ORIGINAL ARTICLE

DEVELOPMENT AND VALIDATION OF KNOWLEDGE AND INTENTION TO BREASTFEED DURING PANDEMIC QUESTIONNAIRE USING EXPLORATORY FACTOR ANALYSIS AND RASCH MODEL

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ABSTRACT

Breastfeeding during the COVID-19 pandemic is challenging. Strong intention and good knowledge on the risk and benefit of breastfeeding are important for a woman to breastfeed her child during this period. This study aims to develop and validate a Malay language questionnaire in order to measure Malaysian women's knowledge and intention about breastfeeding during the pandemic. The items were developed based on an extensive review of literature as well as breastfeeding guidelines and suggestions from experts, followed by an assessment of content and face validity that involved nine and 30 reviewers respectively. A pilot study was conducted on 90 respondents and the reliability assessment was performed using Rasch analysis. Exploratory factor analysis (EFA) was used to determine the number of latent factors within the intention dimension. Among 29 knowledge items and 36 intention items, 19 knowledge items remained with a person separation (person reliability) as well as item separation (item reliability) of 1.73(0.75) and 3.97(0.94). The final intention domain had 17 items with a person separation (person reliability) as well as item separation (item reliability) of 1.54(0.70) and 3.87(0.94). Three latent factors were identified within the intention questionnaire. The final 17 items explained 53.7% of the variance with an overall Kaiser-Meyer-Olkin measure of sampling adequacy of 0.70, x2 = 623.40 (136), p<0.001. Using the framework of the theory of planned behaviour, the drafted questionnaire is reliable and valid based on the Rasch measurement model to measure the knowledge and intention about breastfeeding during an infection outbreak.

***Keywords:* Intention to Breastfeed, Knowledge Breastfeeding, COVID-19, Rasch Analysis, Questionnaire Development**

INTRODUCTION

Breastfeeding is the cheapest, most convenient and the best source of nutrition for growing infants. Breastfeeding has reduced the risk of death from respiratory infection and risk of admission for any respiratory infection by 70% and 33% respectively[1]. Breastfed infants not only have a better cognitive and gross motor function, but also have a lower risk of developing obesity [2-4]. Exclusively breastfed infants have 14 times lower risk of mortality and 80% reduction in risk of developing diarrhoeal illness compared to non-breastfed infants [1]. Breastfeeding is beneficial for both infants and mothers. Women who breastfeed their children tend to have a lower risk of obesity, cardiovascular diseases, diabetes, depression, and some types of breast cancer [3,5].

Before the occurrence of COVID-19 pandemic, the global prevalence of breastfeeding for the first six months of life was 41% [6]. In Malaysia, pre-pandemic prevalence of exclusive breastfeeding for up to six months and up to 23 months was 47.1% and 39.4% respectively [7]. COVID-19 pandemic may reduce the rate of breastfeeding [8-9]. Hospital policies such as separation of COVID-19 positive or suspected mothers from their newborn babies, prohibition of a company during labour, and limited parental entry to neonatal intensive care unit (NICU) are some obstacles to breastfeeding [10].

The transmission risk of COVID-19 infection from mothers to newborn infants is uncertain. Till today, evidence for the presence of the virus in breastmilk was scarce [11-12]. For instance, few studies that were conducted to detect SARS-CoV-2 antigen in freshly expressed breastmilk failed to show positive findings [13-15]. The lack of knowledge on the risk and benefit of breastfeeding during the outbreak of COVID-19 may affect the intention to breastfeed among women. Intention comprised a commitment to breastfeeding, followed by detailed planning and strategies [16]. Intention is a significant determinant and predictor of successful breastfeeding [16].

Various behavioural change models have been used to explain and predict the breastfeeding

practice among mothers during a particular situation. These models include Bandura's social cognitive theory, Pender's health promotion model, Ajzen's theory of planned behaviour (TPB), as well as predicting and changing behaviour theory [17]. In this study, the researchers attempted to develop a questionnaire based on the TPB to predict and explain different breastfeeding intentions and knowledge among women with young infants amid infection pandemics and movement restriction or quarantine.

METHODS

The breastfeeding intention during disease outbreak (BFID) questionnaire was developed to assess the knowledge and intention of women to breastfeed during infection outbreaks. The development of the questionnaire was done in stages.

Stage 1: Questionnaire development - Item generation and presentation

The questionnaire is divided into two domains. The first domain is to assess the knowledge of women on the risk and benefit of breastfeeding during the COVID-19 pandemic, while the second domain is to assess the intention to breastfeed. This stage was conducted between October 2020 and March 2021. The items were developed via an extensive review of the literature and evidence-based guidelines on breastfeeding during the COVID-19 pandemic as well as discussing with a group of experts regarding breastfeeding [16-21]. The researchers searched PubMed/MEDLINE, the Cochrane Library, Epistemonikos and CINAHL using search terms such as 'breastfeeding', 'breast feeding', 'breast milk', 'COVID-19', 'COVID', 'SARS-CoV-2' and 'guideline'. Tables 4 and 5 show the original items in Malay and English.

