



ORIGINAL ARTICLE

Development and validation of scale assessing the knowledge about breast feeding benefits and practices among antenatal and postnatal mothers in South India

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ABSTRACT

Background: Developing a scale to address the breastfeeding benefits and practices among antenatal and postnatal mothers is important as it helps in evaluating the change in the behavior, attitude, and practice with appropriate health education.

Aim: This study was done to develop and validate a scale to assess the knowledge about the breastfeeding benefits and practices in Tamil language among antenatal and postnatal mothers belonging to rural areas of Chengalpattu, South India.

Methods: We developed a scale to assess the knowledge about the benefits and practices of breastfeeding through literature review and expert opinion. Final version was administered among 377 antenatal and postnatal mothers in selected villages of rural Chengalpattu, South India. Construct validation was evaluated through principal component analysis (PCA). Confirmatory factor analysis was performed to check the goodness-of-fit of results. Internal consistency was evaluated through the Cronbach's alpha co-efficient.

Results: A total of 11 questions were finalized in the questionnaire following face and content validity. In PCA, three factor models were obtained with the eigen values of 4.18, 1.91 and 1.48, respectively. These three factors were able to explain for about 68.9% of the variance. Goodness-of-fit indices revealed satisfactory comparative fit indices (0.81), Tucker-Lewis Index (0.73), standardized root mean square residual (0.11), and root mean square error of approximation (0.14). The reliability co-efficient for the questionnaire was 0.80.

Conclusion: We have developed an internally valid and reliable tool for evaluating the knowledge about breastfeeding benefits and practices. The scale should thus facilitate and fast-track the development of a structured breastfeeding educational program for antenatal and postnatal mothers receiving care at the primary health care level.

Relevance for Patients: This questionnaire allows for the objective monitoring of effectiveness of educational activities and also help in comparing the efficiency of various educational models targeting the antenatal and postnatal mothers.

1. Introduction

The World Health Organization (WHO) has defined the exclusive breastfeeding as “giving baby only breast milk for the first 6 months without adding any additional drink including water or food” [1]. Infants should receive the complementary feeds only after the first 6 months of life and the breastfeeding should be continued at least until 2 years of age [2,3]. Breastfeeding is not only beneficial for the child but also has added benefits to

the mothers such as weight reduction, uterine involution, lactation amenorrhea (acting as natural contraception), and reduction in the risk of osteoporosis, ovarian and endometrial cancers [4].

The WHO has also reported that almost 2.4 million children die every year before the age of 5 years and almost two-third of this burden are associated with inappropriate infant feeding practices. Almost one-third of these deaths occur in low and low middle-income countries such as Nigeria and India [5]. Several factors are responsible for such high burden such as economic aspects (lack of money to feed themselves enough to be able to breast feed their child), opportunities to breastfeed or provide expressed breast milk to the child while working, responsibility for the society to value this role of women, and lack of knowledge about the breastfeeding benefits and practices. It is also an important public health responsibility to ensure the implementation of these proper breast-feeding practices such as exclusive breast feeding, initiation of complementary feeding, and continued breast feeding, throughout the country [6].

Implementation of educational programs like awareness sessions at antenatal clinics, anganwadis, community settings has not been governed by the competent authorities despite the availability of standard guidelines and program for promotion of breast feeding (Mother's absolute affection program) [7]. Therefore, analyzing the mothers' knowledge level about breastfeeding is just as important as it also indirectly examines the effect of a comprehensive and structured breastfeeding educational and health promotion program. However, the major challenges faced by the researchers around the world were the lack of validated tool to assess the knowledge and perform such analysis. Although, several scales have been developed and validated in different languages around the world, social, cultural, regional, and lingual contexts might vary across different settings [8-12]. Hence, developing a scale by incorporating these contexts in the local language of the mothers is essential to provide a more reliable finding. Hence, this study was done to develop and validate a scale to assess the knowledge about the breastfeeding benefits and practices in Tamil language among antenatal and postnatal mothers belonging to rural areas of Chengalpattu, South India.

2. Methods

2.1. Study participants

This was conducted as a part of community-based cross-sectional study among the antenatal and postnatal mothers in the rural field practice area of SRM Medical College and Research Institute, Kattankulathur block, located in Chengalpattu district, Tamil Nadu. The study was conducted during October 2019 to September 2020 (1 year). The eligibility criteria for the participants were either the women in their antenatal period or postnatal period (had a live birth up to 6 months before the survey). Line list of the antenatal and postnatal mothers were available in the rural health center. Simple random sampling using computer generated random number tables was performed to select 384 participants (out of which, 377 responded and completed the questionnaire) from this line list.

