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Original article

Nutrition perspective from the view of pregnant women: their understanding of fetal well-being relative to their diet

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Summary. *Introduction*: Nutritionally balanced nutrition assessment, mothers' nutrition motivation, and healthy nutrition information are among the factors that affect infants. Thus, it is possible to shed light on the attempts to reach information in healthy nutrition guides among pregnant women. Aim: The aim of our study was to evaluate the nutritional habits and healthy nutrition knowledge levels of pregnant women. It was aimed to evaluate whether pregnant women should be included in high quality nutrition programs. *Methods*: Our study was performed with volunteer 338 pregnant women who presented to Trakya University obstetrics clinic in March 2018- April 2019. Sociodemographic characteristics were recorded. The General Knowledge Nutrition Questionnaire (GNKQ) was used in our study. *Results*: The differences in GKNQ scores for the pregnant women in our study were evaluated for the four sections and total scores. For the first section, dietary recommendations, the mean was score was 9.66. For the second section (sources of nutrients), the mean score was 32.92. For the third section (choosing everyday foods), the mean sore was 6.23, and for the fourth section (diet-disease relationships), the mean score was 10.24. The mean total score was 59.10. It was seen that most of the pregnant women had not received adequate nutrition education before or during pregnancy. It was observed that some of the pregnant women participated in our study because of the threat of preterm labor and / or premature membrane rupture. 3.84% were found to have preterm history. When evaluated with the GNKQ scale, those with a history of EMR were under investigation and treatment due to the threat of preterm labor. In our study, it was seen that patients who were interned in the ward because of gestational hypertension, preeclampsia, and eclampsia GNKQ scores were lower than in the other patients. This result suggests that nutrition may have an effect on the complications of pregnancy. Unfortunately, although women reported positive changes in lifestyles during pregnancy, it was shown that their dietary intake and knowledge did not meet the recommended nutrient intake for pregnancy. *Discussion*: Considering that diet behavior is very complex, attempts to understand this in terms of nutritional knowledge in pregnant women should start with a clear understanding of awareness. Furthermore, they had a wide range of information, but the correct information was not on a systematic basis. Pregnancy is a life event that triggers a long-term review of nutritional problems. It is important for health professionals to realize that pregnancy is one of the unique opportunities for women to be informed about nutrition. There is a need for greater emphasis on nutritional counseling and education in order to optimize the quality of nutritional habits of pregnant women. Training and forms should be put into practical use for pregnant women. *Conclusion*: Our findings show that evaluating pregnant women with the GNKQ and providing nutritional education will be beneficial on pregnancy outcomes. This study showed that pregnant women had limited knowledge about balanced nutrition rules. It's necessary to increase effective nutrition programs and campaigns for pregnant women. Babies should be provided with a healthy start to life and routine nutrition counseling should be promoted as part of pregnancy care.

Key words: nutritional knowledge, pregnant women, fetal well-being, dietary recommendation

Introduction

Nutritionally balanced nutrition assessment, mothers' nutrition motivation, and healthy nutrition information are among the factors that affect infants. Increased weight gain during pregnancy, macrosomia, leads to an increase in the risk of glucose intolerance and cesarean section (1). Insufficient folic acid and

iodine intake cause preventable birth defects and fetal cognitive problems. Low quality of maternal diet increases the risk of premature birth. Poor maternal nutrition in pregnancy, impaired glucose tolerance, and dyslipidemia may cause increased systemic arterial pressure (2). Fetus exposure to maternal obesity, diabetes, and systemic hypertension may increase the risk of developing obesity and chronic diseases in later ages. Knowledge of the benefits of some basic nutrients such as omega 3 fatty acids and nutrient sources, and deficiencies of nutrients and vitamins and mineral (e.g. iodine, iron) in pregnant women needs to be increased (3, 4).

