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The Effectiveness of an Educational Program Based on the Transtheoretical (Stages of Change) Model for Pregnant Mothers in Preventing the Early Initiation of Complementary Feeding: A Randomized Experimental Trial

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ABSTRACT

Aims Optimal growth and development of children require proper nutrition and healthy eating habits. Lack of knowledge among mothers about child nutrition is a major cause of malnutrition. Therefore, this study aimed to determine the effectiveness of an educational program in delaying the initiation of complementary feeding among pregnant mothers, using the stages of change model.

Materials & Methods First, a descriptive study assessed needs among 100 mothers of children aged 6 to 18 months who were randomly selected and referred to Comprehensive Health Service Centers in Khaf City and included in the study. Then, based on the results of the needs assessment study, a randomized experimental trial was designed and implemented, with 70 pregnant mothers participating (35 in each group). Eight 45-minute educational sessions were held for mothers in the experimental group, consisting of lectures and group discussions. Data were collected using a demographic characteristics checklist and a researcher-developed checklist based on the stages of change model, administered before and three months after the intervention. Data were analyzed using SPSS (version 22). A significance level of less than 0.05 was considered.

Findings The needs assessment results showed that 70% of women had started or intended to start complementary feeding at 4 months of age. The results of the educational intervention indicated that the test group had significantly higher scores on the stages-of-change constructs (precontemplation, contemplation, preparation, action, and maintenance) than the control group three months after the intervention ($P < 0.001$).

Conclusion The study's results confirm the effectiveness of the stages of change model in promoting complementary feeding in children. Since the age at which complementary feeding begins is a contributing factor to malnutrition and growth delays in children, it seems appropriate to use this model to develop educational programs that educate mothers to enhance child nutrition.

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Introduction

Exclusive breastfeeding is recognized as the optimal form of nutrition for infants up to six months of age. In addition to meeting the infant's physical and physiological needs, it also fulfills psychological needs, particularly those of the mother. In recent years, this issue has been among the most important priorities for the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) [1].

In past decades, malnutrition, respiratory infections, and

diarrhea have been identified as the leading causes of infant mortality. In this regard, reports have indicated that breastfeeding can substantially reduce the incidence of these conditions [1, 2].

At present, the shortening of breastfeeding duration, particularly in developing countries, is considered a serious problem, as more than one million children under 12 months of age die annually due to the lack of breastfeeding [3]. Unfortunately, only 36% of infants worldwide are exclusively breastfed, and this rate is 23.1% in Iran [4]. The decline in both the rate and duration of exclusive breastfeeding, which has become a major public health concern in developing countries, may lead to a two- to three-fold increase in malnutrition, infection, and infant mortality [1]. Findings from the latest survey entitled Anthropometric Nutrition Index Survey in Iran showed that 19.1%, 5.8%, and 12.4% of children under five years of age suffer from stunting, wasting, and moderate-to-severe underweight, respectively [5].

According to researchers, breastfeeding is influenced by multiple factors, including educational level, income, geographical location, knowledge and attitudes, customs and traditions, social norms, the degree of support provided by health center professionals, and support from family members. Among these factors, maternal awareness and the awareness of the mother's spouse are considered particularly important. Studies have shown that the shortened duration of breastfeeding is often attributable to mothers' lack of, or insufficient, knowledge regarding the benefits of breastfeeding [6], as well as inadequate access to healthcare providers when problems arise. Mothers' misconceptions about insufficient milk supply, infant hunger and frequent feeding demands, and the lack of support and encouragement from healthcare personnel are also among the major challenges associated with breastfeeding [7].

Since maternal awareness has a direct impact on child feeding, prioritizing the promotion of mothers' knowledge should be considered an essential strategy for preventing growth disorders in children. In this regard, educating pregnant women about the importance of timely initiation of complementary feeding is of particular significance, as maternal education is an effective means of increasing motivation to correct inappropriate complementary feeding practices [8,9]. However, the first step in health education is the identification of educational needs to be incorporated into educational programs [10]. Educational needs assessment is the process of determining what should be taught; in other words, it involves identifying the general direction of a program and diagnosing deficiencies in knowledge and skills. The primary goal of needs assessment is to ensure the necessity of training and determine the type of educational program required [11]. All decisions regarding the formulation of specific objectives, the provision of appropriate educational content, and the effective use of human, financial, and material resources depend on needs assessment [12]. The technique used in the present study was problem-based needs assessment. This approach primarily focuses on identifying individuals' problems and weaknesses so that appropriate, systematic actions can be proposed based on the issues identified [13].