2.2. Development of scale

We developed a scale to assess the knowledge about the benefits and practices of breastfeeding. The items in this scale were developed from the literature review and expert opinion. A rapid review of literature was conducted in the databases and search engines such as MEDLINE, EMBASE, PubMed Central, Google Scholar, and ScienceDirect. We searched in these databases using the following set of terms: "Breastfeeding," "Validation Studies," "Antenatal Women," "Breastfeeding Practices," "Questionnaire Validation," "Postnatal Women" to identify the studies assessing the knowledge about the breastfeeding among antenatal and postnatal women, specifically on the benefits and practices part of breastfeeding knowledge. In total, 13 questions were designed as draft questionnaire. Then, face and content validity of the scale was ensured by reviewing the items for their appropriateness, relevancy, ambiguity, syntax, and difficulty. A team of public health experts under the department were involved to ensure the content validity of the scale. After the careful review, 11 out of 13 questions were retained at the end of validity process (eight questions on benefits of breastfeeding and three questions on practices of breastfeeding). Two questions were excluded as they were not appropriate for the theme of questionnaire. However, slight modification was done in the structure of some questions to make it easy, appropriate and relevant. Response to these items was graded based on the correctness of information provided by the participants to each of the questions.

2.3. Translation process

The questionnaire was initially devised in English language as per the literature review. We adopted a two-step process where the English version was translated into Tamil by two independent language experts (who were native Tamil speakers with English skills). They had no prior knowledge regarding the purpose, content, or interpretation of the questionnaire. Both the English and Tamil versions were compared for any discrepancy in information. Later, it was back translated to English to check the content and the final draft was obtained. This was further verified by an expert in the local language and the final version was constructed. Language and grammatical errors in the final translated Tamil version were rectified. Then, Tamil version was pilot tested among subsample of antenatal mothers for the assessment of difficulty in understanding the questions. The questionnaire was then modified based on the feedback during pilot testing.

2.4. Data collection

Data collection was started after obtaining informed written consent from the eligible participants. Privacy was ensured during the interview of participants. Data were collected using a pre-tested semi-structured questionnaire consisting of the following three sections: Section one consisted of the socio-demographic details; section two consisted of the questions related to breast feeding practices such as breast-feeding during illness, additional calorie and protein intake, section three consisted of questions related to benefits of breast feeding such as mother and child

bonding, hormonal benefits (lactational amenorrhea, involution of uterus and promotion of lactation), immunity and growth and development.

2.5. Statistical analysis

Data were entered into Microsoft Excel and analysis was done in Stata 14.2 (StataCorp, College Station, TX, USA). Continuous variables were summarized as mean (SD) or Median (IQR) depending on their distribution. Categorical variables were summarized as proportions. Intercorrelation of items was evaluated by the Bartlett test of sphericity and Kaiser Meyer Olkin (KMO) measures of sampling adequacy to assess the sample suitability and adequacy of sample size for factor analysis. After these assumptions were satisfied, exploratory factor analysis (EFA) was performed using principal component analysis (PCA) with varimax rotation to extract the factors and calculate factor loadings. Factors with eigenvalue more than one were interpreted as factor models. Factor loadings having values >0.4 were accepted for the characterization of its factor model [13,14]. Confirmatory factor analysis (CFA) was then performed to test the results obtained from EFA by determining the goodness-of-fit of factor models through the Chi-square statistic. Several fit indices such as comparative fit indices (CFIs), Tucker-Lewis Index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR) were utilized for the evaluation and comparison of descriptive goodness-of-fit: Acceptable cut-off for fit indices were CFI ≥ 0.90 , TFI ≥ 0.90 , SRMR ≤ 0.10 , and the RMSEA ≤ 0.08 [15]. Cronbach's alpha coefficient was calculated for assessing the internal consistency of the scale.

3. Results

3.1. Sociodemographic characteristics

In total, 384 women were approached to participate in the study, out of which 377 women consented and responded completed to the questionnaire (response rate = 98.2%), and they were included in the analysis. Sociodemographic details of the participants are provided in Table 1. The mean age of the participants was 24.9 (4.0) years. Majority (92.8%) belonged to 18–30 years age group; about one-fifth (20.4%) of the mothers had no formal education; more than half of the mothers (53%) were unemployed; majority (82.5%) belonged to Hindu religion; about 8.5% belonged to lower class of socioeconomic status as per modified BG Prasad classification; nearly three-fourth (71.1%) belonged to nuclear family; more than two-third (67.9%) were antenatal mothers and rest were postnatal mothers.