Stage 2: Face and content validity

The content and face validity were conducted consecutively between June and August 2021. The preliminary questionnaire was sent to nine breastfeeding experts for the purpose of content validity [22]. The breastfeeding experts comprised international board-certified lactation consultants, obstetricians, neonatologists and public health experts. The process was conducted via an online form. The expert panels rated the relevance of items using four points Likert-type scale with scales ranging from "irrelevant" to "highly relevant." Written comments were sought from the experts to improve the sentence of the items for the targeted constructs. Item-content validity indices (I-CVI) were calculated for each item. I-CVI is the proportion of rater that gives an item relevance rating of at least 3. I-CVI of less than 0.83 were dropped or changed, depending on the feedback from the expert reviewers [22]. Finally, the overall scale-content validity index (S-FVI) which represented the overall relevance of the scale was determined by calculating the average of the I-CVI scores for all the items on the scale. A value of at least 0.83 is the acceptable [22].

A hard copy of the questionnaire containing items with an I-CVI of 0.83 or more was distributed to 30 female staff of a local hospital for the purpose of face validity [23]. The reviewers were those who gave birth in the country between March 2020 and March 2021. Written informed consent was obtained from the reviewers. Reviewers assessed the clarity and comprehensibility of the items using a four points Likert-type scale with scales ranging from "unclear and incomprehensible" to "very clear and comprehensible". Reviewers self-administered the questionnaire themselves with the assistance from trained research assistants. These research assistants were trained by the research team through few face-to-face training sessions in order to ensure that respondents would only assess the clarity and comprehensibility of the items without biasness. Written comments were sought from the respondents to improve the clarity and comprehensibility of the items. Reviewers were requested to complete the assessment of the whole questionnaire in an hour within the same setting. Item-face validity index (I-FVI), which defined as the proportion of rater that gives an item a clarity and comprehension rating of 3 or 4, would be calculated. Items with I-FVI of ≥ 0.83 were kept and remained in the final questionnaire [23].

Stage 3: Validity and reliability using Rasch model and exploratory factor analysis

Study population

The remaining items after the exclusion of items with unacceptable CVI and FVI were piloted to 90 respondents. Respondents were chosen randomly using simple random sampling among women whose children attended the paediatrics clinic for follow-up as well as those who gave birth in any healthcare facility in the country between March 2020 and June 2021.

Sample size calculation

To separate respondents into two groups which were adequate vs. inadequate knowledge and high vs. low intention to breastfeed during COVID-19, the minimum person reliability and separation index required were 0.63 and 1.25 respectively [24]. The recruitment of respondents would end once the person reliability achieved the minimum required value [25].

Data collection

The pilot study was done via an online and hard copy questionnaire that was guided by trained research assistants. No time limit was applied and written informed consent was obtained from the study participants. The questionnaire for the pilot studies was divided into two parts: the knowledge on breastfeeding and the intention to breastfeed during the COVID-19 pandemic. The knowledge domain reported scores on three scales, namely "correct", "wrong" or "unsure", while the

intention domain reported scores on "agree", "disagree" or "unsure". For both domains, the scoring was binary, with "correct" or "wrong" for knowledge domain and "acceptable" or "unacceptable" for intention domain. "Unsure" is considered as wrong answer in both domains.

Data analysis

Both the knowledge and intention scales were analysed separately. Rasch analysis via Winsteps software version 3.72.1 was used to assess the psychometric properties of the questionnaire, including its dimensionality, the fit of the items to the model and the ability of the new questionnaire to discriminate respondents into two different categorisations, namely adequate vs. inadequate knowledge and high versus low intention to breastfeed during the COVID-19 pandemic through person separation and person reliability. Person reliability and separation indices reflect the generalisability of a scale to classify new sample of people along the measured trait [26]. A minimum of 1.25 person separation index or 0.61 person reliability was required to discriminate the respondents into two different categories [27]. The fit of all the data to the model was assessed using infit and outfit mean squares (MNSQ) statistics with the acceptable range of 0.5 to 1.5 [28]. A value of lower or higher than this range means that the observed variance of the item is farther away than the model expected variance [29]. An infit MNSQ statistic of more than 1.5 suggests a deviation from unidimensionality of the data [29]. The ability of the item to discriminate respondents based on their perceived ability was assessed using the estimated discrimination index. The minimum acceptable discrimination index is 0.2 [30]. Furthermore, the redundancy of the items would be assessed based on the largest standardised residual correlation value of the items. Pair of items with correlation value of more than 0.70 was considered redundant and one of the items would be discarded from the final scale [31].