Needs assessments conducted among mothers of children have shown that the importance of complementary feeding, its timing of initiation, its quality and quantity, and its effects on infants' physical health and growth are among the most important educational and performance-related gaps for mothers [14]. In this context, the most fundamental goal of education is behavior change or maintenance, which requires an accurate needs assessment and proper planning for effective educational interventions [15]. One of the most widely used models for planning effective educational interventions is the transtheoretical model, or stages of change model. This model focuses on behavioral changes in individuals and describes their progression through six stages of behavior change. Different individuals may be at different stages of this process. The model explains how inappropriate behavior can be modified or positive behavior acquired. To date, it has been applied in the fields of adopting preventive behaviors, discontinuing unhealthy behaviors, and using medical services [9].

This model includes the following stages: precontemplation (individuals who do not intend to take action in the foreseeable future, usually defined as the next six months), contemplation (individuals who intend to change within the next six months), preparation (individuals who intend to take action in the near future, usually within the next 30 days), action (individuals who have made specific observable changes in their lifestyle during the past six months), and maintenance (individuals who have made and sustained a particular behavioral change over a prolonged period) [16, 17]. Given that different individuals have different needs, and that variations in needs require different forms of support and intervention, this issue has been specifically taken into account in the Stages of Change Model [18].

Since the first step in correcting complementary feeding behavior is to increase mothers' awareness regarding its importance and proper timing of initiation, such increased awareness may lead to behavioral change, meaning that correct behavior replaces incorrect behavior [19]. Studies conducted among Iranian mothers indicate an unfavorable status of exclusive breastfeeding rates as well as low maternal awareness in this area; among the influencing factors, breastfeeding education for mothers plays a decisive role [20]. The effectiveness of education depends on the use of an appropriate theory and model. According to the Stages of Change Model, change is not an event but a process, and individuals are at different stages of this process. At each stage, the determining factors must be identified and used as tools for exploring and understanding the problems associated with current behavior at that particular stage. Using the Stages of Change Model, education can be tailored to the individual's specific stage of behavioral change [21].

The results of numerous studies indicate the positive effect of the Stages of Change Model on behavioral change [22–24]. Since this model emphasizes that individuals do not adopt behaviors uniformly, the present study sought to

provide structured education by first identifying participants at each stage of behavioral change, thereby increasing the likelihood of adopting correct behavior. In addition, another distinguishing feature of this study was the performance of a needs assessment and the identification of mothers' problems in the study area. Needs assessment is the first step in educational planning and serves as the basis for determining educational objectives, selecting and designing educational programs, implementing them, and evaluating the education provided. Therefore, after identifying the problems faced by mothers in the region and implementing the educational intervention, this study was conducted to determine the effect of an educational program based on the Stages of Change Model on preventing the early initiation of complementary feeding.

Materials and Methods

The present study was conducted in two phases. In the first phase, a descriptive study was conducted to assess the educational needs for the intervention. This phase included 100 mothers with children aged 6-18 months who attended the Comprehensive Health Service Centers of Khaf County, located in Razavi Khorasan Province, Iran. Participants were selected and enrolled through simple random sampling. In this method, the required participants were randomly selected from the sampling frame, which had been previously compiled and numbered for this purpose. For the needs assessment, a problem-oriented technique was employed, with emphasis on identifying individual problems.

Subsequently, based on the results of the needs assessment, an educational intervention study was designed for 70 pregnant mothers. To provide education for mothers in this county, a randomized controlled clinical trial was conducted among pregnant women attending the Comprehensive Health Service Centers. The sample size was calculated based on a similar study [25]. At a 95% confidence level and 95% power, the required sample size was estimated at 29 participants per group. Assuming a potential attrition rate of 20%, the sample size was increased to 35 participants in each group, resulting in a total sample of 70.

The inclusion criteria were as follows: pregnant mothers in the seventh month of pregnancy; prior experience of initiating complementary feeding for their previous children; willingness to participate in the study; residence in Khaf City; having an active health record and regular attendance at the Comprehensive Health Service Centers; having at least basic literacy skills; and being in one of the three stages of precontemplation, contemplation, or preparation according to the Stages of Change Model.

