ORIGINAL ARTICLE

Development and Validation of the Self-efficacy, Knowledge, Attitude and Practice towards Environmental Tobacco Smoke (SE-KAP-ETSQ) for Mothers in Malay with Children Below 6 Years Old

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ABSTRACT

INTRODUCTION: Children under 6-years old are the most susceptible to environmental tobacco smoke (ETS). Mothers spend more time with their children and need to be empowered to protect their children from ETS. This study aimed to develop and validate an ETS questionnaire in Malay that measures the self-efficacy, knowledge, attitude, and avoidance practice (SE-KAP-ETSQ) among mothers with children below 6 years old. **MATERIALS AND METHODS:** The SE-KAP-ETSQ was adapted from two questionnaires; 10-item Efficacy Expectation Questionnaire and 29-item KAP-ETSQ. The two phases of the study are: phase 1- the development of the questionnaire and phase 2, the validation of the questionnaire. Data was analysed using SPSS ver.26 and AMOS ver.24. **RESULTS:** A total of 513 mothers were involved in the study; Exploratory factor analysis (EFA) was 186 and Confirmatory factor analysis (CFA) was 327 responded with a mean age of 31.44 years. The EFA identified four domains with 26 items. Factor loadings ranged from 0.574 to 0.854 and Cronbach's alpha ranged from 0.755 to 0.887. CFA generated four models before it achieved best-fit indices with root mean square error of approximation (RMSEA) of 0.053, goodness-of-fit index (GFI) was 0.932, comparative fit index (CFI) was 0.968, Tucker-Lewis index (TLI) was 0.960, Chi-squared/degree of freedom ($\chi 2$/df) was 1.909, that left 17 items with factor loadings ranged from 0.614 to 0.948. Composite reliability and average variance extracted of the domains ranged from 0.778 to 0.858 and 0.534 to 0.689, respectively. **CONCLUSION:** This study produced a valid and reliable, new Malay SE-KAP-ETSQ that can be used for further studies in a wider population.

Keywords
environmental tobacco smoke, young children, mother, development and validation, self-efficacy

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INTRODUCTION

Environmental tobacco smoke (ETS) is one of the main contributing factors for global morbidity and mortality. Children are the most exposed persons and susceptible to the adverse effect of ETS.[1] About 40% of children below the age of 14-years were found to be exposed to ETS based on the data from 192 countries in 2004.[2] Similar findings were also found by the National Health and Nutrition Examination Survey in the United States of America from 2011 to 2012 where the children of 3-11 years old was the highest group to be exposed to ETS with prevalence of 40.6%.[3] In Malaysia, data from the 2012 Malaysia Global School-based Student Health Survey (GSHS-M) showed the prevalence of ETS exposure among school-going adolescents to be approximately 41.5%.[4] A recent local study in Malaysia showed higher ETS exposure among rural primary school children with a prevalence of 55.8%.[5] Several studies identified that the major contributor for child ETS exposure due to parental smoking habit, especially if the ETS comes from the mother.[4–6] As younger children tend to spend more time at home, thus increasing the risk of being exposed and exposure time to ETS by parents who

smoke.[7,8] In addition, the nature of children growing and developing bodies with immature immune systems make them very sensitive and vulnerable to the toxic substances of ETS smoke.[1,9]

In children, ETS exposure was found to be associated with multiple morbidities that can potentially lead to mortality. These conditions are exacerbation of asthma, lower respiratory infections, frequent otitis media, poor oral health, sudden infant death syndrome (SIDS), low birth weight, poor cognitive development, increased risk for psychiatric morbidity, links to the cognitive deficit, and high risk of heavy metal toxicity.[1,10–12] Mothers play an important role in avoiding ETS exposure by their children.[8,13] Apart from the maternal sociodemographic factors like age, race, education level, or socioeconomic status, behaviour specific cognition and affect factors were found to be closely related to avoidance behaviour among the mothers.[13–15] These factors include maternal self-efficacy, knowledge and attitude towards avoiding ETS exposure in their young children.

Published studies in Malaysia on maternal self-efficacy, knowledge and attitude towards ETS exposure in young children are scarce, and identifying a suitable questionnaire is challenging. The Knowledge, Attitude & Avoidance Practice towards Environmental Tobacco Smoke Questionnaire (KAP-ETSQ) was developed to evaluate these factors among the non-smoking pregnant women in Malaysia.[16] However, there is no self-efficacy component in the KAP-ETSQ. Researchers considered self-efficacy as a determinant of behaviour in which it estimates the person's ability to perform a specific behaviour in a specific situation.[17] Self-efficacy is important in ETS avoidance practice and this behaviour is better predicted with a combination of attitude, social norms, and self-efficacy.[17] Efficacy Expectation Questionnaire (EEQ) was developed by Strecher et al in1989 [18] to assess the self-efficacy among smoking mothers towards ETS avoidance in infants. Integrating the self-efficacy domain into the KAP questionnaire will add more value to the whole questionnaire to predict the maternal avoidance practice towards ETS exposure in children. Therefore, this study aimed to develop and validate a new ETS questionnaire in Malay that measures the self-efficacy, knowledge, attitude, and avoidance practice among mothers with children below 6 years old.

