Original Article

Determinants of complementary feeding practices among mothers of 6–24 months failure to thrive children based on behavioral analysis phase of PRECEDE model, Tehran

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ABSTRACT

Background: This study intended to clarify the determining factors of complementary feeding practices among Tehran 6–24 months failure to thrive children in order to use the results for planning the interventions to reduce the possible adverse effects. **Materials and Methods:** In this study, 132 mothers of three medical and health centers were chosen by random sampling among those centers operating under the supervision of south of Tehran District Health Center and study data were collected from them. A valid and reliable questionnaire as a data collection instrument developed based on behavioral analysis phase of PRECEDE model. Spearman and Pearson's correlation coefficient test were used to determine the statistical relationship between factors associated with complementary feeding practices among mothers. **Results:** The mothers' knowledge was as follows: 0.8%, 20.4%, and 78.8% of them were good, medium, and poor, respectively. Mean scores for the mothers' performance in terms of supplementary feeding was 66.8. Pearson correlation indicated a positive and significant correlation between the mothers' performance with enabling and reinforcing factors, but there wasn't any significant relationship between the mothers' performance and knowledge about complementary feeding. **Conclusions:** According to the obtained results, reinforcing factors, and enabling factors are associated with the mothers' performance in terms of complementary feeding. Hence, attention to these issues is essential for better health interventions planning.

Key words: Complementary feeding, failure to thrive, PRECEDE model

INTRODUCTION

Complementary feeding refers to the process of starting giving foods and liquids other than breast milk to the infants for the satisfaction of their nutritional needs due to the insufficiency of the breast milk.[1] According to the World Health Organization, the complementary feeding must possess the following three main characteristics: Timely: Giving foods to all infants should be started from 6 months onwards; Adequate: The complementary foods should be of a nutritional value that can satisfy the growth needs of the child; Appropriate: The foods selected for complementary foods must have variety, be of appropriate texture and in sufficient quantity.[2] Inappropriate complementary feeding practices cause to some problems such as stunting, delay in the motor and mental development, neurological and mental fatigue, frequent diarrhea, lack of micronutrients, and macronutrients or malnutrition.[3] In addition to the increased risk of adult noncommunicable diseases, malnutrition in the 1st years of life in turn causes many short-term severe outcomes including retarded growth and increased child morbidity and

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mortality.[4] Failure to gain weight and height are the indicators of delayed growth in infancy. It is estimated that malnutrition, directly or indirectly lead to almost 60% of the mortality of the children aged lower than 5 years.[4] In 2001, the proportion of children suffering from underweight (i.e., low weight for age) was 10%. In 2011, it increased to 13%.[5] Today, the global underweight has received to %16. In more detail, 52 million children under-5 are suffering from moderate or acute wasting (i.e., low weight for height). In this regard, South Asia ranks first where approximately one in six children have moderate or severe wasting. Globally, the proportion of infants <6 months that exclusively breastfed is 39%.[6] About 39% of infants in the developing countries and 25% in Africa, are exclusively breastfed for the first 6 months.[7] Based on recent estimation, using a mixture of exclusive breastfeeding for 6 months and optimal complementary feeding practices, it is possible to prevent approximately 20% of under-5 deaths in the developing countries.[4] The universal coverage only with improved complementary feeding could be decrease %6 of mortality rate in children aged lower than 5 years.[5] As the findings of Iran's Multiple Indicator Demographic and Health Survey in 2010 indicated the exclusive breastfeeding for the first 6 months was 53.1% in total and 27.8% and 62.8% in the urban and rural areas, respectively.[8] A study in West Azerbaijan, Iran, revealed that 4.3%, 7.5% and 8.7% of the children aged <5 years suffered from underweight, wasting and stunting (i.e., low height for age), respectively.[9] According to the findings gained in Mashhad, Iran, the proportion of the infants who received exclusive breastfeeding up to 6 months was 72.4%.[10] The data collected in Yasuj, Iran, showed that supplementary feeding had not been started for 39% of 6 months old children.[11] More recent reports validated that childhood malnutrition still remains as a health problem in Iran.[12] In Tehran, cessation the breastfeeding and beginning the complementary feeding accounts for the first and second risk factors, respectively. The chance of weight loss for the children who started complementary feeding was found to be 16.9 times more than those for whom complementary feeding has not yet began.[13] The factors affecting the nutritional condition especially in the 1st year of life are different in various societies, but the most important ones are as follows: The time the supplementary food starts, type of the food, infant's disease, family economic status, and mother's belief in health and nutritional problems.[11] Furthermore, the nutritional qualities of complementary foods may not be adequate, they may be started too early or too late, they may be given in too small amounts or not frequently enough.[5] There are models such as PRECEDE-PROCEED to identify other influential factors. Precede-proceed model is used to assess the health-related behaviors and environments affecting health. The phase 3 of the model has been designed for identifying the behavioral and environmental determinants of the health problems. In phase 4, the predisposing factors (including information, attitudes, beliefs, values, and perception about the desired behavior change), enabling factors (including the contextual factors that facilitate or hinder the desired behavioral and environmental changes), and reinforcing factors (rewards and evaluation of others that may encourage or discourage continuing the desired behavior change) are identified.[14] In one study in China, Li *et al.* showed