Dietary behaviors during pregnancy are influenced by a complex set of factors related to the individual and their environment, including physiologic developments. These sociodemographic features, prepregnancy body mass index (BMI), nausea and vomiting during pregnancy, and the effects of the community, especially the family elders, shape women's knowledge and attitudes during pregnancy. Pregnancy gestational diabetes, gestational hypertension, hyperemesis gravidarum, and gastro-esophageal reflux can affect the nutritional profiles of pregnant women (1). There are differences in the motivation of pregnant women and their attitudes towards healthy nutrition. Some women see pregnancy as a turning point towards a healthy diet, while others regard it as a break for healthy nutrition (5).

The level of relationship between the knowledge and awareness level of pregnant women and their compliance with dietary rules should be determined. Thus, it is possible to shed light on the attempts to reach information in healthy nutrition guides among pregnant women and to improve the nutrition quality in their daily lives. In order to support the safe, healthy, and balanced nutrition of women during pregnancy, it is important to have an idea about factors that affect their dietary behaviors.

The aim of our study was to evaluate the nutritional habits and healthy nutrition knowledge levels of pregnant women. It was aimed to evaluate whether pregnant women should be included in high quality nutrition programs.

Methods

Our study was performed with volunteer pregnant women who presented to Trakya University obstetrics clinic for routine pregnancy checks. Written informed consent was obtained from each pregnant woman. A number of specific questions were included in the first part of the questionnaire to characterize the participants.

The study was conducted between March 2018 and May 2019 in Trakya University Women's Diseases and Obstetrics Clinic.

Additional disease information, gestational week, sociodemographic characteristics, and some information about pregnancies (how many weeks of gestation, how many pregnancies) were recorded.

The General Knowledge Nutrition Questionnaire (GNKQ) was used in our study, whose validity and reliability have been proven in the literature (6). The GNKQ represents a more comprehensive assessment of nutritional information than is generally achieved. It is a reliable and valid survey to provide a quality measurement of nutritional information. This tool helps to identify the weak areas of people in the understanding of healthy eating. It also provides useful data to examine the relationship between nutritional information and diet behavior. The scale is useful for individuals in food selection research, providing a clear understanding of the relationship between knowledge and behavior. The GNKQ is also a useful tool for identifying gaps in nutritional knowledge of societies and for evaluating the success of health education campaigns thanks to the wide scope of the scale. The fact that this valuable test is based on a large number of scientific studies makes it more powerful (7,8).

The GNKQ was administered to pregnant women under the guidance of the responsible researcher. In the study, the GNKQ evaluates nutritional profiles and nutritional knowledge levels and includes 135 items covering four nutritional information areas; (i) awareness of current dietary recommendations (11 items), (ii) food sources and nutrient information (73 items), (iii) ability to select daily foods (7 items), and (iv) dietary-disease relationships knowledge level assessment (44 items) (6,7). These four areas underlie the basic considerations of acquisition behavior.

Using the GNKQ, "Do people know what the ex-

isting expert dietary recommendations are?", "Do they know which foods provide the nutrients specified in the experts' recommendations?", Are they aware of the health effects of eating or not eating certain foods?" were examined in the pregnant women.

For the 4 main areas, knowledge subscales and general nutritional knowledge scores were calculated. The raw data obtained from the responses of each participant were coded numerically. The answers were also translated to 1 and 0 for correct and incorrect answers, respectively.

Pregnant women with hyperemesis gravidarum, ectopic pregnancy, missed abortion, gestational trophoblastic diseases, and incomplete and complete abortion were excluded from the study. Pregnant women with special diets (patients with diabetes or those with special diet-regulated chronic diseases) were excluded from the study.

In order to protect and improve the health of both the mother and the baby, we tried to determine deficiencies in order to increase the awareness of balanced nutrition.

Ethical consideration

Ethics committee approval for this study was obtained from Trakya University Ethical Committee of Scientific Research (Decision number: 2019.02.26-21). Written informed consent was obtained from each participant of the study.

