history and associated problems sometimes can be distressing and embarrassing. Eventhough the consent is obtained from the parents but participants were free to withdraw from the study at any time. They were assured that confidentiality of information would be maintained all the time. If the participants have any problem or question, they were free to ask the researchers during the session. No penalty or loss of benefits applied to those who withdraw from the study. Those with menstrual disorders needing further management will be referred to the Paediatric Adolescent Gynaecology clinic in HUSM.

5.4 Sampling frame

Female students form 1 to form 5 from selected secondary schools in Kelantan during data collection between 1/3/2020 and 31/3/2021, fulfilling the inclusion and exclusion criteria.

5.5 Sample size calculation

The sample size was calculated based on factor analysis, as in Table 1

The sample size for factor analysis

- There is no single item ratio that works for all survey development scenarios. Larger sample size or respondent: item ratio is always better since a larger sample size implies lower measurement errors and more stable factor loadings, replicable factors, and generalisable results to the actual population structure. (30)
- Some researcher has suggested subjects-to-variable ratios of 5:1.(31)
- The rule of thumb has been at least 10 participants for each scale item, i.e., an ideal ratio of respondents to items is 10:1. (32)
- Example: number of item x 10 = sample size
- Sample size + 20% non response rate

Table 1: Sample size calculation

Domain	No. of item	Calculation	Sample size	Sample size + 20% non-response rate
Knowledge	35	35 x 10	350	420
Attitudes	23	23 x 10	230	276
Practices	23	23 x x10	230	276

Therefore, the sample size for this study is 420 based on the knowledge domain since it has the largest number among the domain.

5.6 Ethical approval

The conduct of this study was approved by the Human Medical Research and Ethics Committee of USM dated 6/2/2020 (JEPeM code: USM/JEPeM/19110816).

Due to Covid-19 pandemic, the proposed amendments of the study design which involved changes in sampling method using google form was approved by the Human Medical Research and Ethics Committee of USM dated 18/8/2020. (JEPeM code: USM/JEPeM/19110816)

5.7 Inclusion and Exclusion criteria

5.7.1 Inclusion criteria

Female students from form 1 to form 5 in selected secondary schools in Kelantan.

5.7.2 Exclusion criteria

- Not attained menarche
- Mentally challenge
- Illiterate

5.8 Sampling method

A purposive sampling method was used. Based on the list of students provided by the school administration, students who fulfilled the inclusion and exclusion criteria and consented to the study were invited to participate. All consented students were included in the study to meet the required sample.

Before that, an official letter was sent to the Principals of selected secondary schools in Kelantan after ethical approval to get the permission to conduct the study at their centre. The letter included the description of the study and the benefit of the study. After approval, a

consent form to the students and their parents was given before the data collection. Participants were free to withdraw from the study at any time.

In the middle of the study, during construct validation, the information sheet, consent, and questionnaire were transformed into google form due to the Covid-19 pandemic and school closure. The google form distributed by the teacher to those who want to be involved in this study.

5.9 Research tool

The Menstrual Disorder of Adolescent (MenDA) Questionnaire was developed in Malay language, and it was a self-administered questionnaire.

It was divided into two parts. Part 1 consists of the subject's demographic data and menstrual pattern, and part 2 consists of 3 domains: knowledge, attitude, and practice of adolescence towards menstrual disorder. Items for each domain were determined after an extensive literature review and discussion with the supervisor and co-supervisor.

The scoring for the knowledge domain used Likert scale scores of '3', '2', '1' for 'yes', 'don't know' and 'no'. One point is given to a correct answer, and a zero point is given to an incorrect answer. A higher total knowledge score indicates better knowledge of menstrual disorder among adolescents. For attitudes domain, Likert scale scores of '5', '4', '3', '2', '1' were used for 'strongly agree', 'agree', 'not sure', 'not agree', 'strongly disagree' respectively. While for practice domain, Likert Scale score of '5', '4', '3', '2', '1' was used for 'always', 'often', 'sometimes', 'rarely', 'never' respectively.

When the questionnaire development was done, it was assessed for its content and face validity. For content validity, six gynaecologists from Obstetrics and Gynaecology department Hospital Universiti Sains Malaysia, Hospital Universiti Kebangsaan Malaysia and Ministry of Health

Hospital were involved in assessing the relevance of each item in the questionnaire. For face validity, at least ten students from form 1, ten students from form 3 and 10 students from form 5 (a total of 30 students) were recruited to assess the clarity and comprehensibility of the items in the questionnaire.

