Factors related to exclusive breastfeeding in Thai adolescent mothers: Concept mapping approach

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Abstract

The advantages of exclusive breastfeeding for the first 6 months are well-known. Unfortunately, adolescent mothers have lower rates of breastfeeding exclusivity and shorter duration of breastfeeding. There is limited evidence regarding exclusive breastfeeding determinants in adolescent mothers. The purpose of this study was to obtain adolescent mother-generated factors related to exclusive breastfeeding at 6 months. A mixed-methods design was conducted through concept mapping. Thirty adolescent mothers aged 15–19 years who had wide range of exclusive breastfeeding experiences brainstormed about specific factors. They then sorted and rated the statements into key clusters. Finally, half of the participants were involved in the interpretation of the mapping results and the creation of pathway diagrams. Data were analysed by multivariate statistics in the Concept System Global MAX program. The results showed that the adolescent mothers brainstormed about 104 statements on the factors related to exclusive breastfeeding at 6 months. These factors can be categorized into the following six key clusters: (a) breastfeeding advantages; (b) facilitating factors and necessary skills; (c) promotion and support needed; (d) community and social influence; (e) internal and external barriers; and (f) key problems in families. The pattern matching provided understanding of how key clusters are important to successful breastfeeding through comparing three groups of exclusive breastfeeding durations. Finally, the relationships of the stated factors were drawn in pathway diagrams. Exclusive breastfeeding experiences among Thai adolescent mothers showed complexity involving multilevel influences of social systems. The promotion of optimal breastfeeding should recognize the influences of both personal and environmental factors.

KEYWORDS

adolescent mothers, exclusive breastfeeding, mixed methods, Thailand

1 | INTRODUCTION

It is well established that breastfeeding is the best nutrition to save lives, prevent illness, and ensure healthy growth and development through the first 1,000 days of life (Wrottesley, Lamper, & Pisa, 2016). The World Health Organization recommends exclusive breastfeeding for the first 6 months of an infant's life with continued

breastfeeding until 2 years of age or beyond, along with nutritionally adequate, safe, and appropriate complementary foods (World Health Organization & United Nations Children's Fund, 2003). Although breastfeeding initiation rates in Thailand have increased over the last 25 years (Hangchaovanich & Voramongkol, 2006), Thailand currently has the lowest rate of exclusive breastfeeding in the Asia/Pacific region. In fact, rates only slightly increased from 15.1 to 23.1%

between 2009 and 2016 (National Statistical Office & United Nations Children's Fund, 2016; Organization for Economic Co-operation and Development, 2012). In particular, adolescent mothers have lower rates of breastfeeding initiation and exclusive breastfeeding with shorter total duration of breastfeeding than adult mothers (Uzun, Orhon, Baskan, & Ulukol, 2013).

The United Nations Children's Fund (2015) has reported that Thailand has the second highest teenage pregnancy rate in Asia; 16% of all births involve adolescents between 15 and 19 years of age. Annually, approximately 130,000 adolescents deliver babies. Adolescents have a unique and difficult situation from pregnancy to motherhood where they are faced with simultaneously adjusting to psychological tasks and managing transitions, especially during unplanned pregnancy (DeVito, 2010). In Thai culture, adolescent mothers encounter the negative viewpoints of social norms prejudging their unsuitability for parenthood, perceived family and social pressures, no power to negotiate anything in the household, and no economic authority. In addition, many girls are abandoned once they become pregnant and become single mothers (The State of Thailand's Population, 2013). Given the complexities of adolescent motherhood, the promotion of optimal infant feeding practices, including exclusive breastfeeding, can have a potentially large public health impact.

The significant research findings show that adolescent mothers experience the same barriers as most women. Due to their age and social situations, however, they describe factors associated with infant feeding practices somewhat differently from adult mothers. Adolescent mothers often lack breastfeeding knowledge and skills, lack of breastfeeding support from families and health providers, and perceive breastfeeding difficulties such as latching techniques, positioning, management of breastfeeding problems, and fatigue (Monteiro et al., 2014; Nesbitt et al., 2012; Tucker, Wilson, & Samandari, 2011) as general breastfeeding concerns (Balogun, Dagvadorj, Anigo, Ota, & Sasaki, 2015). At the same time, the evidence reports a number of unique troubles concerning breastfeeding decisions such as infant dependency, physical image, and social criticism/judgement (Hunter & Magill-Cuerden, 2014; Hunter, Magill-Cuerden, & McCourt, 2015). Unfortunately, there is limited published data on exclusive breastfeeding determinants in adolescent mothers. Additionally, most qualitative studies have been conducted in western countries, which limit the generalizability to Thailand. In fact, little is known about Thai adolescent mothers' breastfeeding experiences in terms of how teenage mothers generate decisions regarding exclusive breastfeeding and influencing factors. If the factors and unique needs of optimal exclusive breastfeeding in adolescent mothers could be revealed, exclusive breastfeeding promotion might become more effective when linked with the needs of adolescent mothers.