MATERIALS AND METHODS

Study design

This questionnaire development and validation study was conducted in two phases. Phase 1 was the translation and questionnaire development. Phase 2 was the validation study including exploratory and confirmatory analysis and reliability testing.

Phase 1: Questionnaire development

Phase 1 of the study was conducted between January 2020 until July 2020. The development of the questionnaire involved several steps. It started with a thorough literature review on ETS and KAP studies on mothers with young children. This was followed by translation and adaptation of the questionnaire, content validation, face validation and pilot testing. The study instruments selected as the basis for this questionnaire are the EEQ and KAP-ETSQ. Written permission to translate, adapt and use both EEQ and KAP-ETSQ in this study was granted by the original authors.

Translation and adaptation of the study tools.

The EEQ measures self-efficacy among smoking mothers in avoiding ETS exposure to their infants.[18] The original questionnaire is in English and therefore, it had to be translated into Malay. The questionnaire consists of 10 items covering 10 scenarios with different sources of ETS, seasons and places. It used a 1-4 Likert-type scale for answer responses with total score ranged from 10 to 40. Higher score reflecting positive self-efficacy towards avoiding ETS exposure. The EEQ had a Cronbach's alpha of 0.85. The EEQ underwent a forward-backward translation into Malay . The forward translation from English to Malay was conducted by a linguist and a physician. The reconciliation process was done through thorough discussion between researchers and the translators involved to resolve any discrepancies and ambiguities and produced the EEQ Malay-Synthesized

version (EEQ M-S). The EEQ M-S was backward translated from Malay to English by a different linguist and physician without referring to the original English EEQ. The translations were harmonized and adapted to the local culture by the research committee into EEQ Malay version.

KAP-ETSQ was developed in Malay –by Mahmud et al (2019).[16] It used the Health Promotion Model (HPM) as its theoretical framework. KAP-ETSQ consists of 29 items which include 12 items on the knowledge domain, 6 items on the attitude domain, and 11 items on the practice domain.[16] The knowledge domain responses are "true", "false" or "not sure". The total score ranged from 0 to 12. The attitude domain consists of the feeling construct (2 items) and belief construct (4 items). Both constructs are evaluated with a 5-point Likert scale (from 1=strongly disagree, to 5=strongly agree). The total score of attitude domain ranged from 6 to 30. The practice domain refers to avoidance behaviour towards ETS which includes control of ETS exposure (4 items), refusal to enter a situation where ETS is present (2 items), and ETS exposure reduction practice in unavoidable situations (5 items). A 5-point Likert scale was used (from 1=always not true, to 5=always true). The total score of practice domain ranged from 11 to 55. Reverse scoring was applied for every negative item. The score was calculated independently for each domain. The higher score for each domain indicates better particular domain towards ETS exposure. The questionnaire was validated with Cronbach's alpha ranged from 0.758 to 0.824 and factor loadings above 0.6. KAP-ETSQ was adapted from pregnant women to mothers with children under 6-years old. The domains were maintained, and items that were not related to the study population were either deleted or modified. Some new relevant items were added to the domain to replace the deleted items. During this whole process, the conceptual, semantic, and content equivalence of the original items were carefully preserved. Both translated and adapted questionnaires were combined to form the first draft of the Malay version of the 32-item SE-KAP-ETSQ. All original items and its transition during the development and validation process were presented in appendix 1.

The theoretical framework for the development of this questionnaire is the HPM.[19] The HPM postulates that personal factors and behaviour specific cognition and affect factors (i.e., perceived benefit to action, perceived self-efficacy, activity-related affect, interpersonal influences, situational influences) have a direct and indirect influence on health-promoting behaviour.[20,21] In this study, the framework of the SE-KAP-ETSQ focused on four main domains; self-efficacy to avoid ETS, knowledge on ETS and its health effect, and attitude towards ETS that will lead to avoidance practice towards ETS.

Content validation

A group of six experts consisting of two public health specialists, two family medicine specialists, and two paediatricians reviewed the first Malay version of 32-item SE-KAP-ETSQ. All the experts were either involved directly in maternal and child health care or have a special interest in smoking cessation. The experts were provided with the objective of this study, the conceptual framework of the study, and the definitions of each domain. Content validity index (CVI) was used to calculate the content validity at the item level (I-CVI) and scale level (S-CVI). These experts were asked to evaluate each item on its relevancy on a scale of 1 to 4. To obtain I-CVI, the total score of each item was divided by the total number of content experts. When there were five or fewer experts who agreed, the I-CVI value must be 1 and if there were six or more experts, a value at 0.83 was acceptable.[22] S-CVI was calculated by averaging each I-CVI of the total items. S-CVI of 0.8 or higher was acceptable.[22] The experts were asked to give feedback on the clarity, simplicity, and ambiguity of the items. Items were maintained, modified, or deleted based on the CVI calculations and qualitative discussion by the research committee. This produced the content-validated SE-KAP-ETSQ.