The exclusion criteria included unwillingness to continue participation in the study and loss of contact between the mother and the researcher for more than two sessions.

Research Instruments

To achieve the study objectives, a questionnaire was developed based on a review of the literature and related studies. The instrument consisted of a demographic information form and a questionnaire designed in accordance with the stages of behavior change. The demographic questionnaire included age, educational level, occupation, place of residence, spouse's educational level, spouse's occupation, number of children, number of marriages, and monthly income.

The researcher-made Stages of Change Questionnaire consisted of 20 items and was used to determine the extent of progress following the educational program. The items were scored on a four-point Likert scale ranging from strongly disagree to strongly agree, with scores from 1 to 4. The theoretical score range was 20-80. An increase in the score at each stage indicated the participants' progress within that particular stage.

To determine content validity, the questionnaire was sent to 20 specialists in health education and health promotion, who were asked to express their opinions regarding the relevance of the items to the assessment of the stages of change in accordance with the study objectives. In this study, the content validity index and content validity ratio were 0.79 and 0.99, respectively. To estimate reliability, the questionnaire was administered to 20 mothers, and after completion, Cronbach's alpha coefficient was calculated two weeks later. The reliability of the questionnaire was confirmed using Cronbach's alpha of 0.89.

After obtaining informed consent, the researcher distributed the study questionnaire to the research participants before the educational intervention. Given the presence of two comprehensive health service centers in Khaf County, and considering their similarities in terms of population coverage as well as the homogeneity of participants' economic, social, and cultural characteristics, and also to prevent the exchange of educational information and contact between the participating mothers, all individuals covered by one center were assigned to the intervention group, while those covered by the other center were assigned to the control group.

Random allocation was determined by rolling a die. If an odd number appeared, Center 1 was assigned as the control group; if an even number appeared, Center 2 was assigned as the intervention group. Based on the pilot study, participants in the intervention group were selected from pregnant mothers who had entered the third trimester of pregnancy to ensure sufficient time for implementation of the study.

Using the list available at the health center, participants were selected according to the simple random sampling method and based on the inclusion criteria. Initially, an in-person session was held to familiarize the researcher with the mothers' conditions and their level of access to virtual platforms. Before the intervention, the mothers completed the Stages of Change Questionnaire. Those who, based on the algorithm of the Stages of Change Model, were in one of the three inactive stages—precontemplation, contemplation, or preparation—were enrolled in the study. Those who were in the active stages—action or maintenance—were excluded from the study.

No intervention was performed in the control group; however, at the end of the intervention, the educational materials were provided to them to maintain ethical considerations. The educational content was delivered to the mothers in the intervention group using the Stages of Change Model algorithm. Accordingly, training was provided to mothers in the precontemplation, contemplation, and preparation stages. The intervention was conducted over four weeks, with two educational sessions per week, each lasting approximately 45 minutes, on predetermined days and times coordinated in advance with the mothers. The educational program began in the seventh month of pregnancy. Each session began with a review of the previous session and ended with assignments for the following session. The educational sessions were conducted both in person and virtually. In-person sessions were held in compliance with health protocols and used teaching methods, such as group discussion, lectures, question-and-answer sessions, and role-playing, with the support of valid resources from the Ministry of Health. For virtual sessions, the Eitaa messaging platform was used, and where conditions and infrastructure permitted, online classes were conducted via Skyroom. In addition, telephone calls were maintained throughout the program to assess the progress of the participants and to resolve any ambiguities. It should be noted that maternal participation in this study was 100%, and no sample attrition was observed. The posttest was completed three months after the intervention, and the results were compared. Table 1 presents the educational content provided.

Table 1. Content of Educational Sessions for the Intervention Group.

