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Effective factors on nutrition behaviors of pregnant women based on the beliefs, attitudes, subjective norms, and enabling factors model: A cross-sectional study

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Abstract:

BACKGROUND: One of the useful models in health education is the Beliefs, Attitudes, Subjective Norms, and Enabling Factors (BASNEF) model. The model is used to study behavior and to plan for change it and to determine the factors that influence people's decision-making. The aim of this study was to investigate the factors affecting the nutritional behavior of pregnant women based on BASNEF model.

MATERIALS AND METHODS: This cross-sectional study was performed on 360 pregnant women referring to health centers of Tabriz-Iran by two-stage cluster sampling method from April to December 2016. Data were collected using sociodemographic, nutrition subdomain of Health Promoting Lifestyle-II (HPLP-II), and researcher-made questionnaire based on constructs of BASNEF model. Data were analyzed using the SPSS software version 21 and Pearson correlation test and General Linear Model (GLM).

RESULTS: Mean ± standard deviation (SD) of nutrition subdomain of HPLP-II was 24.65 ± 4.75 within the range 9–36. Mean ± SD of BASNEF model constructs (score range) was also obtained as 45.30 ± 10.80 (0–100), 17.98 ± 2.40 (8–24), 9.30 ± 2.82 (0–20) and 2.47 ± 1.74 (0–6) for belief, attitude, subjective norms, and enabling factors, respectively. Based on the GLM, there was significant relationships between nutritional behavior and BASNEF model constructs (belief [$P < 0.001$], attitude [$P = 0.043$], enabling factors [$P < 0.001$], and subjective norms [$P = 0.038$]) as well as the variables of job, husband's education, and job and sufficiency of income for expenses.

CONCLUSION: The results of the present study showed the impact of BASNEF model constructs and some sociodemographic variables on nutrition behaviors in pregnant women. Therefore, in order to improve nutrition behaviors of pregnant women, designing and implementation of interventions based on the BASNEF model are recommended.

Keywords:

Beliefs, attitudes, subjective norms and enabling factors model, nutrition behaviors, pregnancy

Introduction

Pregnant women undergo significant anatomical and physiological changes during pregnancy.[1] Even in low-risk pregnancies, physical and psychological changes related to pregnancy can alter women's ability and affect their quality of life.[2] Given the metabolic changes and even nutrient requirements during this period, an effective diet plan is needed according

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to these changes and food habits of families.[3] Maternal nutrition is an important factor during pregnancy that affects not only maternal and fetal health but also pregnancy outcome.[4] Proper supply of nutrients for women of child-bearing age is related to positive outcome in fertility, pregnancy, fetal development, and childbirth. Elevated basal metabolic rate during pregnancy emphasizes the importance of nutrition and diet during pregnancy.[5]

Studies have shown a positive association between pregnancy weight gain and birth weight.[6] Inadequate maternal weight gain in pregnancy is associated with an elevated risk of delivery of a low-birth-weight infant.[7] Nevertheless, weight gain (even in case of normal body mass index [BMI]) has an adverse effect on pregnancy outcome.[8] High prepregnancy BMI (overweight and obesity) increases complications, especially gestational diabetes.[9] Furthermore, a review study showed that identification of women's dietary patterns during pregnancy may be more applicable to clinical and pregnant health interventions.[10]

Unfortunately, most women do not have enough knowledge on their nutritional needs during pregnancy.[11] Studies also showed that pregnant women do not know about specific diet during pregnancy.[11,12] However, knowledge on pregnancy diet alone does not improve nutrition behaviors of pregnant women. Current training programs also do not help pregnant women to gain weight in an effective manner. Effective interventions (e.g. theory-based training programs) are needed to help pregnant women to improve their nutrition behaviors.[13]