Face validation & pilot study

Ten mothers who fulfilled the inclusion and exclusion criteria were recruited for the face validation of the

content validated SE-KAP-ETSQ.[23] These respondents were given the questionnaire to comment on the content, understanding and clarity of the instructions, language, wording, and general presentation of the items. The results from the face validation were discussed in a meeting by the researchers for fine-tuning. The questionnaire was then pilot tested on another 30 mothers with children below 6 years old from a health clinic.[24] This pilot study was conducted to test the adequacy of the questionnaire and to assess the feasibility of the field-study process as suggested by Connelly[24]. From this pilot study, further modifications were done to the questionnaire and the study flow protocol. Respondents from the phase 1 and phase 2 of the study were mutually exclusive.

Phase 2: Validation study

Phase 2 of the study used exploratory factor analysis (EFA) and followed by confirmatory factor analysis (CFA). The study was conducted between August 2020 and March 2021 at three public health clinics in Selangor, Malaysia. Mothers who attended the maternal and child health clinics were requested to participate. Inclusion criteria included mothers who were aged 18 years old and above, with at least one child below 6 years old and able to read and understand Malay . This population of children were chosen as studies showed more ETS exposure among younger children who spend more of their time at home with parents especially mothers.[8] We defined young children as being preschool aged or below six years old.[25] Exclusion criteria were mothers with a child diagnosed with significant congenital abnormalities, prematurity, global developmental delay, malignancies, or frequently admitted to the hospital. Those who fulfilled the criteria and agreed to participate signed the consent forms and were given the questionnaire for self-administration. A researcher was always available on-site to assist respondents who had any queries and to collect the questionnaire at the end. The study was conducted during the Covid-19 pandemic and there was surge of cases in the middle of the study period; the data collection method for the second test-retest analysis had to be adapted to the online version. This was more feasible to avoid a face-to-face contact with the mother. Mothers who agreed to repeat the questionnaire were contacted through phone message after two weeks with the link to the online questionnaire to answer. A study flow for the questionnaire development and validation is presented in figure 1.

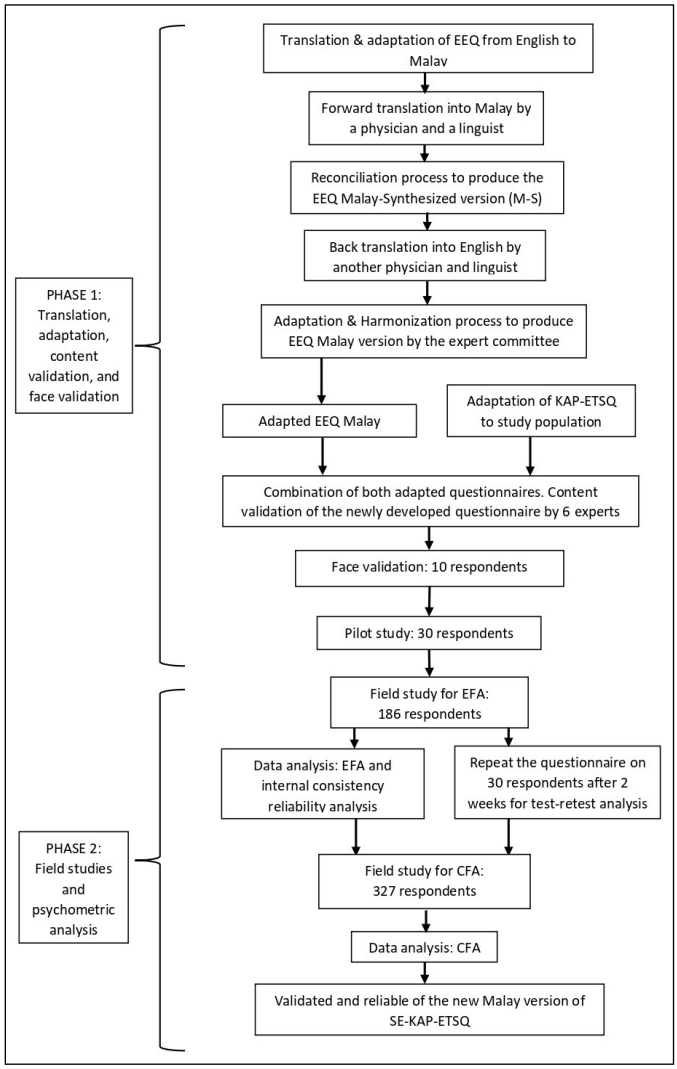

Figure 1: Flowchart of the study

The sample size for EFA used the ratio of five respondents per item as suggested.[26] The total number of items in the initial psychometric tool was 31; therefore, the minimum sample size was 155. With an attrition rate of 20%, the recommended was 186 respondents. For CFA, the sample size depends on model complexity and basic measurement model criteria. A minimum sample of 100 was suggested if the latent domains are 5 and less with more than 3 observed items on each latent domain.[27] This study used a ratio of 10 respondents per item as a guide to determine the sample size.[28] The remaining items post-EFA was 26, thus the sample size calculated with an

attrition rate of 20% was 312. For test-retest reliability analysis, 30 respondents were recruited back from the same sample after two weeks duration.