Session	Session Content	Strategy
First	Introduction of the educator; introduction and acquaintance among group members; presentation of the course objectives and group rules; obtaining informed consent; completion of the questionnaires (simultaneously, the control group completed the questionnaire before the intervention during the first session)	Lecture
Second	Education based on the precontemplation and contemplation stages; definition of complementary feeding; appropriate time for initiation of complementary feeding; review of the benefits of the educational program; explanation of the disadvantages of early initiation of complementary feeding; increasing awareness	Through lectures and information delivery, participants' knowledge, awareness, and perceived sensitivity were enhanced
Third	Based on the preparation stage of behavior change, educational content was provided regarding the main benefits of complementary feeding; participants were followed up again during the week to monitor progress at this stage	Group discussion
Fourth	Based on the action stage of change, education was provided, and techniques were presented to cope with thoughts related to the early initiation of complementary feeding (with weekly follow-up to assess progress in the action stage)	Group discussion; enhancement of mothers' self-efficacy; breaking goals into smaller steps; modeling
Fifth	In accordance with the action stage of change, techniques were presented to control stimuli influencing the early initiation of complementary feeding (with weekly assessment of progress in the action stage)	Group discussion; poster and pamphlet
Sixth	Motivational session aimed at enhancing self-efficacy strategies and the techniques presented to strengthen them, in accordance with the maintenance stage	Group discussion; enhancement of mothers' self-efficacy; breaking goals into smaller steps; modeling
Seventh	Answering the questions of mothers in the intervention group	Group discussion; poster and pamphlet
Eighth	Repetition of the motivational session to enhance self-efficacy strategies and the techniques presented to strengthen them, in accordance with the maintenance stage	Lecture; poster and pamphlet

Statistical Analysis

After data collection, the accuracy of data entry into SPSS (version 22) was verified. Qualitative and quantitative variables were described using frequency and percentage, and mean and standard deviation, respectively. Data were analyzed after assessing the normality of quantitative variables using the Shapiro–Wilk test. Since the data were normally distributed, the independent-samples t-test was used for between-group comparisons, and the paired-samples t-test was used for within-group comparisons. Statistical significance was set at $P < 0.05$.

Findings

The results of the pilot study conducted on 100 pregnant mothers in Khaf County, Iran, who had previously initiated complementary feeding for their children showed that this issue was of considerable importance. Nearly 70% of these mothers had initiated complementary feeding for their children before 4 months of age or intended to begin complementary feeding early. Therefore, early initiation of complementary feeding was identified as the main problem among mothers.

In the present study, 70 pregnant women attending Comprehensive Health Service Centers in Khaf County, Iran, were enrolled and assigned to either the control group (n = 35) or the intervention group (n = 35). The mean age of the pregnant women was 24.85 ± 5.7 years. Most participants (53.8%) had a diploma or lower level of education. No statistically significant difference was observed between the intervention and control groups at baseline ($P > 0.05$), indicating homogeneity between the two groups at the start of the intervention. Table 2 presents other demographic characteristics of the participants.

Table 2. Demographic Characteristics of the Participants.

Variable	Category	No	%
Mother's occupation	Employed	16	22.9
	Home-based income-generating work	14	20.0
	Housewife	40	57.1
Spouse's education	Primary school	2	2.9
	Diploma or below diploma	16	22.9
	University education	52	74.3
Spouse's occupation	Unemployed	4	5.7
	Employee	56	80.0
	Worker	8	11.4
	Other	2	2.9
Household income	Less than 10 million	30	42.9
	More than 10 million	40	57.1
Number of children	One child	34	48.5
	Two children	30	42.9
	Three children	6	8.6
	Total	70	100.0

Table 3. Comparison of Mean Scores of the Transtheoretical Model Components Before and Three Months After the Intervention in the Intervention and Control Groups.

Variable	Group	Before Intervention	Three Months After Intervention	Paired t-Test Result
Precontemplation	Intervention group	11.89 ± 2.04	15.43 ± 2.17	t = -6.45, $P < 0.001$
	Control group	12.06 ± 1.67	11.40 ± 2.00	t = 1.37, $P = 0.18$
	Independent t-test result	t = 0.384, $P = 0.702$	t = -8.64, $P < 0.001$	
Contemplation	Intervention group	11.86 ± 2.25	14.66 ± 2.28	t = -6.32, $P < 0.001$
	Control group	11.14 ± 1.86	11.37 ± 2.17	t = -0.417, $P = 0.68$
	Independent t-test result	t = -1.44, $P = 0.153$	t = -6.16, $P < 0.001$	
Preparation	Intervention group	11.86 ± 2.10	15.00 ± 2.25	t = -4.90, $P < 0.001$
	Control group	12.34 ± 1.86	12.26 ± 2.17	t = 0.165, $P = 0.87$
	Independent t-test result	t = 0.942, $P = 0.349$	t = -4.83, $P < 0.001$	
Action	Intervention group	12.00 ± 1.84	15.03 ± 2.25	t = -6.54, $P < 0.001$
	Control group	11.66 ± 1.93	11.34 ± 2.10	t = 0.66, $P = 0.513$
	Independent t-test result	t = -0.757, $P = 0.451$	t = -7.09, $P < 0.001$	
Maintenance	Intervention group	9.46 ± 1.46	12.34 ± 2.30	t = -7.19, $P < 0.001$
	Control group	8.80 ± 1.77	9.37 ± 2.10	t = -1.14, $P = 0.262$
	Independent t-test result	t = -1.68, $P = 0.096$	t = -5.59, $P < 0.001$	