The dimensionality of the questionnaire was assessed via principal component analysis (PCA) of the residuals, where the raw variance that was explained by the scales was compared to the unexplained variance via the additional dimension (the first contrast). Raw variance explained by measures of over 40%, unexplained variance in first contrast of less than 1/3 of raw variance explained by items, unexplained variance in first contrast of about 2.0 and first contrast disattenuated correlations of over 0.6 suggested unidimensionality [32]. Suitability of the data for Exploratory factor analysis (EFA) is confirmed if the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is above 0.60 and a significant Bartlett's test of sphericity [33]. Principal components analysis (PCA) was used to identify the number of factors that the intention questionnaire could measure. EFA was performed with SPSS version 26 based on the minimum eigenvalues of 1.0 with orthogonal rotation via a varimax algorithm.

RESULTS

Content and face validity index

Nine expert panels rated 29 knowledge items and 36 intention items for relevance to the measured construct. The I-CVI ranged between 0.44 and 1.00, with seven knowledge items and fifteen intention items having an I-CVI of less than 0.80. Three items with an I-CVI of less than 0.83 were modified based on the comments given by the expert panels. Some items with an acceptable CVI index underwent minor modification with mainly word substitution based on the comments by the panellists. Overall, both the knowledge and intention domains of the scale had an acceptable S-CVI value of 0.89 and 0.86 respectively. As for face validation, the 24 knowledge and 22 intention items had I-FVI that ranged from 0.77 to 1.00. None of the knowledge items had an I-FVI of less than 0.83, while three intention items had unacceptable index scores. All these items were removed from the final questionnaire for the pilot study. The S-FVI value of the knowledge domain was 0.92 while the intention domain had a S-FVI value of 0.88.

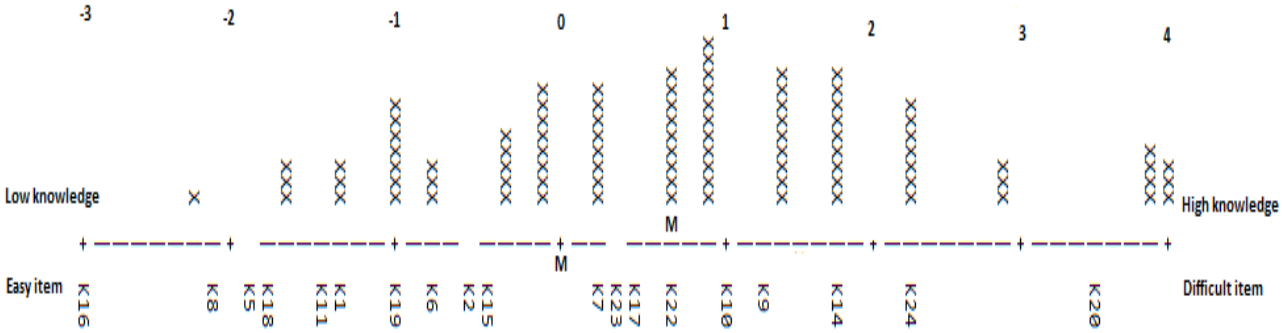
RASCH Analyses and Exploratory Factor Analysis

Ninety respondents completed the questionnaire. All respondents were women who gave birth in healthcare facilities in this country between 1st March 2020 and 30th June 2021. Overall separation and reliability for the knowledge dimension of the questionnaire were satisfactory, with person separation index and reliability of 1.73 and 0.75 as well as item separation and reliability index of 3.97 and 0.94 respectively. Most of the items fit the model well with a mean (sd) MNSQ infit and outfit of 0.99 (0.16) and 1.49 (1.87) respectively as well as ZSTD score of between -2 and 2. However, three items (K3, K4, K21) had unacceptable outfit ZSTD statistics of over 2.00. The unexplained variance in first contrast had an eigenvalue of 2.8 or 6.1%, which was less than 1/3 of raw variance explained by items of 29.2%. The raw variance explained by measures was 47.3%, with first contrast disattennuated correlations that was greater than 0.6. These findings indicated an absence of multidimensionality. Eight items (K21, K12, K13, K1, K4, K3, K8, K5) had a poor item-person correlation on PT-measure correlation with a correlation between -0.11 and 0.27. Among these items, three items (K12, K13 and K21) were removed after reviewing the scalograms and the wright map. These items were removed as the responses to these items contradicted the modelled latent variables despite having a correct data entry and an acceptable I-FVI and I-CVI. Based on the estimated discrimination index, only item K3 could not discriminate the respondents with a discrimination index of -0.04. There were no dependent items based on the largest standardised residual correlations analysis of less

than 0.7. The person separation index and reliability increased to 1.76 and 0.76 respectively after removing non-fitting items and items with poor item-person correlation (K21, K12, K13, K4, K3).