Data entry, EFA, and reliability analysis were conducted using Statistical Package for the Social Sciences (SPSS) version 26, while CFA was conducted using Analysis of Moment Structure (AMOS) version 24. The sociodemographic background was analysed using descriptive statistics. Categorical variables were reported in frequency and percentage while continuous variables were reported in mean and standard deviation. According to the central limit theorem, a large sample size (n>30 or 40), approaches normal distribution.[29,30] Thus, the parametric analysis used would be able to draw an accurate and reliable conclusion.

The reliability of the SE-KAP-ETSQ was tested by using the internal consistency reliability test and test-retest analysis. Cronbach's alpha of more than 0.7 is regarded as acceptable.[31] The intra-class correlation coefficient (ICC) was used for test-retest analysis with values of 0.4 to 0.75 are considered to be fair to good.[32] Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy and Bartlett's Test of Sphericity were used to test data suitability. The KMO index of more than 0.6 with significant ($p<0.05$) Bartlett's Test of Sphericity indicates its suitability to proceed with factor analysis.[27] Factor extraction was done using Principal Component Analysis (PCA) with a varimax rotational method to establish the underlying dimension. Kaiser's criteria with eigenvalue>1 rule and Scree plot was used to determine the factor extraction. Factor loadings were significant if the value is more than 0.5.[27]

The CFA was conducted to further evaluate the four latent domains which included construct validity, convergent validity, and discriminant validity.[33,34] The construct validity was assessed by using fitness indexes that consist of three model fit categories namely absolute fit, incremental fit, and parsimonious fit. Among the frequently used fitness indexes are absolute fit; Root Mean Square Error of Approximation (RAMSEA), incremental fit; Comparative Fit Index (CFI), and parsimonious fit; $\chi 2/df$.[33] The construct was considered to be valid if it achieved the threshold of acceptance for each fitness indexes; RAMSEA<0.08, CFI>0.90, $\chi 2/df<3.0$.[33] The convergent validity was achieved by computing the Average Variance Extracted (AVE) with a threshold of >0.5.[33] The Discriminant Validity of the construct was achieved if the square root of its AVE exceeds its correlation value with other constructs in the model.[33] In addition, standardized factor loadings of >0.6 were considered to achieve unidimensionality. The reliability of the model was analysed by using Composite Reliability (CR) with the value >0.6 and AVE value of >0.5 for each domain.[33,34]

RESULTS

Questionnaire Development: Outcome of the Translation and Adaptation

During the translation and adaptation of the EEQ, it was noted that the EEQ was developed specifically for smoking mothers. On the other hand, the KAP-ETSQ was developed for non-smoking pregnant women. For the developed questionnaire to be relevant to all smoking and non-smoking mothers, it has to be neutral. Therefore, four items in the EEQ that were specifically for smoking mothers were removed; for example, "*Sejauh manakah anda yakin bahawa anda mampu mengelakkan diri daripada merokok di dalam kereta bersama bayi anda*?". Another two items (item 5 & 6) were translated from two seasons situation, "*Sejauh manakah anda yakin bahawa anda mampu mengelakkan diri daripada merokok di dalam bilik yang sama dengan bayi anda di rumah anda ketika musim panas/sejuk?*" into two weather situations, "*Sejauh manakah anda yakin bahawa anda mampu mengelakkan diri daripada merokok di dalam bilik yang sama dengan bayi anda di rumah anda ketika cuaca panas/sejuk?*" to adapt with the Malaysian context.

KAP-ETSQ needed to be adapted from the non-smoking pregnant women to mothers with children below 6 years old. In domain Knowledge, three items (item 9, 10, 11) were removed as its ETS health effects were specific to pregnant women like bad effects on the foetus, low birth weight baby, and premature delivery. Five items (items 4 - 8) were modified to be more relevant in terms of the

adverse health effect of ETS exposure to young children such as frequent middle ear infections, dental caries, cognitive development, lung infection, and asthma. In domain Attitude, four items (item 1, 2, 4 & 6) were modified so that the subject affected to ETS in the sentences referring to the young children. In domain Avoidance Practice, all items (11 items) were modified to adapt to the study population.

The outcome was a combination of the two questionnaires with four domains: Self-Efficacy, Knowledge, Attitude, and Avoidance Practice with a total of 32 items. The answer response for each domain was changed into a 10-point interval scale as recommended for Structural Equation Modelling (SEM) with 1 as the least score and 10 as the highest score.[33] Interval score does not have a designated ranking and only the lowest and the highest score are labelled. The scoring was according to each domain with the higher score indicates a higher achievement.