To address this gap, the researcher used concept mapping to identify the factors related to exclusive breastfeeding among Thai adolescent mothers at 6 months. To the best of our knowledge, this is the first study to use concept mapping to investigate breastfeeding among adolescent mothers. This study used the concept mapping method to (a) obtain participant-generated factor lists related to exclusive breastfeeding at 6 months among adolescent mothers; (b) identify patterns leading to breastfeeding success or failure among adolescent mothers; and (c) produce a visual display of potential pathways driving

Key messages

- The present study is the first to employ the concept mapping method to identify adolescent-generated factors related to exclusive breastfeeding at 6 months among Thai adolescent mothers.
- Breastfeeding advantages, facilitating factors and necessary skills, and promotion and support needs should be strengthened sequentially to promote 6-month exclusive breastfeeding among Thai adolescent mothers.
- The negative influences in Thai communities and society, internal and external barriers, and key problems in family should be resolved or minimized in relation to breastfeeding practices.
- Understanding adolescent-generated factors and the unique needs of optimal exclusive breastfeeding is important for developing effective breastfeeding interventions tailored to meet the needs of Thai adolescent mothers.

the relationship between those factors and exclusive breastfeeding at 6 months. These data will guide the development of an intervention aimed at increasing optimal infant feeding practices for adolescent mothers.

2 | METHODS

2.1 | Design

The concept mapping methodology was applied to identify critical issues faced by Thai adolescent mothers in terms of exclusive breastfeeding within the context of Thai culture in order to determine relative priority and establish areas of consensus and divergence (Trochim, 1989). Several logical and progressive steps that engaged adolescent mothers in the research were used to produce a concept map showing how individual items are interrelated and clustered into concepts with rating of importance. The end products were participant-generated models reflecting these relationships. Multidimensional scaling and cluster analysis were able to identify six key domains related to exclusive breastfeeding at 6 months. Concept mapping-integrated qualitative and quantitative methods generated a framework for understanding the relationships of exclusive breastfeeding determinants at 6 months in Thai adolescent mothers.

2.2 | Setting

Subjects were recruited from a 2,600-bed university hospital in Bangkok, Thailand. This setting is a tertiary hospital receiving patients transferred from all regions in Thailand. Therefore, there is a diversity of socioeconomic status such as family income, educational level, and occupation. However, the majority of patients, also subjects of this

study, came from low to middle socioeconomic status family; because it's a government hospital that services mostly those with reimbursement from the universal coverage program or government officers.

2.3 | Sample

During April–May 2016, sample was purposively recruited from the list of adolescent mothers (aged 15–19 years) admitted to postpartum units who had given birth from 5 to 7 months before data collection with the following inclusion criteria: a) being first-time mothers, b) having exclusive breastfeeding experiences for the first 6 months, and c) being able to understand and speak Thai language. The researcher sought participants who were willing to participate in this study without coercion by telephone.

According to Kane and Trochim (2007), sample size for concept mapping range between 10 and 40. Therefore, 30 adolescent mothers were voluntarily recruited into concept mapping activities according to eligibility criteria with 10 adolescent mothers in each subgroup based on the following exclusive breastfeeding durations: 4–6 months, 1–3 months, and less than 1 month. Uniquely, each section of concept mapping activities can use different numbers of participants. According to the three steps of concept mapping, 30 mothers participated in two sequential steps (brainstorming and sorting and rating of statements). Half of the participants ($n = 15$) were then randomized from the second step to the final step (interpretation of the mapping results and the creation of pathway diagrams; Trochim, 1989). However, two subjects dropped out during the second set of activities involving sorting and rating statements. These two adolescent mothers were aged 17 and 19 years and possessed characteristics that were similar to the remained subjects.

2.4 | Ethical considerations

The Ethics Committee for Research in Human, Faculty of Medicine Siriraj Hospital, Mahidol University, Bangkok, Thailand (EC3 070/2559) provided ethical approval for this study. The concept mapping activities were conducted after written consent forms had been obtained from the participants or the participants' parents in cases involving participants under 18 years of age.

2.5 | Measurement

The breastfeeding information form has six close-ended questions aimed at identifying maternal and infant age, current breastfeeding status, timing of the introductions of formula milk, water, and other supplemental foods. The sort record sheet was used in the second step of structuring in order to obtain the interrelationships of the statements. The participants were able to sort all statements from the brainstorming activity into only five to 10 clusters of ideas representing unique concepts for the participants.

The rating sheet was used in the second step of structuring. All of the statements from the brainstorming session were put into a rating table on the left side, whereas the right side of the sheet contained five-level Likert scales for rating important statements (1 = *relatively*

unimportant to 5 = *extremely important*). Focus questions were asked to rate the items in terms of individual importance and how the adolescent mothers thought the factor affected exclusive breastfeeding success at 6 months.

In regard to the content validity of the questionnaires, three experts specializing in breastfeeding were asked for recommendations about content suitability before implementation.

2.6 | Data collection

Concept mapping proceeded in a series of steps. Over three weekends in May–June 2016, the following three major activities were completed: brainstorming; sorting and rating of factor statements; and interpretation of the mapping results and creation of the pathway diagrams.