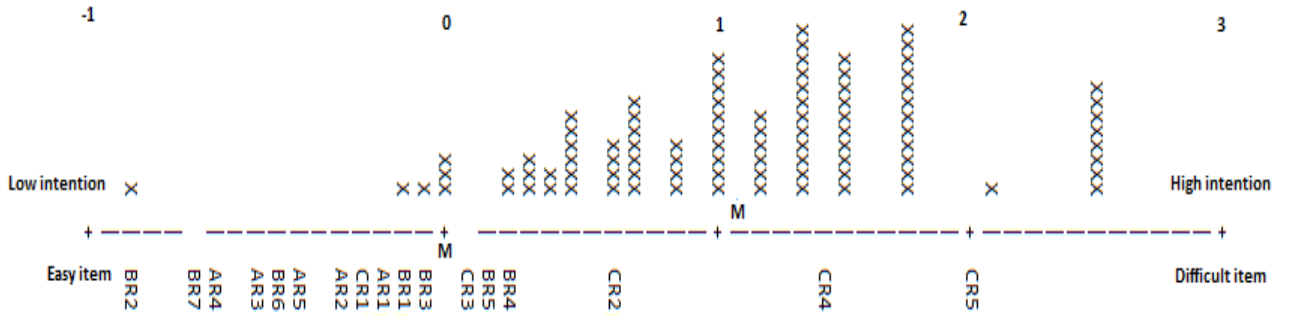
The original 19 items of the intention domain also showed satisfactory overall fit to the Rasch model with a good person separation index and person reliability to separate the respondents into two different strata. The separation index and reliability were 1.52 and 0.70, while the item separation and item reliability were 3.87 and 0.94. Most of the items fit the model well with a mean (sd) MNSQ infit and outfit of 0.98 (0.20) and 1.02 (0.55) respectively. Only one item (R6) had unacceptable outfit MNSQ statistics of 2.92 with a ZSTD score of 5.4 and the same item (R6) had an unacceptable discrimination index (0.16). This item was discarded from the final questionnaire. The presence of multidimensionality was supported by the comparisons that were made between a high unexplained variance explained by the first contrast and the raw variance explained by items as well as the eigenvalue of 3.8 (13.4%) and 5.4 (18.9%) units. Furthermore, the raw variance explained by measure was only 7.97 (29.6%) with first contrast disattennuated correlations of less than 0.6. Two items (R5, R6) had a poor item-person correlation with a PT-measure correlation of 0.07 and 0.09. Only item R6 was removed as it had poor item-person correlation and fit statistics. Removing this item increased the person separation index and person reliability to 1.54 and 0.70 respectively. There were no dependent items based on the largest standardised residual correlations analysis. The overall statistics are presented in Table 1, while the item statistics for the knowledge and intention dimensions are shown in Tables 2 and 3 respectively. Figures 1 and 2 are the wright map for the knowledge and intention dimensions.

EFA proceeded with 18 intention items after initial analysis revealed a KMO value of 0.685 and a significant Bartlett's test of sphericity ($p < 0.001$). From the PCA, five factors had an eigenvalue of above 1. However, only three factors were retained after two of the factors contained only one and two items each. The scree plot presented in Figure 3 shows that the eigenvalues levelled off after the third factor. Orthogonal rotation of the 3-factor solution revealed that one item (R1) failed to load for values of above 0.40 on any factor. After removing the item (R1), all the remaining items were perfectly loaded into three separate factors with correlation indices of between 0.43 and 0.82. The final 17 items explained 53.7% of the variance, with the overall KMO measure of sampling adequacy of 0.70, $x^2 = 623.40$ (136), $p<0.001$. The three factors, which were "attitude", "perceived risk and difficulty to breastfeed during pandemic", and "infection-prevention practice", contained five, seven, and five items respectively.