Content Validation, Face Validation, and Pilot Study

Six content experts' opinions were objectively evaluated using CVI. Item A1 in Attitude domain, "*Saya sukar untuk menumpukan perhatian jika anak saya terdedah kepada asap rokok*" had an I-CVI value of 0.67. Two experts found that the statement was ambiguous and was rephrased into "*Saya berasa tidak tenang jika anak saya terdedah kepada asap rokok*". Others' I-CVI values ranged from 0.83 to 1.00. The S-CVI/Ave was 0.94, showing overall acceptable relevancy of items in the questionnaire. Subjective feedback from the experts were debriefed among the research team to be considered for change. For example, item on the weather situation were suggested to be combined and modified to a nonweather situation. In the Knowledge domain, one misconception item and one ETS-adverse effect were added to replace the deleted items. Feedback from 10 respondents during face validation further fine-tuning the wording and items in the questionnaire. For example, the word "*bilik*" was suggested to be changed to "*ruang*" in the Self-Efficacy domain to make it more general. Two reversed items in the Avoidance Practice domain were removed due to the confusion among respondents. The changes resulted in the pre-field test 31-item SE-KAP-ETSQ. The layout of the questionnaire was changed following the respondent's feedback with more spaces between lines and fewer boxes. The pilot study showed that the study process was feasible. Respondents understood the instructions and were able to answer the questionnaire within 5 to 10 minutes at the waiting area.

Field Testing: Sociodemographic Factors

A total of 513 mothers responded and completed the questionnaire. The total sample for EFA was 186 while for CFA was 327. Table I shows the sociodemographic characteristics and smoking status of respondents and households. The age of respondents ranged from 18 to 51 with a mean (standard deviation) of 31.44 (4.89) years. Most of the respondents were Malays (91%), had a child in the infant group (54.2%), had tertiary education (66.9%), government employee (38.8%), or private (33.1%), B40 (64.9%). With regards to household smoking status, 49.3% stated no smokers and 47.4% stated husbands as smokers and 64% had a smoking restriction in the house.

Exploratory Factor Analysis

Table II shows the EFA with a rotated component matrix for SE-KAP-ETSQ. The KMO value for the EFA sample (n= 186) was 0.817 (>0.6), and Bartlett's Test of Sphericity was significant ($p<0.001$). This indicates that the data was adequate to proceed with factor analysis and there was a significant relationship between our variables. The Kaiser criterion identified eight factors to retain with eigenvalue > 1 which explained a cumulative variance of 70.314% of the variables in the data. From the scree plot, it showed at least two factors to retain. However, the factors were fixed at four as described theoretically. The cumulative variance at four factors was 52.906% which was still acceptable. The communalities value ranged from 0.437 to 0.742. There were three items (K2r, K4r, and AP9) that have low communalities values (<0.30).

Factor extraction using PCA with varimax rotational method supported the four factors as underlying domains which were Self-Efficacy, Knowledge, Attitude, and

Table I: Sociodemographic characteristics of respondents

		Study sample N=513	Percentage (%)	Mean (SD)
Age of mother				**31.44 (4.89)**
Age of child	Infant (0 - 1-year-old)	278	**54.2**	
	Toddler (1 - 3 years old)	137	26.7	
	Preschool (3 - 6 years old)	98	19.1	
Race of mother	Malay	467	**91.0**	
	Chinese	12	2.3	
	Indian	23	4.5	
	Others	11	2.1	
Education of mother	Primary	8	1.6	
	Secondary	135	26.3	
	Pre-university	21	4.1	
	Tertiary	343	**66.9**	
	Others	6	1.2	
Occupation of mother	Private company employee	170	33.1	
	Government employee	114	22.2	
	Self-employed	28	5.5	
	Housewife	199	**38.8**	
	Others	2	0.4	
Household income	B40 (<RM4850)	333	**64.9**	
	M40 (RM4851 - RM10,971)	166	32.4	
	T20 (>RM10,971)	14	2.7	
Smoking status of the mother	Daily smoker	0	0	
	Occasional smoker	1	0.2	
	Non-smoker	512	**99.8**	
Smoking status of household	None	253	**49.3**	
	Husband	243	47.4	
	Other children	0	0.2	
	Babysitter	1	0	
	Others	16	3.1	
House smoking restriction	Total	169	**64.3**	
	Partial	76	28.9	
	None	18	6.8	

Avoidance Practice. Factor loading for items K2r, K4r, AP5, AP6, and AP9 were low (<0.5), thus deleted. This factor extraction resulted in five items in Self-Efficacy, nine items in Knowledge, six items in Attitude, and six items in Avoidance Practice with a total of 26 items.

For the reliability testing following EFA, the overall corrected item-total correlation (CITC) was more than 0.3 except for item AP7 (0.288); however, each domain had Cronbach's alpha >0.7 (ranging from 0.755 to 0.887) and the total Cronbach's alpha was 0.839. Thus, AP7 was retained because it had a high communality value (0.602) and high factor loading in the rotated component matrix (0.754). In all 30 mothers responded for test-retest analysis, answering the same questionnaire on two occasions. The Intraclass Correlation Coefficient (ICC) analysis showed two items with excellent reliability (>0.7) and seven items with acceptable reliability (>0.4). The rest had ICC below 0.4 which indicated poor stability or reproducibility.