Tests as reported in the original text: within-group analysis by independent t-test and between-group analysis by paired t-test.

Findings from Table 3 showed no significant difference in the control group of pregnant women between before the intervention and three months after the intervention in the scores of precontemplation ($P = 0.18$), contemplation ($P = 0.68$), preparation ($P = 0.87$), action ($P = 0.513$), and maintenance ($P = 0.262$).

The results of the paired t-test indicated a significant difference in the intervention group between before and three months after the intervention for the scores of all components of the stages of change model ($P < 0.001$).

The findings also showed that before the educational intervention, no significant difference was observed between the intervention and control groups in terms of the scores of precontemplation ($P = 0.702$), contemplation ($P = 0.153$), preparation ($P = 0.349$), action ($P = 0.451$), and maintenance ($P = 0.262$). However, after the educational intervention, the intervention group showed a significant difference from the control group in the mean scores of all components ($P < 0.001$). This difference reflected a significant improvement in the scores of all components of the stages of change model in the intervention group.

Discussion

The present study was conducted to determine the effectiveness of an educational intervention based on the stages of change model in preventing the early initiation of complementary feeding among pregnant women. The results of the present study showed a positive and significant change before and after the educational intervention, such that the mean scores of precontemplation, contemplation, preparation, action, and maintenance increased after the intervention. In addition, a significant difference was observed between the intervention and control groups in terms of the scores of precontemplation, contemplation, preparation, action, and maintenance.

The findings showed that the mean score of participants in the precontemplation stage increased significantly after the educational intervention. These findings indicate that the mothers' awareness of child feeding for children under two years of age is inadequate. Since maternal awareness has a direct effect on child nutrition, focusing on improving mothers' awareness should be prioritized to prevent growth disorders in children. The results of the study by Babazadeh et al. showed that educating pregnant mothers about the importance of timely initiation of complementary feeding is an appropriate means of increasing motivation to correct

improper complementary feeding practices in children; ultimately, the most fundamental goal of educating pregnant mothers is to change or sustain appropriate child feeding behavior in mothers [9]. In the study by Hezawei et al., it was shown that the educational intervention was associated with changes in the precontemplation stage of feeding behavior among pregnant women, such that mothers at this stage became aware of the importance of complementary feeding and its appropriate starting age and began planning for the timely initiation of complementary feeding for their child [26]. The results also showed that the mean score of participants in the contemplation stage increased significantly after the educational intervention. Therefore, educating pregnant women can provide the basis for change in the contemplation stage to correct child complementary feeding behavior [27]. On the other hand, maternal education plays a vital role in children's health and ultimately leads to increased knowledge and awareness related to children's nutritional needs. Improving mothers' educational status and establishing awareness campaigns for pregnant women regarding infant breastfeeding and complementary feeding can play an important role in improving children's nutritional status [28]. Therefore, the improvement in mothers' precontemplation and contemplation stages may be attributed to increased awareness.

The findings also showed that the mean score of participants in the preparation stage increased significantly after the educational intervention. These findings suggest that holding educational classes improved the preparation score of pregnant women in the intervention group; therefore, it can be stated that educating pregnant women empowers them in decision-making regarding child complementary feeding [29, 30]. This increase in the preparation score may be due to the increased level of information among pregnant women about the importance of complementary feeding, changes in attitude, and increases in precontemplation and contemplation scores following the educational intervention on the importance of timely initiation of complementary feeding. Therefore, educating pregnant women to empower their feeding-related behaviors can be considered an effective facilitator in improving mothers' complementary feeding practices. Consistent with the present study, the results of studies by Golshiri et al. and Hezawei et al. showed that educational interventions for mothers during pregnancy led to changes in maternal performance regarding infant breastfeeding and child complementary feeding [26, 31].