For brainstorming, each participant provided multiple responses to the focal question, "What are the factors related to exclusive breastfeeding at six months among Thai adolescent mothers?" The definition of exclusive breastfeeding was clarified by the statement that breastfeeding refers to an infant who receives only human milk from his/her mother, or expressed human milk, and no other liquids or solids, not even water. In turn, successful exclusive breastfeeding at 6 months means a mother who can provide exclusive breastfeeding from birth to 6 months. Thirty participants provided 399 responses regarding the determinants of exclusive breastfeeding at 6 months. To reduce and edit the statement set, the "idea synthesis" process took place to a) limit meaning of each statement to a single idea; b) ensure that each statement is relevant to the focus question; c) reduce the statements to 120 items or fewer; and d) edit statements for clarity. The facilitator led this process relying on discussion and consensus according to simple guidelines (Kane & Trochim, 2007). Researcher highlighted keywords in the recorded ideas, it became easier to sort redundant ideas, with added 399 statements in a spreadsheet. Thirty participants could form a consensus on which original idea by voted and edited judiciously. These could be consolidated into 104 distinct statements. Twenty-eight adolescent mothers sorted the total distinct statements into separate clusters based on their own conceptual thinking. Next, the adolescent mothers were asked to provide a name and basic description for each cluster. All participants completed the sorting activity.

Using a 5-level Likert scale (1 = *relatively unimportant* to 5 = *extremely important*), the 28 adolescent mothers were asked to rate each statement based on their individual perceptions of the importance of each statement concerning successful exclusive breastfeeding at 6 months.

Once the participants had finished the sorting and rating activities, the data were immediately translated from Thai to English and confirmed by a bilingual professional translator. The data was then entered into the concept system software, which analysed through multidimensional scaling and cluster analysis. To confirm and correct the participants' views and experiences, a group of 15 participants discussed the map results, the number of total clusters, and tentative names for representing their ideas. The concept system software allowed for easy display of maps with different numbers of clusters.

The groups ended up with maps in six clusters. Each group activity was approximately 1.5 hr in length.

After the end of the discussion on the map results, the participants became more familiar with the content and information emerging from the maps and factors. Consequently, the last group activity involved the pathway diagrams and was approximately 1.5 hr in length. The pathway diagram extended the analysis to explore the mechanistic pathways among the factors identified and the outcome of interest through the creation of stories by the participants (Burke et al., 2005). The participants broadened the data of the maps and undertook group discussions about how the aforementioned factors affected successful/unsuccessful exclusive breastfeeding. In small groups of three and four members each, the participants were asked to discuss and diagram the relationships among the items within the clusters. They were then asked to create a story that would share their ideas about how the items within the clusters were interrelated and associated with exclusive breastfeeding outcomes. The participants focused upon both the whole set of clusters as well as those clusters that tended to receive higher ratings for their correlations with exclusive breastfeeding outcomes. All pathway diagrams were then rediscussed with comments from the entire group.

2.7 | Data analysis

The concept mapping was supported by the use of software called the "Concept System Global MAX". This program applied multivariate statistical analysis through the multidimensional scaling and Ward's hierarchical cluster analysis of the sorted statements. In addition, the breastfeeding data was analysed based on descriptive statistics including frequency, mean, and percentage. The data analysis was composed of the following three main steps for data analysis:

First, a similarity matrix was created from the sorted data in two steps. Initially, the results of the items sorted by each person were put into a square table with multiple rows and columns matching the number of statements. This individual matrix was termed "a binary symmetric similarity matrix." Next, the combined group constructed a similarity matrix in which individual cells were summed across individual matrices to include items from all participants. The value in the matrix for any given pair of statements indicated how many people had placed that pair of statements in a cluster. The values ranged from 0 to 30. A high value in this matrix indicates that the statements are conceptually similar in some way, whereas a lower value implies that the statements are conceptually less similar (Kane & Trochim, 2007).

Second, a multidimensional scaling of similarity matrix was used to locate each statement as a separate point on a two-dimension (X, Y) map. To assess the degree to which the configuration of the point

map matches the data from the similarity matrix, the stress value was calculated within a range of 0 to 1 in which a lower value indicated better overall fit. Any value between 0.2 and 0.3 was considered appropriate (Kane & Trochim, 2007). In the present study, a suitable stress value was 0.24. Ward's hierarchical cluster analysis of the multidimensional scaling (X, Y) coordinates to partition the points (statements) on this map into aggregate groups to reflect similar potential concepts in the contiguous areas of the map. The task for the analysis was to decide the number of clusters into which the statements should be grouped as the final number of cluster solutions ranging from 5 to 10 clusters (Kane & Trochim, 2007). This study presented six clusters through consensus while interpreting the map.

Finally, the rating data were coded into a data matrix in which each row or line represented an individual participant and each column was a statement. The average values for each statement could be calculated across participants by obtaining summary statistics for each column. The ratings were combined with the basic computed maps to produce a point rating map, a cluster rating map, and pattern matching.