Table II: Rotated Component Matrix for SE-KAP-ETSQ

Items	Component			
	1	2	3	4
SE1: Others smoking in the same space as		0.813		
SE2: Others smoking in the same car as your		0.689		
SE3: Others smoking in the same space in friends/relatives' house as your child		0.854		
SE4: Babysitters smoking in the same space as your child		0.698		
SE5: Others smoking in public places		0.704		
K1: ETS content (comprehension)				0.719
K2r: No danger if transient exposure				**Deleted**
K3: Danger of getting close to a smoker (comprehension)				0.681
K4r: Exposure to children less dangerous than to adults (misconception)				**Deleted** (0.171)
K5: Risk of lung infection (ETS-caused				0.574
K6: Risk of asthma (ETS-caused disease)				0.762
K7: Risk of premature heart attack (ETS-caused disease)				0.661
K8: Risk of SIDS (adverse effect)				0.652
K9: Risk of caries (ETS-caused disease)				0.767
K10: Risk of otitis media (ETS-caused				0.717
K11: Effect on cognitive development				0.662
A1: Feel uncomfortable if child exposed to ETS (feeling)	0.718			
A2: Dislike child exposed to ETS (feeling)	0.806			
A3: Smoking in front of others need to be avoided (belief)	0.711			
A4: Right to ask others to not smoking near my child (belief)	0.711			
A5: Smoking in public need to be banned (belief)	0.726			
A6: Inappropriate to smoke close to children	0.749			
AP1r: Allow others to smoke in the house when my child is present (control)			0.752	
AP2r: Allow others to smoke in the car when my child is present (control)			0.750	
AP3r: Always associate with people who smoke (control)			0.765	
AP4r: Frequently visit places where smoking is prevalent with my child (enter)			0.644	
AP5: Leave the area when people smoke near my child(reduction)			**Deleted** (0.406)	
AP6: Stop people from smoking near my child (reduction)			**Deleted** (0.485)	
AP7: Leave the group if someone starts to smoke (reduction)			0.754	
AP8: Find a non-smoking area in a restaurant (reduction)			0.674	
AP9: Leave the restaurant if no non-smoking area (reduction)			**Deleted** (0.409)	

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 6 iterations.

Confirmatory factor analysis

CFA was conducted on 26-item SE-KAP-ETSQ after items reduction from EFA with 327 respondents. Four models were generated during this process to achieve the best fitness of the model. Model 1 (Figure 2) produced an unacceptable model as reflected by the fitness index

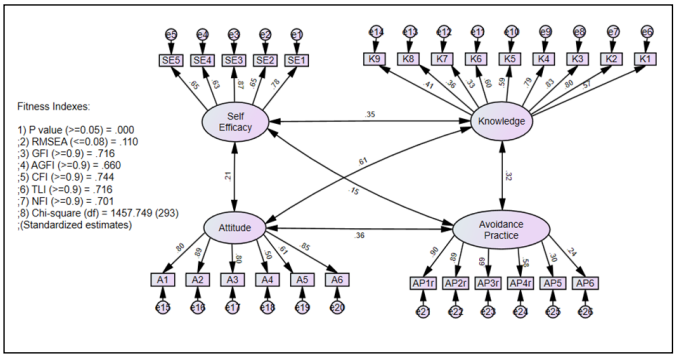

Figure 2: Malay version of SE-KAP-ETSQ with four latent domains (Model 1)

criteria. Five items (AP5, AP6, K7, K8, and K9) with standardized factor loadings of < 0.5 (ranging from 0.24 to 0.41) were deleted and respecify, thus left 21-item SE-KAP-ETSQ for Model 2.

Model 2 still had an unacceptable fitness level. Four items (AP4r, A4, K5, and K6) were identified for having standardized factor loadings of <0.6 (ranging from 0.50 to 0.57). These items were deleted and respecify one by one which resulted in 17-item SE-KAP-ETSQ. Model 3 achieved a satisfactory fitness index except for AGFI with the value of 0.875 which was slightly lower from fitness index criteria of more than 0.9.

To achieve full satisfactory fitness index criteria, modification indices (MI) were examined to look for any redundancy between items in the measurement model. From the MI, it showed high correlation (>15) between e15-e20 (18.770), e5-e2 (17.711) and e9-e8 (17.093). Therefore, these three correlated errors were set as free parameters estimates in model 4. Finally, model 4 (Figure 3) was accepted with four domains and 17 items because it demonstrated acceptable factor loadings, domain-to-

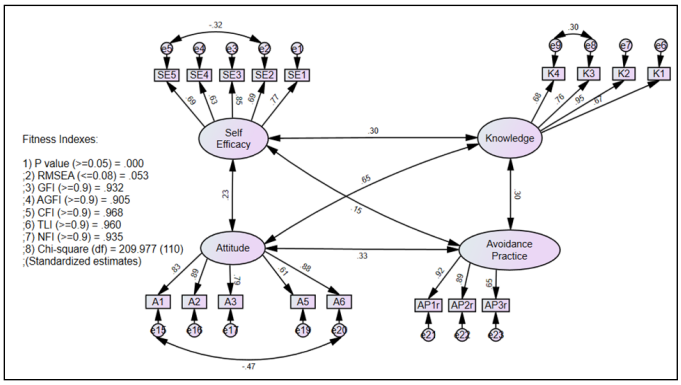

Figure 3: Malay version of SE-KAP-ETSQ after several modifications (Model 4)

Convergent validity and discriminant validity

The AVE value for each domain showed more than 0.5 (ranging from 0.534 to 0.689) which confirmed its convergent validity. The discriminant validity was confirmed as the diagonal values (the square root of AVE of each domain) in the discriminant validity index table (Table III) was higher than the other values (correlation between respective domains). This was supported with the correlation between domains were not exceeding 0.85 which indicates no multicollinearity problem.