The findings of the present study showed that the educational intervention improved mothers' performance in the initiation of complementary feeding. In explaining this finding, it may be noted that understanding the desirable and undesirable consequences of early feeding through education can lead to changes in feeding behavior among pregnant women and may be regarded as an effective tool for promoting mothers' awareness, attitudes, behavioral intentions, and practices regarding child feeding [32]. Therefore, the increase in the action score after the educational intervention in the intervention group may be due to increased awareness and behavioral change among pregnant women. This finding is consistent with the results of the study by Mohammadian et al. on increasing physical activity among health liaisons using the stages of change model [33]. Likewise, the results of the study by Khazaei Nejad et al. showed that an educational intervention based on the stages of change model to modify women's nutritional behavior led to progression from the precontemplation stage to the action and maintenance stages [34]. A study by Tariku et al. in Ethiopia on improving children's nutritional status also showed that a theory-based educational intervention improved mothers' child-feeding performance [35].

The findings of the present study also showed that, after the educational intervention, the mean score of participants in the maintenance stage increased significantly. In explaining this finding, it may be noted that individuals in the early stages of behavior change use behavioral processes less frequently and cognitive processes more frequently. In other words, as individuals move forward through the stages of behavior change, the use of cognitive processes related to behavior change in the context of complementary feeding among pregnant women increases, and this increase is significant across all domains of cognitive processes. The results of Prochaska's study showed that the mean maintenance score in the stages of change model was higher among individuals in the preparation stage than among those in the precontemplation and contemplation stages [32]. Consistent with the present study, the results of Hildebrand's study showed that behavior change and maintenance among individuals in the preparation and action stages were greater than among those in the contemplation and precontemplation stages [36].

Among the strengths of the present study were the needs assessment and the identification of mothers' problems in the study area. The limitations of this study include self-reported data collection, which may be associated with reporting bias. In addition, the lack of blinding of the analyst and the absence of strict environmental control may have affected the results. Therefore, it is recommended that similar studies be conducted among different populations of women, in other settings, and using other models and theories.

Conclusion

Given the unfavorable status of child nutrition and the effectiveness of the stages of change model in modifying individuals' perceptions and behaviors, it seems essential to design and implement programs to improve awareness and change behavior. However, based on the findings of this study, it is recommended that educational programs delivered through non-face-to-face methods and social media be expanded to promote complementary feeding for children.

Ethical Considerations

Ethical approval was obtained with the code IR.GMU.REC.1400.206. In addition, after explaining the objectives of the study, the participants were assured that their personal information and data would remain confidential, and informed consent was obtained from them before answering the questions and participating in the study.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

Trial Registration

Ethical approval was obtained with the code IR.GMU.REC.1400.206.

Consent for Publication

The participants provided written informed consent for the publication of the findings of this study.

Conflict of Interest

The authors declared no conflicts of interest.

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Authors' Contributions

- Conceptualization: Mahdi Moshki;
- Data collection and implementation: Zeinab Basaligheh;
- Data analysis: Nasim Khajavian;
- Manuscript drafting: Mitra Dogonchi;
- Final approval of the manuscript: All authors.

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References

[1]. Butler JT. *Principles of health education and health promotion*. 3rd ed. Australia: Wadsworth/Thomson Learning. 2001:231-255. [Link]

[2]. Shahbazi A, Ghorbani R, Frivar F, Shah-Hoseini AR. A survey on the starting age of complementary feeding and some of its associated factors in the breast-feeding infants (Semnan, Iran). Koomesh. 2007;9(9):59-66. [Link]

[3]. Gholshan M, Ghahvechi F. Comparison of Infants with Low Birth Weight and Normal Weight Regarding Anemia at the Age of 12 Months in Yazd. Tolooebehdasht. 2021;20(5):15-25. [DOI: 10.18502/tbj.v20i5.8515]

[4]. Nafissi N, Khayamzadeh M, Zeinali Z, Pazooki D, Hosseini M, Akbari ME. Epidemiology and Histopathology of Breast Cancer in Iran versus Other Middle Eastern Countries. Middle East J Cancer. 2018;9(3):243-251. [DOI: 10.30476/mejc.2018.4213]