2.8 | Rigour

The quality of this study relied on an appraisal for the unique concept mapping approach including validity and reliability (Kane & Trochim, 2007; Rosas & Kane, 2012). For the validity in this study, the stress value indicated the relationship between the input matrix and the distances on the map in which a high value meant that the map did not represent the input data, whereas a low stress value suggested better overall fit. The appropriate range of stress value was approximately 0.2 and 0.3 (Kane & Trochim, 2007). This study reported suitable internal validity of the stress value at 0.24. The adolescent mothers involved at every stage of the activities confirmed the mapping results. The variety of exclusive breastfeeding experiences increased the opportunity for a broad representation.

In terms of reliability, concept mapping involves a unique method of assessing reliability by focusing on consistency across the assumed relatively homogeneous set of participants. In other words, concept mapping evaluates the reliability of the similarity matrix or map, but not individual statements (Rosas & Kane, 2012). This study employed the Spearman-Brown correlation to analyse the split-half reliability, which reported the average split-half total matrix reliability at 0.81.

3 | RESULTS

A total of 30 adolescent mothers participated in this study based on exclusive breastfeeding duration (Table 1). Statistically significant

TABLE 1 Demographic and exclusive breastfeeding information for the sample (N = 30)

	Total M (SD)	EBF 4–6 months n = 10 M (SD)	EBF 1–3 months n = 10 M (SD)	EBF less 1 month n = 10 M (SD)
Mother age (years)	17.20 (1.42)	18.00 (1.40)	17.42 (1.41)	16.30 (0.80)
Infant age (months)	6.33 (0.50)	6.70 (0.40)	6.20 (0.40)	6.20 (0.40)
EBF duration (months)	3.00 (1.90)	5.40 (0.69)	2.33 (0.70)	0.22 (0.66)

Note. EBF: exclusive breastfeeding; SD: standard deviation.

differences were found in maternal ages between the group of exclusive breastfeeding for less than 1 month and exclusive breastfeeding for 4–6 months ($t = -3.1$, $p = 0.01$). Although the remaining pairs of exclusive breastfeeding duration had no statistically significant differences, maternal age differences between the groups with exclusive breastfeeding for less than 1 month and 1–3 months ($t = -2.0$, $p = 0.06$), 1–3 months and 4–6 months ($t = -0.8$, $p = 0.40$) were reported.

3.1 | Brainstorming: Factors related to 6-month exclusive breastfeeding

The brainstorming activity identified 104 statements as factors related to exclusive breastfeeding at 6 months among adolescent mothers. Collectively, these factors represented a synthesis of exclusive breastfeeding experiences through the specific statements generated by adolescent mothers. The statements were heterogeneous in terms of content and individual aspects, including 63 positive statements and 41 negative statements on exclusive breastfeeding at 6 months (Table 2).

3.2 | Sorting data: Six clusters related to 6-month exclusive breastfeeding

The numbers in Figure 1 show the statements comprising the clusters corresponding with the statements in Table 2. The statements located closer to one another on the map represent similar ideas as determined by the multidimensional scaling analyses. Hierarchical cluster analysis was applied to create a cluster map with the participants' agreements to identify six clusters as major groups of factors on exclusive breastfeeding at 6 months. One hundred and four statements were grouped into six clusters, including the clusters of breastfeeding advantages (11 statements), facilitating factors and necessary skills (23 statements), promotion and support needs (29 statements), community and social influence (7 statements), internal and external barriers (29 statements), and key problems in family (5 statements) (Table 2, Figure 1).

3.3 | Rating data: Importance of clusters on successful 6-month exclusive breastfeeding

The cluster rating map presents the average rating importance for all statements in each cluster (Figure 1). The layers on the clusters indicate the average value where more layers imply a higher average rating of cluster importance in relation to successful exclusive breastfeeding at 6 months. For example, breastfeeding advantages were more important through five cluster layers with an average rating value of 4.17–4.51 than key problems in family, which had only one cluster layer with an average rating value of 2.82–3.16. According to the comprehensive data, the cluster rating information was ranked by the average importance rating of clusters on successful exclusive breastfeeding at 6 months, including breastfeeding advantages (4.51), facilitating factors and necessary skills (4.25), promotion and support needed (3.96), community and social influences (3.52), internal and external barriers (3.22), and key problems in family (2.82).

Another way to examine the rating data is to use a graph called pattern matching (Figure 2). In this method, the average importance rating for each cluster was plotted by dividing into three groups of exclusive breastfeeding experiences (less than 1 month, 1–3 months, and 4–6 months). The results illustrated how the clusters had different degrees of importance among the three groups of exclusive breastfeeding durations and what clusters are likely to promote or demote prolonged exclusive breastfeeding durations. For instance, the cluster of breastfeeding advantages was rated highest in relation to the groups with exclusive breastfeeding for 4–6 months (4.86) and 1–3 months (4.70), whereas the same cluster was ranked third in terms of importance for the group with exclusive breastfeeding for less than 1 month (3.92).