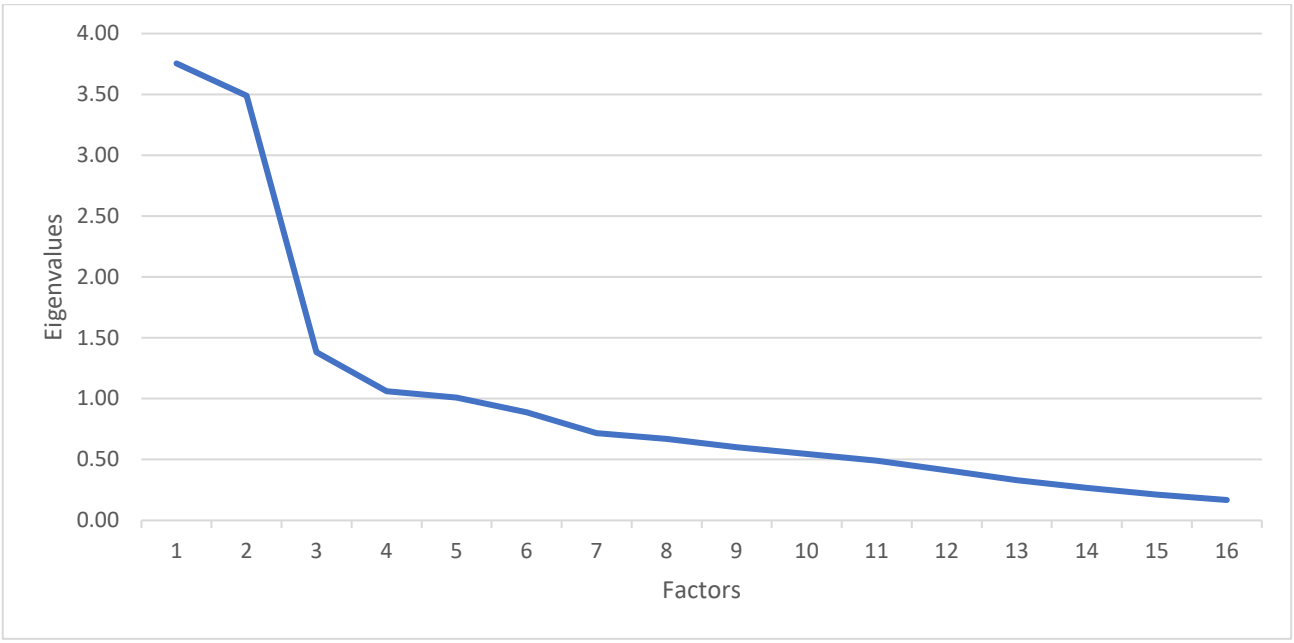
Note: M above the line is the 'mean person measure' while M below the line is the mean item measure.

Figure 1: Wright map depicting the position of each items of the knowledge dimension against each respondents



Note: AR codes for attitude items, BR codes for perceived risk and difficulty, and CR codes for infection prevention practices. M above the line is the 'mean person measure' while M below the line is the mean item measure.

Figure 2: Wright map depicting the position of each items of the intention dimension against each respondents



Note: The scree plot shows that the eigenvalues levelling off after the third factors. These three factors explained 53.7% of the variation in the date.

Figure 3 The scree plot for the EFA of the intention to breastfeed questionnaire

Table 1: Overall statistics

Dimension	KMO†	Cumulative rotation sums of squared loadings (%)	Person separation index (reliability)	Item separation index (reliability)	Average infit MNSQ‡ (SD) §	Average outfit MNSQ (SD)
Knowledge	-	-	1.73 (0.75)	3.97 (0.94)	0.99 (0.16)	1.49 (1.87)
Overall intention	0.712	53.9	1.52 (0.70)	3.87 (0.94)	0.98 (0.20)	1.02 (0.55)
Attitude	0.797	71.3				
Perceived behavioural control	0.810	83.12				
Practice	0.727	91.17				

† Kaiser-Meyer-Olkin, ‡ Mean square statistics, § Standard deviation

Table 2: Items fit and misfit indices for draft of knowledge of breastfeeding during COVID-19 containing 24 items, (N=90)

Item	Measures	Infit		Outfit		Pt-Mea corr§	Disc. Index¶
		Mnsq†	Zstd‡	Mnsq	Zstd		
K1 Initiation of breastfeeding	-0.97	1.23	1.32	1.86	1.78	0.14	0.64
K2 Skin-to-skin	-0.14	1.06	0.52	0.98	0.02	0.40	0.92
K3 Breastfeeding SOP	1.27	1.42	3.81	1.75	3.87	0.18	-0.04
K4 Cleaning breast	3.74	1.2	0.86	2.85	2.47	0.17	0.76
K5 Surface disinfection	-1.48	0.98	-0.03	1.52	1.01	0.27	0.95
K6 Duration of exclusive breastfeeding	-0.41	1.11	0.84	1.14	0.55	0.33	0.83
K7 Breastfeeding initiation during pandemic	0.59	1.07	0.70	1.01	0.14	0.43	0.86
K8 Hand washing	-1.74	0.90	-0.30	1.80	1.28	0.26	0.97
K9 Breastfeeding withholding	1.50	0.76	-2.48	0.64	-2.38	0.66	1.54
K10 Benefit of formula feeding	1.27	0.78	-2.42	0.68	-2.21	0.64	1.54
K11 Antibody in frozen milk	-1.16	0.96	-0.13	0.72	-0.52	0.40	1.08
K12 Avoiding public space	-4.15	1.03	0.35	1.09	0.47	0.05	0.96
K13 Antibody in breast milk	-2.68	1.08	0.33	0.96	0.22	0.13	0.94
K14 Virus in breast milk	1.93	0.85	-1.33	0.74	-1.36	0.59	1.29
K15 Weak infected mother	-0.14	0.99	-0.03	0.90	-0.31	0.45	1.04
K16 Complementary feeding	-5.37	1.00	0.00	1.00	0.00	0.00	1.00
K17 infant-mother separation	0.65	1.12	1.20	1.14	0.80	0.39	0.72
K18 Continuation of breastfeeding during pandemic	-1.48	0.91	-0.32	0.68	-0.49	0.39	1.10
K19 Facemask during breastfeeding	-0.64	0.93	-0.45	1.00	0.11	0.42	1.06
K20 isolation of infected mother	3.49	0.81	-0.84	0.65	-0.67	0.51	1.15
K21 sneezing etiquette	-3.43	1.08	0.34	9.9	4.28	-0.11	0.80
K22 Infected infant	0.87	0.77	-2.56	0.69	-2.08	0.64	1.56
K23 Close contact	0.70	0.78	-2.39	0.67	-2.14	0.63	1.55
K24 Viral contamination	2.40	0.91	-0.58	1.00	0.08	0.51	1.10

