Research Paper
Predictors of Nutritional Behaviors in Iranian Mothers of Children Under Two Years in 2022

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ABSTRACT

Background and Purpose: To attain sustainable development in the future, society requires healthy individuals, with particular emphasis on monitoring the health status of present-day children. Therefore, the present study investigated the most important predictors of nutritional behaviors in Iranian mothers of children under two years.

Materials and Methods: This cross-sectional study was conducted at Nowshahr Health Center between January and July 2022. It involved 400 mothers with children aged 6 to 24 months, randomly selected in a cluster proportional to the volume. The data collection tool was a researcher-made questionnaire comprising 25 questions based on the TPB (attitude, subjective norms, perceived behavioral control, and behavioral intention). The analysis was performed using SPSS software, version 22.

Results: In this study, the Mean±SD of participating mothers ages was 25.3±0.92 years. The results showed that among the constructs of the TPB, perceived behavioral control and subjective norms were the most important predictors of healthy nutritional behaviors among mothers, with a change variance of 20%.

Results: The findings of this study have implications for health professionals, policymakers, and developers of educational and behavioral interventions aimed at developing healthy nutritional behaviors. In this regard, managing and utilizing favorable healthy nutritional behaviors among mothers could yield economic, social, and health benefits.

Keywords: Nutritional behaviors, Complementary feeding, Planned behavior theory, Mother

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Introduction

Childhood is an excellent opportunity for physical growth and development. In addition, many food interests are formed during childhood, and the background of many diseases such as diabetes, cardiovascular diseases, blood pressure, and types of cancers is formed at this age [1]. Meanwhile, to achieve sustainable development in the future, paying attention to the health level of today's children is of particular importance. Approximately 30% of all childhood deaths can be related to short stature or underweight [2, 3]. Therefore, protecting children from conditions caused by malnutrition in the first years of life is especially important for their future development [2].

Malnutrition leads to the disruption of the child's defense mechanisms. As a result, it increases the prevalence, severity, and duration of common childhood diseases such as diarrhea, respiratory infections, and measles. On the other hand, it leads to slower recovery and more weakness. About 45% of the deaths of children under five years of age are related to malnutrition, which occurs in middle and low-income countries [4].

Developing countries are experiencing an epidemic of nutritional disorders. Based on an analysis of multiple indicators of health and population for Iran in 2017, 19.38% of growth disorders were detected among children aged between 6 and 12 months [5]. A study conducted in West Azerbaijan, Iran, found that 4.3% of children under 5 were underweight, 7.5% were suffering from wasting, and 8.7% were stunted [indicating low height for their age) [6]. Another study in Mashhad, Iran, revealed that 72.4% of infants were exclusively breastfed for up to 6 months [7]. Data from Yasuj, Iran, showed that 39% of 6-month-old children had not yet started supplementary feeding [8]. These findings emphasize enhancing maternal nutrition knowledge, promoting balanced diets, and addressing socioeconomic factors to improve the nutritional outcomes of children under two years in Iran.

Children are especially vulnerable at six months and with the start of complementary feeding. The complementary feeding process, introducing food into the child's diet gradually, continues from 6 months to 2 years old. It is through semi-solid foods that the child becomes familiar with them and prepares table food for his additional energy, iron, zinc, and other minerals [9, 10].

About 30% of parents have problems with their children's eating behavior. The loss of parental control over the child, the child starting to eat alone, and using family food are all new events in the life of a toddler. These recent events also require new behaviors, and their combination with drastic changes in the child's appetite and eating habits causes conflicts and differences between mother and child [11].

Models have been designed in health education to outline effective educational programs so that they can change the behaviors that cause problems for society. Based on research on behavior change, prevention training might be more effective if evidence-based theories are used [12]. The theory of planned behavior (TPB) has been successfully used in social and behavioral studies and public health [13]. Various populations with distinct characteristics benefit from this theory since it can explain various behaviors [14-16]. Based on the TPB, intention predicts behavior, and intention is influenced by attitude toward behavior, subjective norms, and perceived behavioral control.