Table III: The CFA result of discriminant validity

Domains	Self-Efficacy	Knowledge	Attitude	Avoidance Practice
Self-Efficacy	**0.731**			
Knowledge	0.304	**0.771**		
Attitude	0.229	0.650	**0.806**	
Avoidance Practice	0.152	0.296	0.332	**0.830**

Reliability testing (second field test for CFA)

Table IV shows the factor loadings of the remaining items and the reliability result of the final model (Model 4). The final model achieved good reliability measurement with CR value of each domain (self-efficacy, knowledge, attitude, and avoidance practice) more than 0.6 (0.850, 0.778, 0.858, and 0.821 respectively) and with acceptable AVE value as stated above. The four domains' Cronbach's alpha values which showed above 0.7 further satisfy its reliability. The final SE-KAP-ETSQ questionnaire has 17 items as shown in Table IV.

DISCUSSION

Studies on the prevalence of ETS exposure among young children in Malaysia is alarming and thus the role and ability of parents to prevent such exposure is paramount.[8,13] Studies showed that children with parents who smoke or have a less negative attitude towards ETS tend to get more ETS exposure.[8] Mothers spend more time with their children and should be empowered to prevent ETS exposure towards their children. Our study produced a new, valid and reliable Malay questionnaire that measures a mother's self-efficacy, knowledge,

attitude, and practice towards avoiding ETS exposure in young children (SE-KAP-ETSQ).

Table IV: The CFA factor loading and reliability result of the final model (Model 4)

Domains	Items	Factor Loading	Cronbach's Alpha (> 0.7)	CR (>0.6)	AVE (>0.5)
Self-Efficacy	SE1: Others smoking in the same space as your child	0.774	0.837	0.850	0.534
	SE2: Others smoking in the same car as your child	0.685			
	SE3: Others smoking in the same space in friends/ relatives' house as your child	0.853			
	SE4: Babysitters smoking in the same space as your child	0.634			
	SE5: Others smoking in public places	0.687			
Knowledge	K1: ETS content (comprehension)	0.667	0.847	0.778	0.595
	K2: Danger of getting close to a smoker (comprehension)	0.948			
	K3: Risk of lung infection (ETS-caused disease)	0.759			
	K4: Risk of asthma (ETS-caused disease)	0.679			
Attitude	A1: Feel uncomfortable if child exposed to ETS (feeling)	0.833	0.871	0.858	0.650
	A2: Dislike child exposed to ETS (feeling)	0.885			
	A3: Smoking in front of others need to be avoided (belief)	0.791			
	A5: Smoking in public need to be banned (belief)	0.614			
	A6: Inappropriate to smoke close to children (belief)	0.879			
Avoidance Practice	AP1r: Allow others to smoke in the house when my child is present (control)	0.923	0.846	0.821	0.689
	AP2r: Allow others to smoke in the car when my child is present (control)	0.894			
	AP3r: Always associate with people who smoke (control)	0.646			

CR: Composite reliability, AVE: Average variance extracted

This study showed several reductions of items during EFA from 31 items to 26 items and during CFA from 26 items to 17 items. This extensive revision explained several items that did not fit well with the underlying factors/domains as proposed in Phase 1. Further item deletion during CFA could be attributed to the carrying over of several redundant or problematic items from the EFA stage. These also happened in other validation studies.[35–37]

During the EFA, two items (K2r and K4r) in the Knowledge domain were deleted after factor extraction due to low factor loading (<0.6). This led to a low communalities value (<0.30) in both items. K2r (*Saya tahu pendedahan kepada asap rokok tidak berbahaya sekiranya dalam tempoh yang singkat*) and K4r (*Saya tahu pendedahan asap rokok persekitaran kepada kanak-kanak kurang berbahaya berbanding kepada dewasa*) were negatively worded items regarding ETS misconception. Negatively worded items are usually added in a questionnaire to correct acquiescence bias.[38,39] However, reversing the items to make them negatively worded may risk confusion among responders that can lead to inconsistency in response thus lower the correlation.[38] Mixing positively and negatively worded items in a structured questionnaire may threaten the construct validity and reliability.[34]

During CFA, another five items in the Knowledge domain (K5, K6, K7, K8, K9 after renumbered) were deleted to improve the model fitness. The items were regarding ETS health effects that are found in young children. These items were regarded as specific medical knowledge that was not commonly known to the general population, unlike the first four items that were commonly known. The remaining items (K1, K2, K3, and K4) loaded ranged from 0.67 to 0.95, describe the Knowledge domain adequately.