Then it was further investigated for its construct validity using exploratory factor analysis and reliability using Cronbach alpha.

The time needed to complete this questionnaire was estimated to be about 15-20 minutes.

5.10 Data collection method

This study was conducted in two phases, the development and the validation phase.

Phase I: Development phase

Domain Identification:

An initial search through available literature was conducted to identify possible domains representing knowledge, attitude and practice of adolescents towards menstrual disorder.

Item Generation:

A research team meeting was conducted with three working researchers to generate a potential item pool of each domain until a final agreement for the first version of the Menstrual Disorder of Adolescent (MenDA) Questionnaire was achieved. During the research team meeting, the principal researcher presented the possible domains of MenDA with corresponding features of each domain and proposed several potential items. The items were generated in the Malay language, and the research team then decided on the most suitable items representing each domain and the best possible Likert scale for this questionnaire.

Any item with negative phrasing was reverse-scored before the data analysis. The total score is the sum of all item scores, with higher scores indicating a more positive response towards menstrual disorder.

Phase II: Validation phase

Content validation:

Content validation is an essential prerequisite to assess the relevance and appropriateness of individual items to the construct being assessed and that key items have not been omitted (33, 34).

The first version of the Menstrual Disorder of Adolescent (MenDA) Questionnaire was given to a content expert panel to assess the content validity. Participants for the content validity session were chosen through purposive sampling. Employing Polit et al., (20) recommendations, six expert panels were recruited through invitation letters. The explanation of the study's purpose and the role as a member of the content validation panel was explained. All panels were asked to rate the items of the MenDA questionnaire version 1.0 concerning their relevance on a 4-point Likert scale (1=test not being relevant; 2=somewhat relevant; 3=quite relevant and; 4=highly relevant) (35, 36). The raw ratings were entered into Microsoft Excel. From here, the item-level content validity index (I-CVI) of each item was calculated manually by dividing the number of experts that gave the item a 3 (quite relevant) or a 4 (highly relevant) by the total number of experts. For at least six raters, the cut-off value for an acceptable item-level CVI will be > 0.82 (37).

The scale level content validity (S-CVIs) was “the proportion of total items judged content valid” (38). There were two methods to measure S-CVI: through calculation of the universal agreement among experts (S-CVI/UA) and S-CVI/Ave.

The scale level-universal agreement, S-CVI/ UA, would facilitate the assessment of inter-rater reliability. The S-CVI/ UA was calculated by getting the number of items with 100%

agreement and divided by the total number of items in that specific domain. (37) The SCVI/Ave was calculated by dividing all I-CVI by the number of items.

The cut-off value for an acceptable S-CVI/ UA will be >0.79 (37,34) and for an acceptable SCVI/Ave will be >0.90 (35, 36).

There was also qualitative data gathering in which a free-text comments section on each item was provided. This was particularly effective to reveal information not identified by the quantitative data on what aspects of the construct are not well-represented by the existing items. The data gathered from the free-text comments and subsequent qualitative analysis often lead to meaningful additions (or subtractions) of items or scales (39).

Refinement of the Menstrual Disorder of Adolescent (MenDA) Questionnaire version 1.0 (appendices, page : 71)was performed in line with the calculated CVI value and the feedback from expert panels that generated the Menstrual Disorder of Adolescent (MenDA) Questionnaire version 2.0 (appendices, page : 78).

The experts' feedback and opinions are useful in improving instruments' content validity (40). 4 out of 39 items were deleted from knowledge domain yielded CVI of 0.66, 3 out of 26 items were deleted from attitude domain yielded CVI of 0.66 and 0.5 and no item were deleted out of 23 items from practice domain as CVI all more than 0.83 (appendices, page : 85)

Face Validation:

Determining the clarity and comprehensibility of the items according to the target group is an important aspect in the study of face validity, especially for developed instruments for a particular population. Data from several studies suggest that at least seven to ten people must have sufficient control over the chance agreement (41). Hadie et al. suggested that 30 students needed to achieve an acceptable FVI value of at least 0.8 from face-to-face surveys (23). Therefore, at least 30 students from form 1 to form 5 were recruited for face validation of items.