3.4 | Diagramming pathway: Correlation between the statement factors in clusters and 6-month exclusive breastfeeding

In this creative activity, the adolescent mothers drew pictorial results in independent designs corresponding with their exclusive breastfeeding experiences. Some pathway diagrams illustrated dynamic relationships, whereas others showed directional relationships in clusters. The first three diagrams can be described as follows:

First, the adolescent mothers explained breastfeeding benefits in terms of the following three dimensions: maternal, infant, and financial benefits, which are interrelated in dynamic ways for a success pathway of optimal exclusive breastfeeding (Figure 3).

Second, the pathway of the facilitating factors and necessary skills cluster explains the complex relationships of the personal aspects (Figure 4). According to the rating information, this diagram can indicate the pathways for the top three factors in this cluster, including patience and effort, firm commitment to breastfeeding, and spending time with infants. For instance, "patience and effort" is the consequence of "breastfeeding as a maternal role"; whereas "breastfeeding as a maternal role" is a cause of "firm commitment to breastfeeding." "Spending time with infants" illustrates the bi-directional correlations between "be able to go outside with infant" and "breastfeeding as a part of a daily routine."

Third, adolescent mothers illustrated the complex dynamics presenting two main sources of breastfeeding support needs from nurses and families. Regarding nursing support, four subgroups of breastfeeding support needs were illustrated in the dynamic relationships of breastfeeding knowledge and skills, preparation of breastfeeding in public and collaboration between nurses and family members, particularly with emotional support as an essential factor. This pathway diagram shows how nursing support directly affects family perceptions and subsequently has indirect influences over successful exclusive breastfeeding for 6 months (Figure 5).

4 | DISCUSSION

The concept mapping process is valuable in that it generates various domains with importance in consideration of exclusive breastfeeding at 6 months through the language of adolescent mothers. Over a

TABLE 2 Statements and ratings generated by participants in the concept mapping session. Statements are presented by cluster (104 statements)

Statements (numbers)	Importance rating
Cluster 1: Breastfeeding advantages	4.51
Breastfeeding benefits infant health ^a (18)	4.79
Breastfeeding promotes normal digestion and excretion ^a (19)	4.71
Breastfeeding is best ^a (38)	4.71
Breastfeeding is more nutritious ^a (39)	4.64
Breastfeeding promotes love and bonding ^a (2)	4.57
Breastfeeding helps cut costs ^a (26)	4.57
Breastfeeding enhances affection and closeness ^a (4)	4.54
Breastfeeding gives a sense of recognition ^a (17)	4.43
Happiness in breastfeeding ^a (1)	4.43
Happiness in responding to infant's needs ^a (3)	4.18
Breastfeeding enjoyment ^a (5)	4.00
Cluster 2: Facilitating factors and necessary skills	4.25
Patience and effort ^a (44)	4.79
Firm commitment to breastfeeding ^a (45)	4.71
Spending time with infants ^a (40)	4.61
Eating foods to enhance breast milk supply ^a (49)	4.50
Sufficient breast milk supply ^a (23)	4.36
Breastfeeding self-efficacy in pregnancy ^a (60)	4.36
Ability to go on outings with infants ^a (42)	4.32
Selecting a suitable breastfeeding position ^a (15)	4.32
Freedom in breastfeeding decisions and practices ^a (12)	4.32
Breastfeeding as a maternal role ^a (16)	4.29
Confidence about effective suckling and latching at discharge ^a (10)	4.21
Confidence in breastfeeding positions at discharge ^a (9)	4.21
Equipment for stocking up ^a (103)	4.21
Breastfeeding as a part of daily routines ^a (95)	4.21
Sufficient milk supply upon return to work/study ^a (24)	4.18
Equipment to facilitate breastfeeding (i.e., breast pads and cloth covering) ^a (104)	4.14
Having an easy baby ^a (41)	4.11
Breastfeeding in side-lying positions and resting ^a (11)	4.07
Breastfeeding convenience ^a (48)	4.04
Enjoyment of rapid recovery after childbirth ^a (13)	4.04
Knowledge about infant's cues ^a (75)	3.96
Assessment of milk supply adequacy ^a (25)	3.93
Enjoyment of rapid weight loss ^a (14)	3.89
Cluster 3: Promotion and support needed	3.96
Detailed and individual facts in expressing/pumping breast milk ^a (51)	4.61
Preparation and use of breast pump properly and safely ^a (52)	4.57
Detailed benefits of EBF for 6 months since pregnancy ^a (32)	4.54
Hands-off technique and assessment ^a (86)	4.43
Family agreement with optimal EBF ^a (31)	4.39
Continuously teaching of breastfeeding skills and practice ^a (50)	4.36
Families ease housework and infant care ^a (30)	4.32
Information for solving common problems in breastfeeding since pregnancy ^a (57)	4.29
Nurses and family members offer similar advice ^a (28)	4.21
Quick receipt of proper assistance and solutions ^a (58)	4.14
Nursing rooms are available in public ^a (22)	4.14
Key family members offer encouragement ^a (27)	4.14
Nurses offer enough time ^a (87)	4.07

(Continues)

TABLE 2 (Continued)