Educational interventions can be more effective by identifying the factors affecting nutritional behavior. Mothers also play a crucial role in promoting children's health, so by empowering them, educational programs can be more effective. The present study investigated the predictors of nutritional behaviors based on the TPB in mothers with children aged 6-24 months living in Nowshahr City, Iran. It is hoped that an appropriate educational program can be designed and implemented from the results of this study.

Materials and Methods

We conducted a cross-sectional descriptive-analytical study in Nowshahr to develop a questionnaire, evaluate the questionnaire's psychometric properties, and determine the most vital predictors of feeding behavior among mothers with children less than 24 months old. The study population consisted of mothers with children aged 6 to 24 months, and the study samples were selected from this group. Study inclusion criteria were living in Nowshahr, having a child between 6 and 24 months old, and being interested in participating, while study exclusion criteria were unwillingness to participate.

The study participants were selected through random proportional cluster sampling. Each health center in Nowshahr was nominated as a cluster, and participants were selected randomly based on the proportion of mothers with children between 6 and 24 months. Af-

Table 1. Reliability results of the TPB questionnaire in the feeding behavior questionnaire of mothers

Questionnaire Constructs	Number of Items	Cronbach α	Pearson Correlation Coefficient	ICC
Attitude	8	0.69	0.82	0.90
Subjective norm	8	0.68	0.86	0.92
Perceived behavioral control	7	0.80	0.75	0.85
Intention	1	0.84	0.83	0.90

TPB: Theory of planned behavior; ICC: Interclass correlation coefficient.

ter determining the share of each center, the desired people were selected using a table of random numbers.

The sample size was determined based on a similar study by Soheili Azad et al. [17] using Equation 1:

1. $n=(z)^2 p\,(1–p)/d^2$

The initial sample size was calculated with a confidence level of 95% (z=1.96), a probability of success of 0.5 (p=0.5), and a margin of error of 5% (d=0.05), resulting in 384 individuals. However, to enhance the generalizability of the findings, the sample size was increased to 400 participants.

A researcher-made questionnaire was used to collect data at this stage. It was based on the theory of behavior constructs, and educational needs were assessed by interviewing health experts from the Mazandaran University of Medical Sciences and health education experts and reviewing relevant articles and sources [18-21]. After that, the face and content validities of the questionnaire were evaluated. After confirming the validity and reliability of the questionnaire, it was used to identify the most important predictors of the feeding behavior of mothers with children aged 6 to 24 months. The first part of the questionnaire was demographic questions, including age, mother's education, spouse's education, mother's employment status, spouse's employment status, number of children over two years old, economic status, and place of residence. The second part of the questionnaire was related to attitude, subjective norms, perceived behavioral control, behavioral intention, and waste separation behavior. In the second part, the questions were answered using a Likert-type scale ranging from "completely disagree" to "completely agree" on a scale of 1 to 5.

To check the face validity of the questionnaire, 15 participants examined the questionnaire in terms of difficulty level, appropriateness, relevance, ambiguity, and misconceptions [22]. After evaluating the face validity of the questionnaire by the participants, ambiguous items were revised. Qualitative content validity in this study was determined based on experts' judgment. The assessment was based on the opinions of experts with knowledge and experience in the fields of health and nutrition experts and general practitioners who had research and study experience in the field of complementary nutrition. In the qualitative review of content validity, the opinions of 10 experts were used to modify the questionnaire based on the expressions of grammar, use of appropriate words, necessity, importance, and placement of phrases.