3.2. Psychometric properties

3.2.1. Construct validity

Before conducting EFA, Bartlett test of sphericity was done to check the intercorrelation level of the items in the scale and KMO measures of sample adequacy was performed. Bartlett test showed high significance (Chi-square 2120.56, $P < 0.001$) and KMO value was 0.753 indicating very good intercorrelation

Table 1. Sociodemographic characteristics of the study participants (n=377)

Characteristics	Frequency (%)
Age category	
18–30 years	350 (92.8)
>30 years	27 (7.2)
Educational qualification	
No formal education	77 (20.4)
Primary	99 (26.3)
Secondary	135 (35.8)
Higher	66 (17.5)
Occupation	
Employed	177 (46.9)
Unemployed	200 (53.1)
Socioeconomic status*	
Upper class	70 (18.6)
Upper middle class	86 (22.8)
Middle class	92 (24.4)
Lower middle class	97 (25.7)
Lower class	32 (8.5)
Family type	
Nuclear	268 (71.1)
Joint	109 (28.9)
Religion	
Hindu	311 (82.5)
Christian	29 (7.7)
Muslim	37 (9.8)
Antenatal/postnatal period	
Antenatal mothers	256 (67.9)
Postnatal mothers	121 (32.1)

*Modified BG Prasad classification 2019

between the items, and thus fulfilling the prerequisites for performing EFA.

Table 2 displays the pattern from EFA conducted with PCA method. Three factors having eigenvalue of 4.18, 1.91, and 1.48 were retained and factor loadings were generated using varimax rotation (Figure 1). Factor 1 consisted of five items and accounted for 32.02% variance, Factor 2 had three items explaining 21.70% variance, whereas Factor 3 had the remaining three items explaining 15.19% variance, thus together the three factors explained 68.9% of the variance. Factor 1 consisted of items describing the general benefits of breastfeeding, Factor 2 consisted of items describing the practices related to breast feeding, while Factor 3 had questions specifically related to specific hormonal benefits of breastfeeding.

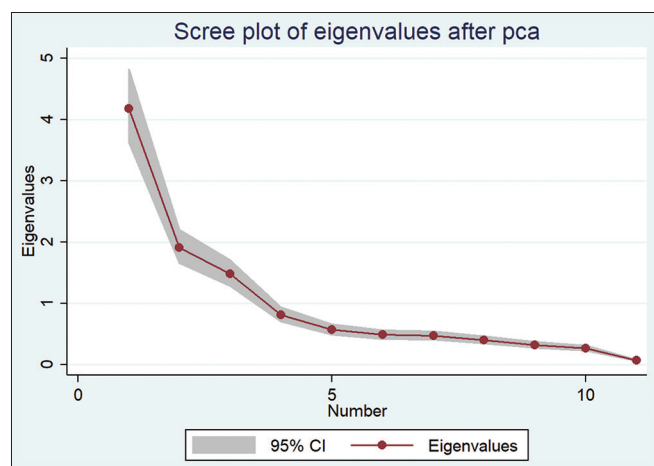
The model obtained through EFA was further analyzed by CFA. The three-factor models were generated using structural equation modelling as shown in Figure 2. However, item 1 from Factor 1 needed to be removed from the scale as the model was not converging. Hence, the CFA was performed with the final 10-item scale. Goodness-of-fit indices revealed satisfactory CFIs (0.81), TLI (0.73), SRMR (0.11) and RMSEA (0.14). Thus, the three-factor model revealed in the EFA showed adequate model fit.

Table 2. Results from exploratory factor analysis analyzed using principal component method (n=377)

Breast feeding knowledge assessment scale	Factor 1	Factor 2	Factor 3
Item 1: Who do you think are the beneficiary of breastfeeding?	0.9042	0.2622	0.0994
Item 2: Whether the breastfeeding promote child to mother bonding?	0.8804	0.0332	0.0416
Item 3: Whether the breastfeeding promote immunity?	0.8500	0.0787	0.0460
Item 4: Whether the breastfeeding promote growth and development?	0.7948	0.0173	0.1224
Item 5: Whether the breastfeeding promote mother to child bonding?	0.6073	0.4034	0.1256
Item 6: Do you think additional calorie required during lactation?	0.1868	0.8013	0.0394
Item 7: Do you think additional protein required during lactation?	0.0845	0.7401	0.1733
Item 8: Whether the breastfeeding can be continued during illness to mother or child?	0.2384	0.7284	-0.2300
Item 9: Whether the breastfeeding promote uterine involution?	0.0343	0.0673	0.8422
Item 10: Whether the breastfeeding act as natural contraceptive?	0.3126	-0.3874	0.6654
Item 11: Whether the breastfeeding promote lactation?	0.0934	0.5227	0.6240
Eigenvalue	4.18	1.91	1.48
Percentage of variance explained	32.02%	21.7%	15.19%
Cronbach's alpha		0.80	