Statements (numbers)	Importance rating
Support from a lactation consultant ^a (8)	4.04
Casual responses to nurses ^a (34)	4.00
Friendly advice and assistance ^a (85)	4.00
Clarification of certain traditional and family beliefs ^a (54)	3.93
Advice for breastfeeding in public ^a (21)	3.93
Nurses are mediators in resolving family conflict ^a (53)	3.79
Financial help from family ^a (29)	3.71
Addition of water by a key family member ^b (78)	3.68
Introduction of rice gruel by a key family member ^b (80)	3.64
Management of breastfeeding with work/study ^a (92)	3.61
Advice of women with previous experience ^a (81)	3.54
Support by teachers/colleagues ^a (93)	3.39
Support for a place and equipment at school/work ^a (56)	3.39
Solutions for infant sleeping for a long time ^a (76)	3.36
Introduction of pureed bananas by a key family member ^b (79)	3.36
Positive experiences of family members ^a (6)	3.14
Cluster 4: Community and social influences	3.52
Breastfeeding information is easy to access and offers independence ^a (33)	4.43
Breastfeeding is natural for mothers as a social value ^a (37)	4.39
Formula feeding is normal in community ^b (99)	3.54
Advertising of infant formula companies ^b (98)	3.32
Risks of formula feeding from other people ^a (7)	3.21
Formula feeding is convenient ^b (101)	2.93
The benefits of formula feeding are equal to breastfeeding ^b (100)	2.79
Cluster 5: Internal and external barriers	3.22
Infant's choking with a large volume of milk ^b (63)	4.11
Breast engorgement pain every 1–2 hours ^b (61)	4.04
Breastfeeding is time-consuming ^b (68)	3.89
Sore/cracked nipples cause pain ^b (46)	3.71
Delayed correction of a tongue tie ^b (94)	3.64
Short/flat nipples ^b (47)	3.54
Tiredness with breastfeeding in a sitting position at night ^b (69)	3.54
Returning to work/study ^b (43)	3.46
Unintended pregnancy interrupts breastfeeding preparation ^b (102)	3.43
Maternal medications and effects on breastfeeding ^b (97)	3.43
Post-caesarean section pain ^b (35)	3.43
Breast milk leakage ^b (64)	3.43
BF requires mothers to eat more ^b (90)	3.39
Breast engorgement limits outings ^b (62)	3.39
Episiotomy pain ^b (36)	3.36
Lack of breastfeeding experience ^b (84)	3.25
Insufficient rest and sleep ^b (67)	3.21
Maternal health problems ^b (96)	3.18
Lack of freedom in selecting favourite foods ^b (89)	3.14
Tired of eating traditional foods ^b (88)	3.11
Changing study plans ^b (55)	3.07
Breastfeeding is exhausting ^b (66)	2.96
Infant wakes more frequently at night ^b (77)	2.96
Breastfeeding is more difficult ^b (59)	2.86
Infant is resistant and refuses breastfeeding ^b (65)	2.82
Infant dependency ^b (70)	2.71

(Continues)

TABLE 2 (Continued)

Statements (numbers)	Importance rating
Want to go out with friends ^b (71)	2.39
Frustrated and angry when baby cries ^b (74)	2.04
Embarrassed when breastfeeding in public ^b (20)	2.00
Cluster 6: Key problems in family	2.82
No power to negotiate with family members ^b (82)	3.11
Working to receive acceptance from family members ^b (91)	3.00
Breastfeeding pressure and stress from family members ^b (83)	3.00
Problems and conflicts with family ^b (72)	2.64
Family concerns about EBF babies being small and thin ^b (73)	2.36

Note: EBF: exclusive breastfeeding.

^aPositive statements related to exclusive breastfeeding at 6 months.

^bNegative statements related to exclusive breastfeeding at 6 months.

Cluster Legend

Layer Value

1	2.82 to 3.16
2	3.16 to 3.50
3	3.50 to 3.83
4	3.83 to 4.17
5	4.17 to 4.51

FIGURE 1 Cluster rating map presented the average rating of important for all statements in six clusters on exclusive breastfeeding for 6 months

FIGURE 2 Pattern match comparing the average rating of six clusters between exclusive breastfeeding of less than 1 month, 1-3 months, and 4-6 months. Note: EBF: exclusive breastfeeding

FIGURE 3 Diagram of the pathways in the breastfeeding advantages. Note. BF: breastfeeding; EBF: exclusive breastfeeding

FIGURE 4 Diagram of the pathway in the facilitating factors and necessary skills

hundred statement factors contained multilevel factors in a social system. All of the statements were classified into six clusters that resulted from the multivariate analysis and participant interpretations in ordering by cluster the average rating of important influence on successful exclusive breastfeeding at 6 months.