Beliefs, Attitudes, Subjective Norms, and Enabling Factors (BASNEF) model is one of the useful health education models. It consists of a combination of the two models, PRECEDE model and behavioral intention model. The BASNEF is a comprehensive model for developing new behaviors in developing societies. It focuses on the impact of the knowledge; attitude and individual skills on behavior changes.[14] Constructs of BASNEF model are behavioral beliefs, attitudes, subjective norms, and enabling factors.[15] The model is used to meet the health educational needs of developing countries. It is used to study behaviors and plan to change them and to define the effective factors on individual decision-making. It assesses attitudes toward behavior, social pressures, behavior intention and enabling factors (e.g., skill, time, and cost) that are effective on transformation of an intention to an effective behavior.[16]

Effects of BASNEF model have been confirmed in several studies.[16,17] In one study, BASNEF model was applied to patients with type 2 diabetes during hypertension control and prevention of its side effects.[16] Dietary knowledge, attitude, and behavior of pregnant women were assessed in a study where poor knowledge and attitude of pregnant women toward nutrition were estimated.[18] Nutrition behaviors of students in schools were assessed based on the BASNEF model. It showed that an educational intervention based on BASNEF model improved nutrition behaviors of the students.[15] Given the inadequate knowledge and unhealthy attitude toward pregnancy diet[11] and by taking into account that healthy diet guarantees a successful pregnancy and delivery,[19] and the importance of nutritional behaviors on pregnancy outcome,[10] this study aimed to assess the related factors with nutritional behaviors of pregnant mothers based on the BASNEF model constructs to develop and implement effective training programs and strategies to improve nutritional status of pregnant women, and consequently improve maternal and neonatal outcomes.

Materials and Methods

Study design and setting

This cross-sectional study was conducted on 360 pregnant women visiting health centers in Tabriz-Iran in 2016 after approving the study protocol by Ethics Committee by Tabriz University of Medical Sciences. The inclusion criteria were residence in Tabriz-Iran, willingness to participate in the study, singleton pregnancy of more than 16 weeks, the possibility of phone contact. The exclusion criteria were a history of pregnancy with fetal malformations, strong marital conflicts (according to confessions of the pregnant woman), history of infertility, history of drug use or hospitalization, and medical problems during pregnancy (e.g. thyroid disease, hypertension, and high-risk pregnancy).

Study participants and sampling

Participants selected from 60 centers and 25 bases affiliated to Tabriz University of Medical Sciences by the two-stage cluster sampling method. A list of the qualified pregnant women with their telephone numbers was prepared at each center or base, and then participants were selected from each center and base using the proportionate stratified random sampling technique. During the phone call, the selected women were asked to attend the meeting. In the face-to-face meetings, the participants were first evaluated with respect to basic information and the inclusion/exclusion criteria of the research and if they had the eligibility criteria were provided with comprehensive information on the reasons for conducting the research, its usefulness, results, and confidentiality of the information. After explaining the objectives of the research and reminding the women that they were free to decide whether to take

part in the research or not, written consent was obtained from the eligible women who volunteered to participate in the research.

Data collection tool and technique

Data collection tools were questionnaire on sociodemographic, constructs of the BASNEF model and nutrition sub-domain of the Health Promoting Lifestyle-II questionnaire (HPLP-II).

The researcher-developed questionnaire for BASNEF model constructs consisted of eight items on attitude, 21 items on beliefs, 5 items on subjective norms, and 6 items on enabling factors. The questionnaire was prepared according to a valid reference and scientific books. Attitude items were scored in a scale from agreed to disagreed (agreed = 3, no comment = 2, and disagreed = 1). Belief items ranged from 2 to 6, and participants could choose more than one option per question. To unify the questions, if all the correct options were selected, a score of 100 was given, if none of the options was selected, a score of zero was given, and if some of the correct options were selected, a score between 0 and 100 was given. The score range of the belief items were between zero and 100. Items on subjective norms were scored based on a five-point Likert scale (very high = 4, high = 3, low = 2, very low = 1 and not at all = 0). Items on enabling factors were also scored as yes = 1 and no = 0. In all four constructs of the model, a higher score indicates a better status. Validity of the questionnaire was assessed using face and content validity. It was assessed by ten experts in health education, reproductive health, and midwifery. Necessity or unnecessity of the items were assessed by the experts and the content validity ratio (CVR) was calculated. The items with a CVR lower than the acceptable value based on the Lawshe's table (0.62) were excluded.[20] Reliability of the questionnaire was assessed by test-retest within a 2-week interval on 20 pregnant women. The intra-correlation coefficients were calculated as 0.87 for attitude, 0.75 for beliefs, 0.88 for subjective norms, and 0.75 for enabling factors.