In the quantitative part, based on the opinions of 10 experts, the content validity ratio (CVR) of three expressions scored less than 0.62, according to the Lawshe table. These expressions were removed, so the questionnaire expressions were reduced to 25. The content validity index (CVI) was conducted to ensure that the items were designed best in terms of being relevant for content measurement [22]. Based on the average scores of the CVI, none of the phrases was lower than 0.79, and therefore, no item was deleted. Finally, 25 items out of 28 questions, with appropriate content and form validity, were entered into the reliability testing phase of the questionnaire using the Cronbach α, the Pearson correlation coefficient, and the interclass correlation coefficient (ICC). The value of Cronbach α coefficients for questionnaire constructs varied between 0.69 and 0.84. The test re-test reliability was also used to check the stability of the questionnaire. In this method, the Pearson correlation coefficient was calculated between the scores obtained from two times of questionnaire implementations in a two-week interval. The ICC is the most acceptable test for determining reliability. If this index is higher than 0.8, the level of reliability is favorable [18] (Table 1).

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Table 2. The characteristics of the study sample

Variables		Mean±SD/No. (%)
Age (y)		25.3±0.92
Education	Illiterate	12(2.9)
	Elementary	19(4.8)
	3rd-grade middle school	26(6.6)
	Diploma	233(58)
	University	110(27.7)
Spouse's education	Illiterate	14(3.5)
	Elementary	14(3.5)
	3rd-grade middle school	34(8.5)
	Diploma	199(49.7)
	University	139(34.6)
Employment status	Employed	51(12.8)
	Householder	349(87.2)
Spouse's employment status	Employed	348(87)
	Householder	52(13)
Number of children over two years old	0	94(23.5)
	1	208(52)
	2	82(20.5)
	3	12(3)
	≥4	4(1)
Economic status	Low	169(42.3)
	Medium	201(50.3)
	Good	30(7.4)
Place of residence	Town	216(54)
	Countryside	184(46)

The data were imported into SPSS software, version 22 for analysis, employing descriptive statistics such as frequency, Mean±SD. The normality of data distribution was assessed using the Kolmogorov-Smirnov test, which was not confirmed. Consequently, inferential statistics were utilized, including the Spearman correlation coefficient test. Statistical measurements such as R^2/adjusted R^2 and regression analysis were employed to ascertain how the model explained the total variability in the data. Furthermore, regression analysis aided in identifying statistically significant predictors within the model. Specifically, in the linear regression (stepwise) analysis, nutritional behaviors were designated as the dependent variable, while awareness, attitudes, subjective norms, perceived behavioral control, and intention were considered independent variables. Throughout all statistical analyses, the significance level was set at 0.05.

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Results

In this study, 400 mothers from Nowshahr participated and completed the questionnaires. Table 2 presents that the Mean±SD age of the participants was 25.3±0.92 years. Of the participants, 216 resided in urban areas, while the remaining lived in rural areas. Regarding education, 233 individuals (58%) had a diploma, 110(27.7%) had attained a university degree, 26(6.6%) held a bachelor's degree, and 31(7.7%) had either elementary education or were illiterate.

The statistical analysis showed a significant correlation among attitude, subjective norms, perceived behavioral control, and behavioral intention. Additionally, attitude, perceived behavioral control, and intention significantly correlated with feeding behavior (Table 3).

Regression analysis and the stepwise method were used to determine the predictive power of behavioral intention to promote nutritional behaviors among mothers. Results showed that perceived behavioral control and subjective norms were identified as the final predictors of changes in the rate of nutritional behavioral intention. These variables could explain about 42% (R^2=0.417) of the changes in the behavioral intention for nutritional behaviors (Table 4).

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Discussion

Using the TPB, this study explored the factors influencing nutritional behaviors among mothers of children aged 6 to 24 months in Nowshahr. The study's findings showed that the constructs of the TPB have a significant role in predicting nutritional behaviors among mothers with children under the age of 2 years. Specifically, perceived behavioral control and subjective norms were identified as influential factors, explaining 42% and 20% of the variance in intention and behaviors related to nutritional practices, respectively.

Previous research has consistently validated the effectiveness of the TPB in explaining human behavior. For example, Combs et al. demonstrated that theory constructs accounted for 53% of behavioral intention [23], while Rachmah et al. found that following intervention implementation, mean scores for attitudes, subjective norms, perceived behavioral control, intention, and exclusive nutritional behavior significantly increased in the experimental group compared to the control group [24]. These differences can be due to variations in influential demographic factors (such as age, educational level, and cultural background), methodological approaches, and the timing of data collection.