† Mean score, ‡ Standardised as a Z-score, § Point measure correlation, ¶ Discrimination index

Table 3: Items fit and misfit indices for draft of intention to breastfeeding during COVID-19 containing 19 items, (N=90)

Item	Measures	Infit		Outfit		Pt-Mea corr§	Disc. Index¶
		Mnsq†	Zstd‡	Mnsq	Zstd		
R1 Difficult access to formula milk	0.59	1.22	2.09	1.42	2.58	0.29	0.44
R2 Quarantine improves breastfeeding	-0.40	0.85	-1.14	0.77	-1.06	0.58	1.22
R3 Handwashing before breastfeeding	-0.40	1.03	0.27	0.88	-0.46	0.46	1.01
R4 Formula feed to avoid jaundice	-0.40	0.89	-0.83	0.74	-1.22	0.56	1.19
R5 Cleaning breast before breastfeeding	3.08	1.21	1.09	1.47	1.05	0.09	0.74
R6 Difficulty to breastfeeding in public	1.95	1.28	2.48	2.92	5.39	0.07	0.13
R7 Financial benefit of breastfeeding	-0.62	0.96	-0.24	0.92	-0.24	0.48	1.05
R8 Continue breastfeeding during pandemic	-0.86	0.73	-1.79	0.51	-1.94	0.65	1.33
R9 Wearing facemask when ill	0.42	1.01	0.16	0.92	-0.49	0.48	1.02
R10 Breastfeeding safe money	-1.22	0.80	-1.03	0.72	-0.76	0.56	1.19
R11 Poor milk quality during quarantine	-1.22	0.70	-1.71	0.4	-2.09	0.65	1.32
R12 Anxiety reduces milk	-0.19	1.05	0.43	1.09	0.50	0.43	0.91
R13 Continue breastfeeding during pandemic	-0.77	0.66	-2.43	0.44	-2.50	0.70	1.42
R14 Not breastfeed outside of home	0.06	1.18	1.52	1.25	1.40	0.34	0.66
R15 anxiety prevent breastfeeding	-0.13	0.91	-0.69	0.84	-0.82	0.54	1.16
R16 wash hand after breastfeeding	-0.07	1.31	2.38	1.29	1.50	0.26	0.52
R17 Express milk when ill	1.89	1.08	0.76	1.15	0.67	0.33	0.80
R18 Uses formula during pandemic	-0.69	0.72	-1.97	0.49	-2.29	0.67	1.37
R19 Express breast milk at workplace	-1.03	1.11	0.69	1.15	0.56	0.35	0.88

† Mean score, ‡ Standardised as a Z-score, § Point measure correlation, ¶ Discrimination index