The nutrition subdomain of HPLP-II consists of 9 items scored based on a Likert scale ranging from never (Score 1) to always (Score 4). The range of scores is from 9 to 36. The validity and reliability of this tool in Iran are confirmed. Hence, the construct validity of this instrument is confirmed by confirmatory factor analysis and the content validity is confirmed by content validity Index (CVI = 0.82). Furthermore, its reliability has been tested and confirmed by Cronbach's alpha method (0.78).[21]

Sample size was estimated 358 individuals using GPOWER software with considering d = 0.05 about the mean score of nutrition behaviors (m = 2.69), standard deviation (SD) =0.54, and α =0.05.[21] Because of cluster sampling, with respect to the design effect of 1.5, final sample size was calculated 358 individuals. At the end, 360 pregnant women were studied because of possible attrition.

Data were analyzed using SPSS (SPSS Inc., Chicago, IL, USA, version 21.0). The normality of the data was checked using skewness and kurtosis. Descriptive statistics were used to describe the sociodemographic characteristics of the participants, nutrition behavior, and BASNEF model constructs. Pearson correlation test was used to determine the relationship between nutrition behaviors and BASNEF model constructs. Independent *t*-test and one-way analysis of variance (ANOVA) were used to determine the relationship between sociodemographic characteristics and nutrition behaviors. Then, to determine the effect of each of the independent variables (sociodemographic characteristics and constructs of BASNEF model) on the dependent variable (nutrition behaviors), those variables that had significant relationship with nutrition behavior based on the bivariate tests including independent *t*-test and one way ANOVA ($P < 0.05$) were entered into the adjusted GLM. *P* value lower than 0.05 was considered statistically significant.

Ethical consideration

Ethical approval was obtained from the Ethics Committee of Tabriz University of Medical Sciences (Ethics code: TBZMED.REC5/4/7550). Participants were informed of the purpose of the study and signed a written informed consent form. In the meantime, they were free to leave the study at any time. All methods were performed in accordance with the declaration of Helsinki.

Results

In this study, 360 people were assessed from April to December 2016. Mean ± SD of age and BMI of the participants were 29.3 ± 5.5 years and 24.6 ± 4.1 kg/m^2, respectively. Nearly half of the participants (192, 53.3%) had high school diploma and bachelor degree. Almost half of the husbands (187, 51.9%) had high school diploma and bachelor degree. About one-third of the participants (98, 33.7%) lived in personal houses and (106, 36.4%) lives in rental homes. More than half the participants (212, 58.9%) reported their income fairly sufficient for their living expenses. Majority of mothers (286, 92.9%) and fathers (280, 90.9%) were interested in finding out gender of their babies by ultrasound [Table 1].

Mean ± SD of nutrition behavior score was 24.65 ± 4.75 within the range 9–36. Mean ± SD of constructs of the

Table 1: Sociodemographic characteristics of the participants (*n*=360)