Table 3. Inter-item correlation and reliability statistics of the breastfeeding knowledge questionnaire

Breast feeding knowledge assessment scale	Average inter-item correlation	Cronbach's alpha (if item deleted)
Item 1: Who do you think are the beneficiary of breastfeeding?	0.2460	0.77
Item 2: Whether the breastfeeding promote child to mother bonding?	0.2663	0.78
Item 3: Whether the breastfeeding promote immunity?	0.2666	0.78
Item 4: Whether the breastfeeding promote growth and development?	0.2722	0.79
Item 5: Whether the breastfeeding promote mother to child bonding?	0.2687	0.79
Item 6: Do you think additional calorie required during lactation?	0.2870	0.80
Item 7: Do you think additional protein required during lactation?	0.2947	0.81
Item 8: Whether the breastfeeding can be continued during illness to mother or child?	0.2993	0.81
Item 9: Whether the breastfeeding promote uterine involution?	0.3125	0.82
Item 10: Whether the breastfeeding act as natural contraceptive?	0.3211	0.82
Item 11: Whether the breastfeeding promote lactation?	0.2887	0.80

**Figure 1.** Screen plot test-ratio of the number of extracted factors to the Eigenvalues.

3.2.2. Reliability (internal consistency)

Table 3 shows the inter-item correlation and reliability statistics of the scale. The reliability coefficient (Cronbach's alpha) for the overall questionnaire was found to be 0.80 indicating acceptable internal consistency. However, the deletion of item 1 as a result of CFA findings lead to reduction in the reliability coefficient

(0.80 \rightarrow 0.77). The Cronbach's alpha for factor 1, 2 and 3 were 0.74, 0.80 and 0.53, respectively.

4. Discussion

We know that the knowledge about the breastfeeding benefits and practices are one of the key components of the health education provided for the antenatal and postnatal mothers during their regular follow-up visits. Hence, it is logical to focus the educational and promotional activities on this population. However, any educational program or interventions should be evaluated on regular intervals, to understand the effect of these educational activities. It is also not possible to compare the activities that are not found to be methodologically uniform and measurable. Hence, we need to have an appropriate questionnaire to evaluate the program or activities. Although several questionnaires have been developed and validated over the years, we wanted to develop a questionnaire that could be used in our region. In addition, we attempted to develop a scale that is appropriate with the local culture, as the Indian women have several cultural, traditional practices and beliefs in relation to the breastfeeding that are being passed down across several generations. Hence, we attempted to develop and validate a scale measuring the knowledge about breastfeeding benefits and