The adolescent mothers perceived the first cluster of breastfeeding advantages as the most important factor influencing successful exclusive breastfeeding. Most of the factors of breastfeeding benefits illustrated the advantages of maternal emotion, while nearly half of the factors described infants' health benefits and only one factor was concerned with financial benefits. However, the advantages of infants' health were all placed in the top four cluster rankings. The cost-saving benefits and psychological value for the adolescent mothers were mentioned sequentially. According to previous studies, the fact that breastfeeding is the best for infant health was a key factor influencing both breastfeeding intention (Smith, Coley, Labbok, Cupito, & Nwokah, 2012) and success (Wambach & Cohen,

2009). In addition, long-term breastfeeding mothers expressed maternal emotional benefits (Brown, Raynor, & Lee, 2011; Wambach & Cohen, 2009), promotion of bonding (Nesbitt et al., 2012), and economic saving benefits (Wambach & Cohen, 2009). Notably, this study revealed that breastfeeding with "enjoyment" and "happiness" might reflect breastfeeding satisfaction in adolescent mothers. Adolescent satisfaction is a key indicator for a vast array of optimal functioning, positive health outcomes, and successes (Proctor, Linley, & Maltby, 2009). However, few studies have emphasized the influence of breastfeeding satisfaction on breastfeeding outcomes in adolescent mothers. Therefore, breastfeeding encouragement should be advocated among adolescent mothers in order to breastfeed with feelings of satisfaction through happiness and enjoyment.

Regarding the second cluster, facilitating factors and necessary skills were displayed as a large group with a subset of facilitating factors comprising breast milk supply and management, independence, and convenience in addition to an item of body image, patience,

FIGURE 5 Diagram of the pathways in the promotion and support needed. Note. BF: breastfeeding; EBF: exclusive breastfeeding

commitment, and self-efficacy. Moreover, necessary skills consisting of positions, effective suckling, and infants' cues were addressed in this study. Although the average rating of this cluster was placed on the second rank, there were prominent factors with high degrees of importance, including "patience and effort" and "firm commitment".

Maternal patience and effort was rated as the most important for successful exclusive breastfeeding, potentially reflecting difficult experiences for breastfeeding exclusivity. The literature review found that physical discomfort from breastfeeding practices increased adolescent mothers' perceptions of breastfeeding difficulties such as pain, sore nipples, and fatigue (Nuampa & Tilokskulchai, 2017). Another key factor, breastfeeding commitment was directly affected by breastfeeding knowledge for maternal health benefits and feelings of maternal role adaptation as presented in the diagram results. According to Nesbitt et al. (2012), keen awareness of breastfeeding benefits and a feeling of responsibility towards motherhood could develop breastfeeding commitment in teenage mothers, which is associated with continued breastfeeding. Lack of commitment is evident in formula-feeding mothers who gave up easily when confronted with common breastfeeding problems (Avery, Zimmermann, Underwood, & Magnus, 2009). At present, however, there are few, if any, studies about the influence of breastfeeding commitment on exclusive breastfeeding outcomes among adolescent mothers.

The third cluster, promotion and support needed, disclosed the key social network among adolescent mothers in which nurses and

family members affected exclusive breastfeeding at 6 months. For nursing support, there were two series of breastfeeding support during hospitalization and after discharge through four types of social support, namely, emotional, instrumental, informational, and appraisal support (House, 1981). Initially, the adolescent mothers needed information about the benefits of exclusive breastfeeding, solving common problems, using a hands-off technique and assessment, teaching skills, and rapid solutions with emotional support. Subsequently, they described the practices of expressing/pumping breast milk, breastfeeding in public, and family agreement and support in detail.

The adolescent mothers required cooperation between nurses and family members to reconcile family conflicts and traditional myths about breastfeeding as highlighted in this study. Family conflicts and arguments might have been related to unintended pregnancy backgrounds, which could be explained in the sixth cluster on key family problems. Decisions about infant feeding can be governed by family practices (Nesbitt et al., 2012; Tucker et al., 2011). Social support can minimize the impact of stressful life situations and increase an individual's abilities to tolerate or resist stressors that threaten health (House, 1981). Social support is important for adolescent mothers who have several problems requiring assistance to reduce stress and achieve balance in breastfeeding and adaptation to the maternal role. Effective breastfeeding support should consider family relationships and acceptance of exclusive breastfeeding at 6 months.

From the top of the rating information, the adolescent mothers in the present study required breastfeeding information on expressing/pumping breast milk, proper use of breast pumps, and solution of infant's choking with an oversupply of milk. These results contradicted those of many studies frequently reporting insufficient milk supply as the major problem leading to weaning from breastfeeding (Tucker et al., 2011; Wambach & Cohen, 2009). Milk expression is chosen for several reasons consistent with adolescent needs. For example, expressing milk can give adolescent mothers freedom, reduce the pain of breast engorgement and manage milk oversupply. During the new trend of breastfeeding transformation with the use of breast pumps, it is vital to prepare knowledge for women who choose milk expression in order to avoid harmful effects (Rasmussen & Geraghty, 2011).

The fourth cluster, community and social influences, disclosed a small group consisting of promoting and demoting factors such as easy access to breastfeeding information, influence of social norms, or formula milk advertisements. The adolescent mothers rated access to information via social networks as the most important factor. Informal social network sites are frequently preferred over the websites of formal organizations. In this study, the younger mothers wanted to access information quickly and easily (Noble-Carr & Bell, 2012). Breastfeeding as a part of the environment with support and acceptance as the norm can predict breastfeeding duration (Brown et al., 2011). Therefore, it is important to establish the perception of breastfeeding as a social norm through several modes of social media and community resources in order to promote comfortable feelings and reflect good mothering when breastfeeding in public.