Characteristic	*n* (%)*
Age (year)	
<25	90 (25.0)
25-35	216 (60.0)
>35	54 (15.0)
Mean±SD†	29.3±5.5
Education level	
Elementary	59 (16.4)
Secondary	63 (17.5)
High school	46 (12.8)
Diploma	106 (29.4)
University	86 (23.9)
Job	
Housewife	327 (90.8)
Employed	8 (2.2)
Home based work	25 (6.9)
Sufficiency of income for expenses	
Sufficient	70 (19.4)
Fairly sufficient	212 (58.9)
Insufficient	78 (21.7)
Residence	
Personal	98 (33.7)
Rental	106 (36.4)
Others‡	87 (30.0)
BMI (kg/m^2)	
<19.8	43 (11.9)
19.8-25.9	189 (52.5)
26-29	75 (20.8)
>29	53 (14.7)
Mean±SD†	24.6±4.1
Husband's education level	
Elementary	56 (15.6)
Secondary	84 (23.3)
High school	33 (9.2)
Diploma	90 (25.0)
University	97 (26.9)
Husband's job	
Employed	84 (23.3)
Worker	109 (30.3)
Shopkeeper	37 (10.3)
Others§	130 (36.1)
Wanted pregnancy	322 (89.4)
Fetal sex	
Girl	132 (36.7)
Boy	174 (48.3)
Unknown	54 (15.0)
Husband interest in fetal sex	280 (90.9)
Woman interest in fetal sex	286 (92.9)

*Valid percent has been reported in all the variables because of missed data. †All data indicate the *n* (%) unless they have been specified, ‡Others indicate residence in the relative house and corporate house, §Other includes occupations, such as building painter and farmer. BMI=Body mass index, SD=Standard deviation

BASNEF model were also calculated and obtained as 45.30 ± 10.80 for belief on behavior within the range of 0–100, 17.98 ± 2.40 for attitude toward behavior within the range of 8–24, 9.30 ± 2.82 for subjective norms within the range of 0–20, and 2.47 ± 1.74 for enabling factors within the range of 0–6. According to Pearson correlation analysis, significant ($P < 0.05$) and direct correlations of score of nutrition behavior with attitude toward behavior ($r = 0.317$, $P = 0.002$), belief on behavior ($r = 0.317$, $P < 0.001$), subjective norms ($r = 0.204$, $P < 0.001$), and enabling factors ($r = 0.166$, $P = 0.002$) were found [Table 2].

According to the bivariate tests, significant relationships were found between nutrition behavior with education ($P > 0.001$), job ($P > 0.001$), husband's education ($P > 0.001$) and job ($P > 0.001$), sufficiency of income for expenses ($P > 0.001$). According to multivariate analysis (adjusted GLM), there was significant relationships between nutritional behavior and BASNEF model constructs (belief [$P < 0.001$], attitude [$P = 0.043$], enabling factors [$P < 0.001$], and subjective norms [$P = 0.038$]). Furthermore, homemakers ($P = 0.013$) compared to women with home-based jobs, women whose husbands had secondary education ($P = 0.041$) as compared to pregnant women whose husbands had university education and women whose husbands were worker ($P = 0.040$) compared to pregnant women whose husbands had other jobs, had lower nutrition behavior score. The participants with sufficient ($P = 0.029$) or fairly sufficient ($P = 0.005$) income had higher nutrition behavior score than those with insufficient income [Table 3].

Discussion

The present study aimed to assess the effective factors on nutrition behaviors of pregnant women based on the BASNEF model. The results indicated a relationship between nutrition behaviors of pregnant women with the BASNEF model constructs and some sociodemographic characteristics including job, husband's education level and job and sufficiency of income for expenses.

In the present study, the nutrition behavior score was at a moderate level, which is consistent with a study conducted in Turkey among pregnant women.[22] However, in another study, the mean score of nutrition behavior reported 21.05, which was lower than the one reported in the our study.[23] These results might be due to different educational level of the participants since illiterate people were also included in the previous study. Acquisition, learning, and implementation of training courses on pregnancy nutrition by the health centers were feasible in this study since more than half of the participants had a high school diploma or an academic degree. More than half of the participants reported relatively adequate income that helped the pregnant

women to eat balanced meals containing almost all nutrients.

The highest mean of the BASNEF model constructs belonged to attitude toward behavior in the present study. According to the BASNEF model, attitude is a combination of one's beliefs about the results of a behavior and the value of the results of the behavior. Pregnant women may pay more attention to different aspects of their nutrition and its effect on the fetus, and this cause that they have a good attitude toward the advantages and disadvantages of nutrition, and this factor can cause a relationship between attitudes and nutritional behaviors of pregnant women.