[5]. Sheykh AR, Naghavi M, Abd Elahi Z, Zarati M, Vaseghi SA, Sadeghi GF, et al. Current status and the 10-year trend in the malnutrition indexes of children under 5 years in Iran. Iran J Epidemiol. 2008;4(1):21-28. [Link]

[6]. Rafizadeh R, Heidari Z, Karimy M, Zamani-Alavijeh F, Araban M. Factors affecting breast-feeding practice among a sample of Iranian women: a structural equation modeling approach. Ital J Pediatr. 2019;45:1-8. [DOI: 10.1186/s13052-019-0724-9] [PMID] [PMCID]

[7]. Pirzadeh A, Naghdi A. Evaluation of mothers' knowledge, self-efficacy, and performance in the field of exclusive breastfeeding and its related factors in infants less than 6 months of age in Ashkzar city of Yazd Province. Tolooebehdasht. 2022;20(6):73-84. [DOI: 10.18502/tbj.v20i6.8959]

[8]. Aleagha MM, Mohebbi S, Aghaali M, Hozoori M. Assessment of maternal knowledge, attitude, and practice regarding nutrition of children aged 12-36 months and its related factors in Qom Province, Iran, using a self-report method. Qom Univ Med Sci J. 2020;14(4):57-65. [Link]

[9]. Moradi F, Babazade T, Zebae N. Impact of educational intervention on mothers' empowerment about proper nutrition among infants under 2 years of age covered by health homes of district 18 of Tehran municipality. Iran J Health Educ Promot. 2014;2(3):242. [Link]

[10]. Jahanbakhsh M, Setayesh H. Educational needs of medical records practitioners in Isfahan teaching hospitals. Iran J Med Educ. 2011;10(5):1. [Link]

[11]. McGeary J. A critique of using the Delphi technique for assessing evaluation capability-building needs. Eval J Australas. 2009;9(1):31-39. [DOI: 10.1177/1035719X0900900105]

[12]. Barbazette J. Training needs assessment: methods, tools, and techniques. Hoboken (NJ): John Wiley & Sons; 2006. [Link]

[13]. Yousefy A. Need Evaluation Techniques. Iran J Med Educ. 2002;2(1):68-67. [Link]

[14]. Yaghoubi M, Salimi M, Karamali M, Ehsani-Chimeh E. Factors affecting the evaluation of teachers by systematic and Delphi methods in the military university in Tehran. J Mil Med. 2019;21(3):251-261. [Link]

[15]. World Health Organization Working Group. Growth of healthy infants and the timing, type, and frequency of complementary foods. Am J Clin Nutr. 2002;76(3):620-627. [DOI: 10.1093/ajcn/76.3.620] [PMID]

[16]. Butterfoss FD, Kegler MC, Francisco VT. *Mobilizing organizations* for health promotion: theories of organizational change. 2008. [Link]

[17]. Glanz K. *Theory at a glance: A guide for health promotion practice*. Washington (DC): US Department of Health and Human Services. 1997. [Link]

[18]. Weinstein ND, Rothman AJ, Sutton SR. Stage Theories of health behavior: conceptual and methodological issues. Health Psychol. 1998;17(3):290. [DOI: 10.1037//0278-6133.17.3.290] [PMID]

[19]. Pradanie R, Rachmawati PD, Cahyani MD. Factors associated with mothers' behaviors in selecting complementary feeding in Surabaya, Indonesia. Nurse Media J Nurs. 2020;10(3):306-316. [DOI: 10.14710/nmjn.v10i3.27706]