Table 4: The original Malay questionnaire

Knowledge
1. Penyusuan susu ibu sepatutnya dimulakan dalam masa satu jam pertama selepas kelahiran
2. Sentuhan kulit ke kulit boleh dilakukan selepas bersalin semasa wabak
3. Ibu yang dijangkiti wabak perlu menyahkuman pada permukaan yang disentuhnya
4. Bayi perlu diberi susu ibu sahaja dari lahir sehingga berumur genap 6 bulan
5. Penyusuan susu ibu perlu dimulakan dalam masa satu jam pertama selepas bersalin semasa wabak
6. Ibu yang dijangkiti wabak perlu mencuci tangan sebelum dan selepas menyusui bayinya
7. Penyusuan susu ibu perlu dihentikan jika ibu disyaki menghidap COVID-19
8. Susu formula yang suam boleh mengelak jangkitan COVID-19
9. Antibodi dalam susu ibu tidak hilang selepas dibekukan
10. Jangkitan virus telah dibuktikan boleh berlaku melalui penyusuan susu ibu
11. Jika ibu yang dijangkiti wabak terlalu lemah, susunya boleh diperah untuk diberikan kepada bayi
12. Makanan pelengkap perlu diberi apabila bayi berumur 6 bulan
13. Ibu dan bayi perlu berada bersama selepas bersalin semasa wabak
14. Penyusuan susu ibu perlu diteruskan walaupun semasa wabak
15. Ibu yang dijangkiti wabak perlu memakai pelitup muka apabila menyusui bayinya
16. Ibu yang dijangkiti wabak perlu diasingkan daripada bayinya
17. Penyusuan susu ibu perlu dihentikan jika bayi dijangkiti wabak
18. Penyusuan susu ibu perlu dihentikan jika ibu merupakan kontak rapat pesakit COVID-19
19. Virus boleh mencemari susu yang telah diperah
Intention
Attitude
1. Kuarantin dan PKP memberi saya lebih masa untuk menyusu badan
2. Menyusu badan mengurangkan perbelanjaan keluarga ketika Perintah Kawalan Pergerakan (PKP)
3. Semasa wabak COVID-19, saya meneruskan penyusuan susu ibu kepada bayi saya
4. Menyusu badan menjimatkan wang ketika wabak
5. Semasa wabak COVID-19, saya masih menyusukan bayi saya mengikut kehendak bayi
Perceived risk and difficulty to breastfeed during pandemic
1. Semasa wabak COVID-19, saya memberi susu formula untuk mengelak dari perlu ke klinik kerana jaundis
2. Saya tidak menyusukan bayi saya kerana susu saya kurang berkhasiat akibat pemakanan saya ketika PKP
3. Kebimbangan saya terhadap penularan wabak menyebabkan susu saya berkurangan
4. Saya tidak menyusukan bayi saya ketika di luar rumah ketika wabak
5. Saya tidak memberi susu ibu ketika saya tidak sihat kerana takut bayi dijangkiti virus
6. Semasa wabak COVID-19, saya menukar kepada susu formula
7. Tempat kerja saya tidak memberi peluang untuk saya memerah susu badan
Infection-prevention practice
1. Saya mencuci tangan sebelum memberikan bayi saya susu
2. Saya memakai pelitup muka semasa menyusu apabila saya selesema
3. Saya mencuci tangan selepas memberikan bayi saya susu
4. Saya memberi susu yang diperah ketika saya tidak sihat
5. Saya mencuci payudara saya setiap kali sebelum memulakan penyusuan

Table 5: The original English questionnaire

Knowledge

1. Breastfeeding should be started within the first hour after birth
2. Skin-to-skin contact can be done post-delivery during pandemic
3. A mother that is infected with COVID-19 needs to disinfect the surface that she touches
4. Babies should be given breast milk only from birth until 6 months of live
5. Breastfeeding should be started within the first hour of delivery during an outbreak
6. Mothers who is infected with COVID-19 should wash their hands before and after breastfeeding their babies
7. Breastfeeing should be discontinued if the mother is suspected of having covid-19
8. Warm formula milk can prevent COVID-19 infection
9. Antibodies in breast milk remained even after frozen
10. Viral infections have been shown to occur through breastfeeding
11. If the infected mother is too weak, her milk can be expressed to be given to the baby
12. Complementary foods should be given when the baby is 6 months old
13. The mother and the baby need to be together after delivery during an outbreak
14. Breastfeeding should be continued even during an outbreak
15. Mothers infected with COVID-19 should wear face mask when breastfeeding their babies
16. A mother infected with COVID-19 should be isolated from her baby
17. Breastfeeding should be stopped if the baby is infected with COVID-19
18. Breastfeeding should be discontinued if the mother is a close contact of COVID-19 patient
19. The virus can contaminate the milk that has been expressed by the mother

Intention

A. Attitude and belief

1. Movement Control Order (MCO) and Quarantine period give me more time to breastfeed
2. Breastfeeding reduces the family expenses during Movement Control Order (MCO) period
3. I regularly wash hands before breastfeeding my baby
4. Breastfeeding can save costs during pandemic
5. During COVID-19 Pandemic, I still breastfeed my baby according to their needs

B. Perceived behavioural control

1. During COVID-19 pandemic, I give formula milk to prevent jaundice that leads to the need for clinic check-up
2. I am not breastfeeding my baby because my breast milk decreases due to my poor diet during movement control order (MCO)
3. My worry towards this pandemic causing my breast milk to reduce
4. I will not breastfeed my baby outside the house during this pandemic
5. I will not breastfeed my baby when I am not feeling well because I am afraid my baby will be infected with the virus
6. I substitute breast milk with formula milk during COVID-19 pandemic
7. My workplace did not allow me to express my breast milk