An explanation about the purpose of the study and role as a face validation member was given. Consent was obtained before that. The Menstrual Disorder of Adolescent (MenDA) Questionnaire version 2.0 was given to the consented students.

The students were asked to rate the items' clarity and comprehensibility based on a 4-point Likert scale (1= item not clear and understandable; 2=somewhat clear and understandable; 3= clear and understandable and; 4= very clear and understandable). There were also be a free-text comments section on each item and a blank space at the end of the questionnaire should the students want to give additional suggestions on the response process format (42).

Then the raw ratings for each item-level clarity and comprehensibility were entered into Microsoft Excel. From here, the item-level face validity index (I-FVI) of each item were calculated manually by dividing the sum of FVI scores by the maximum score multiplied by the number of raters (43).

Items modifications were performed in line with the calculated FVI value as well as the feedback from the face validity sample, which generated the Menstrual Disorder of Adolescent (MenDA) Questionnaire version 3.0. There were no items deleted after face validation in all 3 domains due to FVI value all >0.80 .

Construct validation:

A construct validation session was conducted with at least 420 students from form 1 to form 5 in selected secondary schools to assess the feasibility and to understand how well the population responds to the questionnaire.

An information sheet, consent form and instructions were attached to the questionnaire in a google form. In addition to items assessing knowledge, attitude and practice towards menstrual disorder, there were also questions for obtaining demographic information such as age, ethnicity, religion, height, weight and menstrual pattern.

Female students from form 1 to form 5 who already obtained permission from parents and consented to the study were approached. The purpose of this study was explained to the students, and their right to withdraw was assured. The self-administered questionnaire MenDA version 3.0 was given to them to be filled in 15-20minutes. Anonymity was assured and emphasised. Students were guided regarding how to answer each question.

The data obtained from the session were analysed through Exploratory Factor Analysis (EFA) using Statistical Package for Social Sciences (SPSS) version 24 software to evaluate the relationship within a group of observed variables, as measured through questions or items (26). EFA acts as one of the data reduction techniques that reduce the number of questions into sets of questions by assessing similar constructs using inter-correlation items.

After running the factor analysis, we assessed the scale reliability by calculating Cronbach's alpha coefficient. Cronbach's alpha measures the internal consistency of the item scores (i.e. the extent to which the scores for the items on a scale correlate with one another). Cronbach's alpha was a widely used method to correlate between items, and it is frequently used in medical research (44). Cronbach's $\alpha \geq 0.70$ is considered acceptable for internal consistency.

5.11 Statistical analysis

Data entry and analysis was done using IBM SPSS Statistics Data Analyzer version 24.0.

The demographic data and menstrual patterns among adolescents were analysed using descriptive statistics to look for mean, standard deviation and frequency.

Refer to table 1 in page 54 and table 2 in page 55

Validity:

The construct validity of this questionnaire was evaluated using the exploratory factor analysis (EFA). Factor analysis is used for data reduction.

The data were subjected to an EFA using SPSS Statistics version 24.

In this procedure, items with similar characteristics were grouped under one component. The Keiser-Meyer-olkin (KMO) was used to assess the sampling adequacy of these data and to test whether the variables in the sample were adequate to correlate. A KMO value of 0.5 and above indicates sampling adequacy (45, 46).

Bartlett's test of Sphericity was used to see whether there is a relationship between variables. Factor analysis can proceed if the value of Bartlett's test of Sphericity was significant (p-value < 0.05).(47)

Principle component analysis (PCA) extraction method with direct varimax rotation was applied for construct validity. The numbers of factors with an eigenvalue above one were examined.

Factor Loading exceeding 0.4 was considered meaningful for the items to be considered as factors.

Scree plot was also considered in determining the number of components to be taken into accounts. The scree plot was a graph of the Eigenvalues against all the factors that are useful to determine how many factors to retain (17).

Then factor analysis was repeated by including and excluding each item with poor correlation with others until the best combination is obtained.

Reliability:

The MenDA questionnaire's internal consistency was then determined by calculating the questionnaire's reliability through Cronbach's Alpha value, α . Cronbach's alpha was a widely

used method to correlate between items, and it is frequently used in medical research (44).

Cronbach's $\alpha \geq 0.70$ was considered acceptable for internal consistency.

The value of ≥ 0.2 is considered acceptable for each item in the scale for corrected item-total correlation.