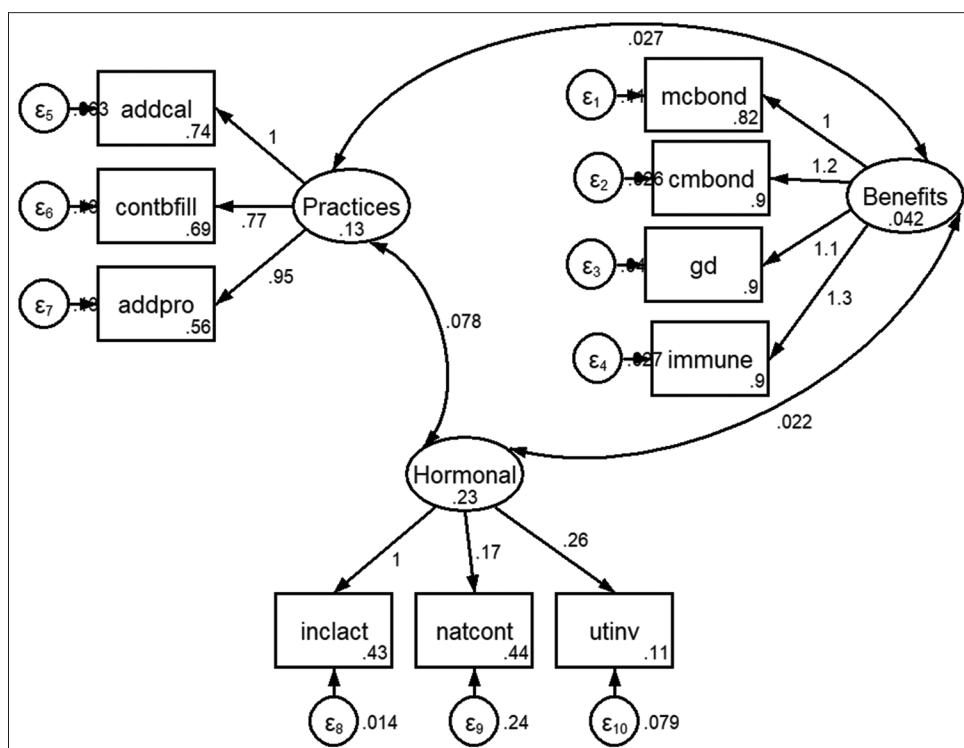


Figure 2. Structural equation modelling of the breastfeeding knowledge assessment scale structure. General Benefits (Factor 1), Practices (Factor 2), Specific hormonal benefits (Factor 3).

practices among antenatal and postnatal mothers in Chengalpattu, South India.

Our results indicated a three-factor model for the scale, with Factor 1 containing the questions related to general benefits of breastfeeding, Factor 2 on breastfeeding practices, and Factor 3 on specific breastfeeding benefits (hormonal benefits). Previous studies attempting to develop and validate a breastfeeding knowledge questionnaire has reported a widely variation in the factor components [8-12,16,17]. However, the reason for such variation could be the difference in the target population for the assessment of knowledge, educational activities and program recommendations relevant to the study setting. In spite of the differences in the scale structure, our questionnaire was found to be acceptably valid as per the CFA indices.

The reliability assessment showed an overall Cronbach’s alpha of 0.80 for the developed scale. This finding was also comparable with the previous regionally developed versions of breastfeeding knowledge assessment questionnaire across different settings [8-12,16,17]. This highlights the fact that the developed scale has acceptable internal consistency similar to other regional forms of the questionnaire, despite the lingual, regional and cultural differences.

Our study had many strengths. To the best of our knowledge, this was the first study to develop and validate a Tamil version of knowledge assessment scale about breastfeeding among antenatal and postnatal mothers in an Indian setting. Homogeneity among the study participants in the cultural, economic and social context might help in better generalization of study results among the mothers. Despite these strengths, our study also had

certain limitations. We were not able to assess the test and retest reliability as the study was done at a single cross-sectional point of time. Moreover, the mothers were recruited from the rural areas, and therefore our sample may not be representative of all the antenatal and postnatal mothers present in the community. Hence, further research exploring the external validity of the questionnaire needs to be done to fix cut-off points for assessing the breastfeeding knowledge among antenatal and postnatal mothers. We have only assessed the physical aspects of breastfeeding benefits and practices, while the economic and societal aspects are not covered in the developed questionnaire. Hence, future studies can focus on adding these components and validate the same to comprehensively assess all the domains of breastfeeding.

Our study findings have several programmatic implications at a primary care level. This questionnaire allows for the objective monitoring of effectiveness of educational activities and also help in comparing the efficiency of various educational models targeting the antenatal and postnatal mothers. This will help in speeding up the process of developing a unique breastfeeding educational plan and the implementation of this plan in the routine antenatal clinics at the primary health centers.

Developing and validating this questionnaire in Tamil language have provided a scientific basis for applying this scale among Tamil-speaking mothers and capture their level of knowledge about breastfeeding benefits and practices. It emphasises the application of such simple instruments at routine antenatal and postnatal clinics in primary health center, at least once during their entire visit schedule. This could help to identify those with

low level of knowledge and provide them necessary counseling about the benefits of breastfeeding and training on breastfeeding practices. Further research is warranted to establish the construct validity of an instrument, as it is a continuous process of evaluation, re-evaluation, refinement, and development. Future directions in research need to be consider for tackling the cross-cultural measurement invariance.

5. Conclusion

We have developed a scale to assess the breastfeeding knowledge about the benefits and practices among the antenatal and postnatal mothers. This scale was found to be valid and reliable tool for evaluating the knowledge about breastfeeding benefits and practices. The scale should thus facilitate and fast-track the development of a structured breastfeeding educational program for antenatal and postnatal mothers receiving care at primary health care level.

Conflicts of Interest

The authors declare no conflicts of interest.

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