Table 2: Status of beliefs, attitudes, subjective norms and enabling factors model constructs and its relationship with nutrition behaviors of pregnant women (n=360)

Characteristic	Mean±SD*	Relationship with nutrition behaviors	
		r	*P*
Beliefs (0-100)	45.30±10.80	0.317	<0.001‡
Attitudes (8-24)	17.98±2.40	0.258	<0.001‡
Subjective norms (0-20)	9.30±2.82	0.204	<0.001‡
Enabling factors (0-6)	2.47±1.74	0.166	0.002§
Nutrition behaviors (9-36)	24.65±4.75	-	-

*SD, ‡Pearson correlation test, §Spearman correlation test. SD=Standard deviation

In our study and the study conducted in Zanjan-Iran, the enabling factors had the lowest mean score among the structures of BASNEF model.[24] Enabling factors are one of the important structures of the BASNEF model. Someone may intend to engage in the recommended behavior but cannot perform or is discouraged to perform the intended behavior due to lack of skills (not skilled in choosing healthy foods), lack of resources to perform the recommended behavior (lack of money to buy the recommended foods), or barriers to the recommended behavior (lack of access to the recommended foods).[25] Perhaps, the high level of education could have improved their attitude.

A significant relationship was found between nutrition behavior and the BASNEF model constructs in the present study. So that with increasing the score of each of the model constructs, the score of women's nutritional behavior improved. Various studies have shown that nutrition counseling and training courses can improve quality and quantity of nutrient intake during pregnancy.[26] Since no study was found in the literature review regarding the relationship of constructs of this

Table 3: Relationship between sociodemographic characteristics and beliefs, attitudes, subjective norms and enabling factors model constructs on nutrition behaviors in pregnant women based on general linear model (*n*=360)

Characteristic	Unadjusted		Adjusted	
	β (95% CI)	*P*	β (95% CI)	*P*
Beliefs	18.29 (16.26-20.33)	<0.001	0.10 (0.06-0.14)	<0.001
Attitudes	0.51 (0.3-0.71)	<0.001	0.19 (0.01-0.39)	0.043
Subjective norms	0.33 (0.16-0.50)	<0.001	0.17 (0.01-0.33)	0.038
Enabling factors	0.66 (0.39-0.92)	<0.001	0.63 (0.36-0.89)	<0.001
Education level (university)				
Elementary	−2.75 (−4.29-−1.20)	0.001	0.74 (−0.93-2.42)	0.382
Secondary	−2.27 (−3.79-−0.76)	0.003	1.09 (−0.52-2.71)	0.184
High school	−2.90 (−4.57-−1.23)	0.001	−0.13 (−1.24-1.44)	0.884
Diploma	−2.18 (−3.51-−0.85)	0.001	0.09 (−1.24-1.44)	0.885
Job (home based work)				
Housewife	−4.24 (−6.13-−2.35)	<0.001	−2.34 (−4.17-−0.50)	0.013
Employed	−2.56 (−6.26-1.14)	0.174	−2.06 (−5.33-1.21)	0.217
Husband's education level (university)				
Elementary	−2.83 (−4.35-−1.31)	<0.001	−1.54 (−3.27-0.19)	0.081
Secondary	−3.08 (−4.43-−1.72)	<0.001	−1.68 (−3.29-−0.07)	0.041
High school	−2.22 (−4.04-−0.39)	0.017	−1.85 (−3.80-0.11)	0.064
Diploma	−1.07 (−2.39-0.26)	0.114	−0.04 (−1.43-1.36)	0.959
Husband's job (others*)				
Clerk	1.56 (0.30-2.82)	0.015	−0.39 (−1.76-0.98)	0.580
Worker	−1.77 (−2.94-−0.60)	0.003	−1.12 (−2.18-0.05)	0.040
Shopkeeper	1.55 (−0.12-3.23)	0.069	0.58 (−0.94-2.01)	0.457
Sufficiency of income for expenses (insufficient)				
Sufficient	3.05 (1.54-4.55)	<0.001	1.59 (0.16-3.02)	0.029
Fairly sufficient	1.75 (0.54-2.96)	0.005	1.56 (0.48-2.63)	0.005