that this model can be used as an effective tool for identification community health needs.[15] Furthermore, Noruzi used this model as a framework for identifying factors that may have a role in decreased quality of women's life among postmenopausal.[16] World Health Organization has recognized the need to evaluate the infant and young child feeding practices with the aim of planning targeted interventions to at-risk populations, and to monitor and evaluate progress with feeding practices after the start of interventions.[5] Taking these facts into account, the present study intended to clarify the determining factors of complementary feeding practices among mothers of 6–24 months failure to thrive children based on behavioral analysis phase of PRECEDE model in order to use the results for planning the interventions to reduce the possible adverse effects.

MATERIALS AND METHODS

This cross-sectional study was designed as a descriptive - analytic study conducted with a sample of mothers with a failure to thrive child living in Tehran. In November 2013, with multi-stage sampling, three medical and health centers were chosen among centers operating under the supervision of South of Tehran District Health Center and data were collected based on them. The appropriate sample size obtained by the formula; it was found to be 132 subjects. Considering a loss of 10%, the sample size increased to 150 subjects.

To prepare the list of the mothers with a failure to thrive child, the children health record (log book) and profiles were used. 150 mothers were chosen by random sampling. The inclusion criteria were as follows: The mothers with a child aged 6–24 months, the mothers with a failure to thrive child diagnosed based on the Infant Growth Monitoring Chart (In more detail, the growth curve for these children is located above the red curve [standard deviation = −3] for 2-time periods of monitoring, but it is not ascending and parallel to the normal growth curve [However, only the children afflicted with developmental disorder whose weight curve was below the 50th percentile were included in the study]), the mothers with a child who based on the physician's clinical examinations and routine tests, had no genetic and chromosomal abnormality or inherited or chronic disease, the mothers who did not send their child to the kindergarten, the mothers with reading and writing literacy and finally, the mothers who were not employed. Data collection instrument were a questionnaire developed based on behavioral analysis phase of PRECEDE model, which was used for determining affecting factors of complementary feeding practices among mothers. A section of this questionnaire has been developed in a study conducted in Shiraz, Iran.[17] Another section was designed by studying numerous books and articles and reviewed by experts in health education and nutrition knowledge. To determine the reliability, a pilot study was conducted among 30 mothers in the target study population. Test-retest reliability coefficient was calculated for each section of the questionnaire and validity was measured by Cronbach's alpha in repeated tests for each section of the questionnaire, that as follows: Mothers' knowledge section ($r = 0.774$, $\alpha = 0.775$),

mothers' performance section ($r = 0.925$, $\alpha = 0.714$), enabling factors section ($r = 0.875$, $\alpha = 0.831$), predisposing factors section ($r = 0.822$, $\alpha = 0.753$).