One of the study's essential findings was that the construct of perceived behavioral control had a significant positive effect on behavioral intention and nutritional behaviors. So, the behavior of mothers in following nutritional behaviors is influenced by their perceived behavioral control, which was aligned with the findings of previous research [23-25]. Since perceived barriers heavily influence perceived behavioral control, it is crucial to identify diverse personal, social, and environmental obstacles to adopting preventive behaviors. Strategies like brainstorming and assisting individuals in finding suitable solutions can effectively increase healthy nutritional behaviors. Additionally, given that

Table 3. The Spearman correlation coefficient between the constructs of the TPB

Questionnaire Construct	1	2	3	4	5
Attitude	1				
Subjective norm	0.147**	1			
Perceived behavioral control	0.421**	0.428**	1		
Intention	0.271**	0.783**	0.610**	1	
Behavior	0.306**	0.091	0.394**	0.278**	1

**Correlation is significant at the 0.01 level (2-tailed).

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Table 4. Multivariate regression analysis for predicting mother's nutritional behavioral intention

Model	Variables	Coefficient of Explanation (R^2)	95% Confidence Interval	P	Adjusted R^2
1	Perceived behavioral control	1.302	(1.132-1.472)	<0.001	0.362
2	Perceived behavioral control	1.020	(0.835-1.206)	<0.001	0.417
	Subjective norms	0.495	(0.337-0.652)	<0.001	

Table 5. Multivariate regression analysis for predicting mother's nutritional behavior

Model	Variables	Coefficient of Explanation(R^2)	95% Confidence Interval	P	Adjusted R^2
1	Perceived behavioral control	0.649	(0.509-0.790)	<0.001	0.170
2	Perceived behavioral control	0.788	(0.630-0.946)	<0.001	0.194
	Subjective norms	-0.243	(-0.377-0.109)	<0.001	

self-efficacy plays a pivotal role in perceived behavioral control, employing strategies to enhance self-efficacy proves effective in promoting these behaviors.

Another important finding in the study was the positive and significant correlation between the construct of subjective norms and behavioral intention. Furthermore, subjective norms were identified as a crucial determinant in healthy nutritional behavioral intention within model number 2. This finding aligns with previous research [26-28], emphasizing the importance of social influences in shaping individuals' intentions toward healthy nutritional behaviors.

While Sudrajad's study did not find subjective norms to be a significant predictor of healthy nutrition behaviors [29], it is important to recognize the influential roles of family, friends, community health workers, effective role models, officials, and community leaders in shaping individuals' intentions toward adopting healthy behaviors. Therefore, effective interventions to enhance preventive behaviors should involve influential figures, such as religious leaders, athletes, and artists, to encourage people to adopt and maintain healthy behaviors. Their endorsement and influence can significantly promote positive health behaviors within communities.

Another important finding of this study was the positive and significant correlation between attitude, behavioral intention, and healthy nutritional behaviors. Additionally, attitude positively and significantly correlated with perceived behavioral control and subjective norms. As stated in the introduction section, according to the TPB, behaviors are influenced by behavioral intention, which is shaped by the three constructs of attitude, subjective norms, and perceived behavioral control. These findings underscore the interplay between these constructs influencing individuals' intentions and subsequent behaviors regarding healthy nutritional practices [30].

Following our findings, studies by Dickin et al. and Swanson et al. have also highlighted that the intention to pursue and engage in healthy nutritional behaviors, alongside constructs such as social norms and perceived behavioral control, are predictors of such behaviors [31, 32]. Consequently, mothers with a positive attitude towards healthy nutritional behaviors and demonstrate a serious understanding of the risks associated with malnutrition are more likely to have the intention to adopt these behaviors. In our study, we assessed attitudes towards healthy nutritional behaviors and understanding of the risks of malnutrition. Although the correlation between attitudes and constructs was positive and significant, attitudes did not significantly contribute to predicting intention and healthy nutritional behaviors in this study. It is important to note that factors beyond individual behavior, such as the availability of resources to adhere to healthy nutritional guidelines, the affordability of nutritious foods, and implemented strategies, can influence healthy nutritional behaviors among mothers with children under 2 years old. Further research in this domain is essential to inform policymakers and stakeholders about the necessity of implementing effective interventions and policies to promote healthy nutritional behaviors.