In the Attitude domain, A4 was deleted in the third measurement model for further improvement. Item A4 (*Saya mempunyai hak untuk meminta perokok supaya tidak merokok berhampiran anak saya*) had lower factor loading compared to other items in the Attitude domain. This could be due to its statement of 'one's rights to ask a smoker not to smoke near the child' was not considered an attitude by responders. Attitude, from its comprehensive definition, is comprised of cognitive, affective, and behaviour that predispose positively or negatively to certain objects, situations, concepts, or persons.[40] Therefore, asserting rights may not fit into any components of attitude definition.

CFA was performed after the determination of the observed and the underlying latent variables relationship by EFA. It is superior to EFA as it verifies the relationship, establishes the validity of the measurement model (construct validity, convergent validity, and discriminant validity), and assesses its reliability.[33] Throughout the CFA, four measurement models were generated after repeated process of modifications with the final model achieving the best fitness indices (RMSEA

0.053, GFI 0.932, CFI 0.968, TLI 0.960, $\chi 2$/df 1.909), unidimensionality, and no issues with multicollinearity.[33] This was achieved through deletion of low factor loading (<0.6), constraint the redundant pair as "free parameter estimate" and maintain acceptable domain-to-domain correlation. Content appropriateness of the related items was also reviewed during the process of modification.

This construct validation was further supported with a good convergent and discriminant validation process. Convergent validity can be verified with an AVE value of 0.5 and above for each domain.[33] The final model showed that it has AVE above 0.5 for all its domains thus indicating that all remaining items correlate well with its corresponding domain. Discriminant validity was examined by identifying items' redundancy and examining intercorrelation between domains.[33] As the square root of the AVE of each domain was higher than every correlation value between domains, this verified its discriminant validity.

Test-retest reliability is one of the two relevant forms of reliability assessment other than internal consistency.[41] Low ICC (<0.4) of the test-retest analysis in most of the items during the first field test may indicate poor stability or reproducibility of a questionnaire. However, many factors could affect the test-retest analysis which should differentiate the true score variance from random or transient measurement error.[41] The factors may involve changes in the external environment, different administration of data collection, and lack of sample heterogeneity.[41] It was unfortunate that during this study, we (and the world) faced the Covid-19 pandemic. It affected some aspects of the data collection. Most of the data collection was conducted face-to-face as originally intended during the non-lockdown period. However, the test-retest second test was conducted during a period of lockdown and thus it was impossible to conduct the second test physically.

Respondents who agreed were given an online questionnaire and this could affect the reliability value since a different method of the questionnaire was administered. There was also variety in the interval duration between the first and second tests as the second test was done online, it was difficult to control the feedback of the responses on the same date. So, the interval duration ranged between two to four weeks. This variation may also affect the accuracy of the reliability score. Nevertheless, the remaining items after EFA still had good internal consistency reliability with individual Cronbach's alpha values ranged from 0.682 to 0.886 and good overall Cronbach's alpha of 0.839.

This study also showed that the final measurement model has good construct reliability. CR is commonly used over Cronbach's alpha for reliability assessment of the latent variables in CFA due to its less biased estimate.[42] It demonstrated that the CR for domain Self-Efficacy, Knowledge, Attitude, and Avoidance Practice were adequate (≥0.6); 0.850, 0.778, 0.858, and 0.821 respectively[33]. The Cronbach's alpha for every domain during the second field test was also highly satisfied with all values more than 0.7, thus further support its good construct reliability.

Strengths and Limitations

This study had undergone a robust translation, adaptation, and validation process which included EFA and CFA to develop a valid and reliable Malay version of the ETS questionnaire for mothers with young children in Malaysia. The 17-item questionnaire is the first to be developed in -Malay and within the Malaysian context. It is also more comprehensive by including the self-efficacy component in the KAP format with comparable validity and reliability to the previous similar questionnaires.[13,15,18]

There is a limitation to this study. Firstly, the sample of the study was limited to mostly Malay mothers in the semi-urban population. The result of the study may not represent the other Malay-speaking population in Malaysia. As stated above, the test-retest analysis of this study was poor due to the factors explained. Therefore, this questionnaire may require repeat test-retest reliability analysis to further examine its stability over time.

CONCLUSION

The Malay version of the SE-KAP-ETSQ is a valid and reliable questionnaire that can be used to measure the self-efficacy, knowledge, attitude, and avoidance practice among mothers with children under 6-years old. It has gone through a robust validation process. The four domains were explored through EFA with good factor loading. The validity of the questionnaire was comprehensively examined by CFA where it achieved its construct validity through best model fitness index, determinant validity, and convergent validity. The questionnaire also demonstrates good reliability in terms of its composite reliability and internal consistency. Further studies using the SE-KAP-ETSQ in the wider intended population may improve the SE-KAP-ETSQ limitations. This questionnaire will give invaluable input regarding maternal factors on self-efficacy, knowledge, and attitude towards avoiding ETS in children, thus appropriate intervention can be planned.

ETHICAL APPROVAL

Ethics approval was obtained from the Medical Review and Ethics Committee (MREC) and the University Research Ethics Committee with the reference of KKM/ NIHSEC/ P19-2766 (6) and 600-TNCPI (5/1/6) respectively.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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