C. Practice

1. I wash hand before breastfeeding my baby
2. I wear facemask while breastfeeding when I am unwell
3. I regularly wash hand after breastfeeding my baby
4. I give my baby expressed breast milk when I am unwell
5. I wash my breast each time before breastfeeding my baby

DISCUSSION

TPB is a behavioural theory which is developed to explain factors that can affect a decision to perform a particular behaviour [34]. Based on the theory, a behaviour is resulted from combined interaction between behavioral intention and the ability to perform the behaviour (perceived behavioural control) [34]. The attitude towards the behaviour, the norm of the society and people that matter to the individual as well as the perceived difficulty or ease to perform the behaviour further influence the behavioral intention [34]. In a meta-analysis, Jong-Long et al. examined the efficacy of the theory of planned behaviour (TPB) in predicting breastfeeding [35]. TPB was able to explain and predict the intention to breastfeed accurately [35]. Previous study found a significant correlation between knowledge and attitude towards breastfeeding [36]. Therefore, measuring the level of knowledge on breastfeeding during infection outbreak is vital to explain the difference in attitude and intention to breastfeed among women.

Instead of utilising the more commonly used classical test theory, the researchers used Rasch analysis to validate the newly developed questionnaire. Rasch measurement of internal consistency is more robust and is less affected by random or unexpected responses, of which the presence was not identified during the pilot study [37]. The researchers did not include bogus items or instructed response items in questionnaires and did not use specific scales to detect inconsistent responses during the pilot study to identify random responses [37]. The Rasch model not only could map the respondents and the items side-by-side, but also could arrange them according to their measures of ability and item difficulty in a single map (Wright map). The Wright map represents the appropriateness of each item in the scale to assess the respondent's knowledge and ability [38]. The fitness of the responses to the expected model was measured using infit and outfit mean-square fit statistics. The more unexpected the responses compared to the model, the lower the estimate of the internal consistency.

From the Rasch analysis of the knowledge questionnaire, the researchers had identified eight problematic items with poor PT-measure correlation index. Out of the eight items, only three (K12, K13, and K21) were removed after reviewing the scalogram and the wright map. Based on the scalogram, these three items were easy items that could not discriminate respondents with different abilities. Despite some wrong responses that could represent random stochastic responses, most respondents answered the questions correctly. These three items were situated lower away from the person with the lowest ability difficulty index between -2.68 and -4.15 logit on the Wright map. Based on the logit transformation formula from proportion [39];

$$\text{logit} = \ln [\text{proportion} / (1-\text{proportion})]$$

People with the lowest ability had between 79% and 94% proportion of answering the questions correctly. Therefore, removing these items could increase the response rate without affecting the scale's reliability to discriminate respondents into two knowledge groups.

The researchers used Rasch analysis to assess the quality and validate the new questionnaire items based on the responses obtained from the pilot study. With Rasch analysis, multiple dimensions could be detected in the intention questionnaire. The multidimensionality of the questionnaire was further assessed using EFA. From EFA, the items in the questionnaire could be loaded perfectly into three components. The three components measured distinct elements contributing to the intention to breastfeed based on the TPB. The first component was attitude. It measured the respondents' attitude after considering the consequence of breastfeeding during pandemics and quarantine. The second component measured the respondents' perceived risk and difficulty to breastfeeding during the pandemic. This component was strongly related to their level of knowledge as assessed by the other domain of the questionnaire. The last component was practice. This section assessed the respondents' ability to continue breastfeeding during the COVID-19 pandemic via good infection prevention practice.

Limitation

The new questionnaire was piloted to only 93 respondents. This small sample size might lead to lower reliability and internal consistency of the questionnaire. However, the person separation index generated suffices to separate the respondents into two strata. Based on the initial analysis, the data had a KMO measure of sampling adequacy of above 0.60 and a significant Bartlett's test of sphericity. These two statistical measures further supported the adequacy of the sample size to run EFA. The researchers did not proceed with confirmatory factor analysis (CFA) in this study. This study aimed to explore and discover latent factors and thus supported the assessment of multidimensionality from the Rasch analysis rather than testing the fitness of the items to the factors. The respondents were among women whose children attended the paediatric clinic follow-up. Most of these children were born in the hospital and required hospital admission during the neonatal period. Previous admissions might have influenced the level of knowledge and the intention to continue breastfeeding among the respondents' post-discharge.

CONCLUSION

Using Rasch analysis, both dimensions of the questionnaire had an optimum person separation and person reliability index which was sufficient to discriminate the respondents into two strata. The multidimensionality of the intention domain was confirmed using Rasch analysis and EFA with three latent factors being identified. By using the Rasch measurement model, the newly developed BFID questionnaire was a reliable and valid tool to measure the knowledge and intention to continue breastfeeding during infection outbreaks.

Conflict of interest
The authors declare no potential conflict of interest.

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