The cluster of internal and external barriers presented a large set of obstacles involving variant difficulties including the physical condition of mothers, negative attitudes, problems in public, problems with breast milk supply, infants' health problems, and adolescent mothers' behaviour. Uniquely, many breastfeeding barriers were indicated in adolescent characteristics, including unintended pregnancy, a need for freedom, frustration and anger during infant crying, lack of breastfeeding experience, self-seeking of maternal foods, and concerns about body weight that might increase breastfeeding challenges and affect exclusive breastfeeding failure. At the same time, previous studies have rarely described unique adolescent characteristics and the limitations unintended pregnancy places on breastfeeding outcomes. The mothers normally expressed several negative attitudes on breastfeeding experiences such as pain, difficulties, lack of freedom, and embarrassment (Hunter et al., 2015; Monteiro et al., 2014).

Moreover, this cluster found that breast engorgement problems and a large volume of milk were the main barriers to successful exclusive breastfeeding, although breastfeeding evidence has often reported insufficient milk supply as the major reason for weaning from breastfeeding (Tucker et al., 2011; Wambach & Cohen, 2009). Oversupply of breast milk should be prevented among adolescent mothers because doing so could help reduce many problems such as infant discomfort, limited outings due to breast engorgement, pain, and breast milk leakage.

Finally, the cluster of key family problems was found to be related to unsuccessful exclusive breastfeeding at 6 months. The adolescent mothers in this study encountered some conflicts about infant

feeding, no power to negotiate, pressure and stressful breastfeeding, family acceptance issues, and family concerns about breastfeeding exclusivity. Low power to negotiate needs was rated in the groups as having top priority. Dependency increased the salience of the opinions and strains of troubled family relationships (Smith et al., 2012). Family members might offer negative effects with a lack of knowledge and a history of negative attitudes about breastfeeding (Woods, Chessier, & Wiperman, 2013). Recognizing the social support network, health care providers can broaden the scope by involving people who are influential in the adolescent breast-feeding mothers' lives. Not only do breastfeeding skills need to be added to programs, but skills to negotiate, express needs, and reduce conflicts with family members are also required.

Concept mapping presents a strategic pathway for creating successful exclusive breastfeeding. Among six clusters, breastfeeding advantages, facilitating factors and necessary skills, and promotion and support needs should be strengthened. Next, negative influences in communities and society, internal and external barriers, and key problems in family should be diminished for breastfeeding practices. Although adolescent mothers live in different cultures, they may encounter similar barriers on exclusive breastfeeding due to their age and the social perceptions of teen mothers.

To promote 6-month exclusive breastfeeding in adolescent mothers, a unique program should be developed throughout multi-component levels. In particular, intrapersonal and interpersonal factors should be highlighted. According to the ecological model for health promotion, behaviour is determined by the influences of five personal and environmental levels and their interactions (McLeroy, Bibeau, Steckler, & Glanz, 1988). Little, if any, has been revealed by previous studies that identifies the factors necessary for breastfeeding support through the lens of the ecological model.

Research findings may be viewed in light of limitations, including limited transferability due to purposive sampling and small sample size. However, the findings can be transferred to similar situations or participants. In addition, this study did not document the adolescent mothers' demographic data and explore their effect on the rating results, except maternal age and infant feeding type. However, Thai adolescent mothers were younger than 20 years of age and reported low socioeconomic status in the previous study (Sriyasak, Åkerlind, & Akhavan, 2013).

5 | CONCLUSIONS

Exclusive breastfeeding experiences among Thai adolescent mothers show complexity involving the multilevel influences of social systems. Promotion and support of successful exclusive breastfeeding at 6 months should recognize the influences of personal factors and their environments, particular comprehensive breastfeeding advantages, key facilitators and skills, and breastfeeding support from nurses and family members. A multilevel model for promoting 6-month exclusive breastfeeding among Thai adolescent mothers should be applied with the development of subsequent programs. Finally, the guidelines for promoting exclusive breastfeeding in adolescent mothers should be implemented with evidence from scientific research.

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CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

CONTRIBUTIONS

This paper employed concept mapping as a type of integrated mixed method that is structured conceptualization to organize and interpret qualitative data with quantitative techniques, resulting visually ideas through pictorial representation. In addition, each concept mapping step allows adolescent mothers in the interpretation of maps constructed during the mapping groups that ensures the results direct reflection of their thoughts. The results of this study showed that adolescents share the same barriers/issues, even with context/country differences. I am sure that this paper reflects all aspects of adolescents' needs and is useful for further tailored interventions.

I certify that I have read and approved the final version of the manuscript. I agree to take public responsibility for its contents. All authors have contributed to the design, performance, analysis, and interpretation of the research findings. The work reported in the paper has not been and is not intended to be published anywhere, except in the "Maternal and Child Nutrition" journal.

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