[20]. Shahhosseini Z, Nikbakht R, Kalvani N. The Necessity of breastfeeding education with a health literacy approach by maternal healthcare providers: A policy brief. J Mazandaran Univ Med Sci. 2025;34(241):181-187. [Link]
[21]. Mizuno A, Kaneko H, Suzuki Y, Okada A, Takeda N, Morita H, et al. Enduring relevance of the stages of change model for transforming lifestyle behaviors. Circ J. 2023;87(8):1138-1142. [DOI: 10.1253/circj.CJ-23-0292] [PMID]
[22]. Frith E, Loprinzi P. Can Facebook reduce perceived anxiety among college students? Randomized controlled exercise trial using the transtheoretical model of behavior change. JMIR Ment Health. 2017;4(4):e8086. [DOI: 10.2196/mental.8086] [PMID] [PMCID]
[23]. Mohammadi M, et al. Investigating the Effect of Nutrition Education Based on Bloom's Classification on the Level of Self-Efficacy and Nutrition Behavior of Female Students at Puberty. J Health Field. 2024;12(1). [DOI: 10.22037/jhf.v12i1.44503]
[24]. Mohammadi M, Shekari R, Vahedian-Sharoodi M, Esmaily H, Aval MG, Ghavami H. Investigating the effect of nutrition education based on Bloom's classification on the level of self-efficacy and nutrition behavior of female students at puberty. Iran J Health Educ Health Promot. 2024;12(2):219-228. [Link]
[25]. Safar Alizadeh F, Parto Azam H, Sadighi R. Investigating the Relationship Between the Awareness of the Mothers Referring to Health and Treatment Centers in Khoy and Their Function About the Nourishment of the Children Under 3 Years Old. Nurs Midwifery J. 2009;7(3). [Link]
[26]. Hazavehei MM, Etesamifar T, Moeini B, Roshanaei GH, Mahboubi M. Education based on BASNEF model; an affective education on regular use of nutritional supplements during pregnancy. J Biol Todays World. 2014;3:174-179. [Link]
[27]. Baghdari N, Bahrami M, Norozi A, Sadeghi S, Mazlom S, Mohajeri A. The effect of mothers' training via newsletter and group discussion on the energy intake of preschool children. J Midwifery Reprod Health. 2014;2(3):180-187. [DOI: 10.22038/jmrh.2014.2850]
[28]. Rayhan MI, Khan MSH. Factors causing malnutrition among under-five children in Bangladesh. Pak J Nutr. 2006;5(6):558-562. [DOI: 10.3923/pjn.2006.558.562]
[29]. Klohe DM, Clarke KK, George GC, Milani TJ, Hanss-Nuss H, Freeland-Graves J. Relative validity and reliability of a food frequency questionnaire for a triethnic population of 1-year-old to 3-year-old children from low-income families. J Am Diet Assoc. 2005;105(5):727-734. [DOI: 10.3390/nu11010159]
[30]. Fahmida U, Kolopaking R, Santika O, Sriani S, Umar J, Htet MK, et al. Effectiveness in improving knowledge, practices, and intakes of "key problem nutrients" of a complementary feeding intervention developed by using linear programming: Experience in Lombok, Indonesia. Am J Clin Nutr. 2015;101(3):455-461. [DOI: 10.3945/ajcn.114.087775] [PMID]
[31]. Golshiri P, Sharifirad G, Baghernezhad F. Comparison of two methods of education (lecture and self-learning) on knowledge and practice of mothers with under-3-year-old children about growth monitoring and nutritional development stages. Iran J Med Educ. 2011;10(5):1. [Link]
[32]. Prochaska JM, Paiva AL, Padula JA, Prochaska JO, Montgomery JE, Hageman L, et al. Assessing emotional readiness for adoption using the transtheoretical model. Child Youth Serv Rev. 2005;27(2):135-152. [DOI: 10.1016/j.childyouth.2004.07.001]
[33]. Keshavarz Mohammadian S, Farmanbar R, Mohtasham-Amiri Z, Atrkar Roushan Z. Factors associated with physical activity based on the stages of change model among health volunteers in Rasht. Iran J Health Educ Health Promot. 2015;3(3):253-265. [Link]
[34]. Khazaeinejad A, Salmani F, Moodi M. Evaluating knowledge and stages of nutritional behavior change in diabetic patients covered by comprehensive health service centers in Ghayenat city in 2020. Mod Care J. 2021;18(3):e117692. [DOI: 10.5812/modernc.11769]
[35]. Tariku B, Whiting S, Mulualem D, Singh P. Application of the Health Belief Model to Teach Complementary Feeding Messages in Ethiopia. Ecol Food Nutr. 2015;54(5):572-582. [DOI: 10.1080/03670244.2015.1049344] [PMID]
[36]. Hildebrand DA, Betts NM. Assessment of stage of change, decisional balance, self-efficacy, and use of processes of change of low-income parents for increasing servings of fruits and vegetables to preschool-aged children. J Nutr Educ Behav. 2009;41(2):110-119. [DOI: 10.1016/j.jneb.2008.09.007] [PMID]