*Other includes occupations, such as building painter and farmer. Adjusted R^2=0.266. CI=Confidence interval

model and nutrition behaviors of pregnant women. Therefore, the studies that have assessed this model in other groups of society are discussed here. One study showed that the BASNEF model can encourage young people to develop healthy eating habits and promote their health status in an effective manner.[27]

In a study that assesses the impact of training programs based on the BASNEF model on nutrition behaviors of students, show that the intervention increased the score of knowledge and attitude of students, which reflected the impact of the intervention on belief, persistence, and enhancement of students' attitudes toward healthy nutrition behavior.[28] Another study showed that nutrition training courses based on the BASNEF model can be effective in improving healthy nutrition behaviors of the elderly.[25] The intervention increased score of knowledge and attitude of students, which reflect the impact of intervention on belief, persistence, and enhancement of students' attitudes toward healthy nutrition behavior.

There was a significant relationship between education and nutrition behaviors of pregnant women in the present study. Those with secondary school education had lower nutrition behavior score than those with academic education. A study showed that education was predictor of healthy nutrition behaviors. Healthier nutrition behaviors were practiced in those with higher education.[29] Another one showed unhealthy nutrition behaviors in people with low education. Given the negligible impact of training courses on illiterate or low-educated people, different educational methods including media (e.g. radio and television) should be used to increase awareness of these people on healthy nutrition habits.[30] This may be due to the low level of awareness and financial ability of these people.

There was a significant relationship between maternal occupation and nutrition behaviors in pregnant women in the present study. Homemakers developed unhealthier nutrition behavior compared to women with home-based jobs, which might be due to their low income and higher education of women with home-based jobs that increase their knowledge and cooperation to acquire more information on healthy nutrition habits. There was also a significant relationship between occupation of the spouse and nutrition behaviors of pregnant women. Workers developed unhealthy nutrition habits due to their low level of income and literacy. However, by assessing the impact of jobs on women's nutrition behavior and showed that housewives developed healthier nutrition habits compared to employed women probably due to more spare time to spend on mass media (radio, television, and magazines) to acquire knowledge on healthy nutrition habits.[31]

There was also a significant relationship between income and nutrition behaviors of pregnant women in the present study. The people with adequate income developed healthier nutrition behavior compared to people with insufficient income. Another study similar reported the positive and significant correlation of household income and women's education with their nutrition behaviors.[32] A review study showed that such individual factors as age, occupation, education, and household income affect nutrition behaviors of pregnant women.[33] Improving people's employment status and increasing their financial capacity will probably improve their nutritional status.

A review of literature revealed that this was the first study on assessment of women's nutrition behaviors based on the BASNEF model constructs. Random sampling was one of the strengths of the study. One of the weaknesses of the study was cross-sectional nature of the study. Therefore, the relationship shown between nutrition behavior with job, husband's education level and job, sufficiency of income for expenses, and the BASNEF model maybe do not necessarily indicate a causal relationship. Another limitation of the present study is using of researcher-developed questionnaire for measuring of BASNEF model constructs. The validity of this questionnaire was only assessed by content validity and its construct validity was not assessed. Therefore, it is recommended to develop a standard questionnaire based on the constructs of BASNEF model to assess the factors related to nutritional behaviors of pregnant women in future studies. Furthermore, conducting of interventional studies based on BASNEF model is recommended.

Conclusion

The results of the present study showed the impact of occupation of the husband, education of husband, adequacy of household income, and BASNEF model constructs on nutrition behaviors of pregnant women. Therefore, it is recommended that interventional studies on nutrition behaviors of pregnant women based on the BASNEF model be designed and implemented in the future. Social impacts of governments and health policy-makers and the supportive-economic role of the family seem to be neglected in this study.

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Conflicts of interest

There are no conflicts of interest.

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