The first section of the questionnaire included items on demographic characteristics of the parents and children. Including 10 items, the second section was assigned to the evaluation of the mothers' knowledge. For this section, as the score of "1" was given to the correct response and of "0" to the wrong response. In terms of the knowledge, the mothers were divided into three groups, that is, good (score = >%80), medium (score = %60–%80) and poor (score = lower than %60). The third section of the questionnaire was devoted to the assessment of the mothers' performance on complementary feeding including 16 items and designed based on the Health and Medical Education Ministry's complementary feeding Program using a 4-point Likert Scale (i.e., always, often, rarely, never). The highest and lowest scores given to the mothers' performance were 3 and 0, respectively. The fourth section of the questionnaire covered the evaluation of enabling factors using 7 items. The responses designed for these items were yes/no; again, a score of "1" and "0" was given to yes and no responses, respectively. Finally, the fifth section of the questionnaire designed to assess the predisposing factors by asking 7 questions. The response format for this part was selected similar to that of the former section (i.e., yes/no format). It is worth mentioning that, all of the scores in this questionnaire convert to 0–100; for a more clear definition, if score of every section have been considered 0-X, it is change to: Score $\times$ 100/X. For example: Mothers' performance score$_{(/100)}$ = ($Q_1 + Q_2 + \ldots + Q_{16} \times (100/(3 \times 16)$.

After making the necessary arrangements with the heads of the centers, data were collected with the consent of mothers and assurance given to them about the privacy of their information. The developed questionnaire was filled out by the mothers based on which the mothers' knowledge regarding using the exclusive breastfeeding of the infants aged under 6 months and the performance of the mothers in using the complementary feeding in terms of its proper starting time and how to continue it. Then, collected data were analyzed using SPSS V 22.0 [IBM Corp.: Armonk, NY] descriptive statistics, Spearman and Pearson correlation tests.

RESULTS

In this study, 18 mothers were excluded because of incomplete questionnaire and 132 mothers were studied. The average age of the mothers and children was found to be 29.3 ± 5.5 years and 15.2 ± 4.9 months, respectively. The lowest frequency and highest frequency of child birth rate was fourth rank and first rank, respectively. For other demographic characteristics, shown in Tables 1 and 2 indicates the average and standard deviation scores of different factors extracted from the behavioral analysis phase of PRECEDE model, which were explored in this study. The mothers' knowledge was as follows: 0.8%, 20.4%, and 78.8% of them were good, medium, and poor, respectively. As the best foods to start complementary

feeding, 79.5%, 10.6%, 7.6%, 2.3% of mothers selected mashed potato, fruit Juice, cereals, and legumes, respectively. As it is evident from Table 2, the mean scores for the mothers' performance in terms of complementary feeding was 66.8. Meanwhile, the statistical test indicated that there wasn't any statistically significant relationship between the mothers' performance and their knowledge ($r = 0.128$), education ($r = 0.18$) and age ($r = 0.713$). The correlation coefficients obtained from Pearson statistical test have been shown in Table 3. Based on findings, there was a statistically significant correlation between mothers' performance and enabling factors, also mothers' performance and predisposing factors.

DISCUSSION

Study findings revealed that despite training provided for mothers by the personnel of the health and medical centers, mothers' knowledge regarding complementary feeding was poor. The mothers' knowledge was as follows: 0.8%, 20.4%

Table 1: The frequency distribution of demographic variables

Variables	Number (%)
Father's education	
Elementary education	22 (16.7)
Lower-secondary	53 (40.2)
Upper-secondary	44 (33.3)
Vocational school	5 (3.8)
Undergraduate	8 (6.1)
Mother's education	
Elementary education	26 (19.7)
Lower-secondary	40 (30.3)
Upper-secondary	63 (47.7)
Vocational school	1 (0.8)
Undergraduate	2 (1.5)
Occupation's father	
Self employed	110 (83.3)
Employed	22 (16.7)
Sex of child	
Girl	79 (59.8)
Boy	53 (40.2)
Rating of birth	
First	62 (47)
Second	55 (41.7)
Third	12 (9.1)
Fourth	3 (2.3)

Table 2: Mean scores of factors behavioral analysis phase of PRECEDE model

Variable	Mean (/100)	SD
Knowledge	42.8	15.9
Performance	66.8	14.2
Enabling factors	57.03	20.8
Reinforcing factors	65.01	24.9

SD=Standard deviation

Table 3: Correlation coefficients between the scores of mother's performance and behavioral analysis phase of PRECEDE model factors