To bolster positive attitudes regarding healthy nutritional behaviors, it is recommended that accurate statistics on the prevalence of child malnutrition be provided, and corrective feedback on the consequences of this condition should be offered through various media channels. Such initiatives can raise awareness and promote positive attitudes towards healthy nutritional practices.

Based on our findings, perceived behavioral control is the most influential variable in predicting the intention and healthy nutritional behaviors. It shows the strongest predictive power and could independently predict intentions and healthy dietary behaviors among mothers, accounting for approximately 36% and 17% of the variance, respectively. Perceived behavioral control encompasses an individual's perception of their resources, including skills, time, and financial means required to accomplish a specific task [33]. It reflects a person's belief in their ability to control the situation and effectively manage the resources necessary for a given task. Generally, individuals are more inclined to engage in behaviors that they perceive as feasible and within control [13].

As the second construct of the TPB, the subjective norms construct plays a significant role in describing the behavioral intention to initiate complementary feeding and nutritional behaviors. In Iran, subjective norms are crucial in influencing behavioral intention, as mothers are heavily influenced by their peers and tend to emulate behaviors that align with social norms observed among other mothers in the community. It is essential to acknowledge that individuals' behaviors are greatly influenced by social pressures, especially when adhering to healthy practices to avoid public criticism or to satisfy significant others in their lives [34].

Conclusion

Based on the study findings, the TPB demonstrates a notable predictive capability for both behavioral intention and healthy nutritional behavior among mothers with children under two years old, explaining approximately 42% and 20% of the variance, respectively. Perceived behavioral control and subjective norms emerged robust predictors of healthy nutritional behavior. These findings significantly affect planning, designing, and implementing interventions to promote healthy nutritional behaviors. By leveraging these predictors, appropriate strategies can be formulated to effectively address and mitigate the effects of malnutrition among children under two years old. This issue underscores the importance of targeted efforts to enhance maternal understanding and control over nutritional practices

and foster supportive social norms within communities. Such initiatives promise to improve young children's nutritional status and overall well-being.

Due to the study's cross-sectional design, establishing a cause-and-effect relationship was challenging. Consequently, further research in larger communities and the implementation of clinical and interventional studies are warranted. Another limitation of the study pertained to the reliance on self-reported performance measurements. However, efforts were made to mitigate this limitation by clearly stating the study objectives and assuring participants of the confidentiality of their information. Additionally, to enhance the generalizability of the findings, it is recommended that more extensive studies with larger sample sizes be conducted, encompassing diverse urban and rural areas across different provinces. This measure would facilitate a more comprehensive understanding of the factors influencing healthy nutritional behaviors among mothers with children under two years old.

Study implications

The study on predictors of healthy nutritional behavior among mothers has significant implications for public health. Health workers can use insights from this research to develop targeted strategies to improve maternal nutritional practices and reduce childhood malnutrition risk. Utilizing the TPB helps identify effective intervention strategies tailored to individual attitudes, norms, and perceived control, empowering mothers through educational programs. Health worker training based on TPB equips them with skills to recognize determinants of healthy behaviors, improving care delivery. Tailored communication strategies based on TPB insights promote adopting and maintaining healthy behaviors. Identifying predictive factors also aids in resource allocation and healthcare personnel deployment, ensuring better alignment with mothers' specific needs and enhancing overall care effectiveness.

Ethical Considerations

Compliance with ethical guidelines

The research was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (Code: IR.SBMU.SME.REC.1401.032). Informed written consent was obtained from all participants, and the Declaration of Helsinki provisions were observed in this research.

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