Variable	Knowledge score		Enabling factors score		Reinforcing factors score	
	r	P	r	P	r	P
Mother's performance	0.134	0.126	0.302	<0.001	0.2	0.021

and 78.8% of them were good, medium, and poor, respectively. Soheyliazad *et al.*, have been reported that mothers' knowledge regarding infants' complementary feeding were as follows: 61% = good, %27 = medium and %12 = poor which is similar to our results.[18] By a comparison of these two studies, it can be inferred that the values obtained in the present study are indicative of the poor knowledge of mothers living in south of Tehran. Furthermore, the results of a study by Khoshnevis-Asl *et al.* showed that knowledge majority of the mothers participating in their study were medium, which indicate the weak role of the medical and health-care team in promoting mothers' knowledge.[19] The results of the present study, shown that there wasn't any statistically significant association between mothers' knowledge and level of education. On the other hand, the results of researches conducted in Yasuj and Borujerd were different from our study.[11,18] However, the result of study Khazaei *et al.* are in consistency with our study.[20] In addition, no statistically significant association was found between the knowledge and the child birth rate that results of the study by Fesharakinia *et al.* are in consistency with our study.[21] On the basis of the findings of this study, there wasn't any statistically significant relationship between the mother age and her knowledge. This finding is not in consistency with the results of the study by Khoshnevis-Asl *et al.*[19] Karimi *et al.* study showed that there wasn't any statistically significant relationship between the mother age and her knowledge.[22] Grains such as rice are considered as the best food for starting supplementary feeding. The best foods to start complementary foods were gruel, milk and rice and the almond porridge. In the 4th week of starting complementary feeding, the different vegetable purée is deemed as an appropriate food choice for the children.[23] In this study, 79.5% of the mothers selected mashed potato as the most suitable item for starting the complementary feeding with fruit juice, cereals and legumes considered as the other available choices. In one study by a group, interviews were conducted with the mothers who had a child aged below 2 years. They enumerated the soft texture, satiety property, their nutritional value, and availability as the reasons why they selected soft purée for their children.[24] In a study carried out by Panahandeh and Dostaresanaye reported that >80% of the infants were started their complementary feeding with the most appropriate food.[25] As per the pattern recommended by the Health Ministry, the addition of different nutritional ingredients to the infants' complementary feeding program must be done by 5–7 days time interval.[23] Only %25 of the mothers participating in the present study correctly answered this question. In one study, Joukar *et al.* found that for %23 of the cases, this time interval has been observed.[26] The mean

score for the mothers' performance on complementary feeding was found to be 66.8. Statistically, significant correlation were not reported between mothers' performance and the mother's age and level of education and the rate of childbirth. Mohammad hossini *et al.* revealed that %60 of the mothers had a medium performance that there wasn't any statistically significant relationship between the mothers' performance for complementary feeding and level of education.[11] As per the findings of this study, the association between the two variables, that is, mothers' knowledge and performance were not statistically significant. On the contrary, one study by Alizade *et al.* conducted on exploring the relationship between knowledge and performance of the mothers reported a statistically significant association between these two variables and can be claimed that promoting mothers' knowledge would result in their improved performance.[27] Accordingly, by continuous training of mothers for promoting their knowledge, it is possible to improve the feeding condition of both the families and community. Identifying the training requirements of the mothers regarding the complementary feeding's starting time, method, quality, and quantity by taking their beliefs, attitudes, and culture into account allows planning and providing the required services so as to increase their knowledge and improve their performance. In the present study, the enabling factors scale tried to evaluate the perceptions of the mother about the accessibility of the services, financial and informational resources, available nutritious materials for the provision of the child food etc., On the basis of the results of this study, there was a statistically significant correlation between the mothers' performance and the enabling factors. The predisposing factors scale attempted to assess the mothers' perception from the level of receiving these supports by asking some questions about existing social and family supports. As per the results, mothers' performance and predisposing factors were positively related. According to Jalili *et al.* there was a statistically significant relationship between the mothers' preventing behaviors from their children's iron deficiency anemia and the predisposing and enabling factors.[28] As for the limitations of the study, it can be argued that the three medical centers in the study were located in the immigrant-based region of the south of Tehran. Hence, this fact must be taken into account when extending the findings of the study to other regions. The application of precede Model as a diagnostic tool assisting with the identification of the factors influencing the mothers' behaviors in respect to children feeding was one of the strength points of this study. The findings of this study are useful for planning interventions for modifying the mothers' behaviors in terms of children's feeding, improving the training services provided by the health and medical centers, increasing the efficiency of the educations delivered in the medical centers and decreasing the failure to thrive incidence.

Acknowledgments

Conflicts of interest

There are no conflicts of interest.

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