Data analysis

All statistical analyses were performed using the IBM SPSS 21.0 package program. The non-parametric Mann-Whitney U test was used for group comparisons. The data were evaluated using appropriate descriptive statistics. Median, minimum, and maximum were calculated as descriptive statistics. Mean and standard deviation are used for descriptive statistics of quantitative variables and percentage and frequency are used for qualitative variables. Significance value (p) for all statistical analyses was defined as 0.05.

Results

Three hundred sixty-nine volunteer pregnant women participated in our study. However, 31 pregnant women were excluded from the evaluated group because they did not fully answer the questions. The study was completed with 338 pregnant women. The ages of the women ranged between 18 and 41 years.

The differences in GKNQ scores for the pregnant women in our study were evaluated for the four sections and total scores. For the first section, dietary recommendations, the mean was score was 9.66±1.60 (mean±standart deviation). For the second section (sources of nutrients), the mean score was 32.92±8.03). For the third section (choosing everyday foods), the mean sore was 6.23±4.51, and for the fourth section (diet-disease relationships), the mean score was 10.24±4.51. The mean total score was 59.10±10.77.

Fifty-four (15.97%) of the pregnant women in our study stated that they received diet training from family physicians during pregnancy checks. There was no statistically significant difference between GNKQ scale total score and sub-scores for 284 (84.02%) preg-

Table 1. GNKQ scores for all pregnant women and evaluation of nutritional education

GNKQ scores	All pregnant women N= 338		According to taken nutritional education (NE) (at least 3 hours/ One month)				
			NE - (n= 284)		NE + (n=54)		*P*
Knowledge section (max score)	Mean±SD		Mean±SD		Mean±SD		
1. Section: Dietary recommendations	9.66	1.60	9.65	1.62	9.74	1.50	0.719
2. Section: Sources of nutrients	32.92	8.03	33.24	7.87	31.25	8.69	0.096
3. Section: Choosing everyday foods	6.23	2.09	6.22	2.15	6.25	1.75	0.922
4. Section: Diet-disease relationships	10.24	4.51	10.32	4.46	9.83	4.77	0.465
Total	59.10	10.77	59.45	10.76	57.27	10.74	0.174

**SD: Standart Deviation*

Table 2. GNKQ scores according to trimesters and number of pregnancies

Parameters	Trimester							Number of pregnancies						
	1 n=57 (16.86%)		2 n=65 (19.23%)		3 n=216 (63.90%)		*p*	1 n=113		2 n=109		3 n=116		*p*
Knowledge section (max score)	Mean±SD		Mean±SD		Mean±SD			Mean±SD		Mean±SD		Mean±SD		
1. Section: Dietary recommendations	9.28	2.10	9.75	1.71	9.74	14.02	*0.135*	9.53	1.73	9.49	1.75	9.96	1.26	0.048*
2. Section: Sources of nutrients	33.61	8.52	33.06	8.54	32.70	7.76	*0.744*	34.15	7.97	31.01	7.78	33.52	8.05	0.008*
3. Section: Choosing everyday foods	5.63	2.24	6.33	1.77	6.36	2.12	*0.059*	6.20	2.08	6.26	2.06	6.23	2.15	0.976
4. Section: Diet-disease relationships	10.87	4.46	10.29	4.33	10.29	4.53	*0.255*	10.56	4.55	9.77	4.41	10.37	4.56	0.391
Total	59.57	11.57	58.69	10.72	59.10	10.61	*0.903*	60.46	10.80	56.64	10.02	60.10	11.10	0.014*

nant women who had not diet education, and among the pregnant women who had diet education (*p=0.174*) (Table 1). It was thought that the pregnant women who were given diet education during pregnancy did not benefit from it enough. It was seen that most of the pregnant women had not received adequate nutrition education before or during pregnancy.

Of the pregnant women, 57 (16.86%) were in the first trimester, 65 (19.23%) were in the second, and 216 (63.90%) were in the third trimester. There was no significant difference between the scores obtained from the GNKQ according to the number of pregnant women. One hundred thirteen (33.43%) pregnant women were primiparous, and 225 (66.56%) were multiparous. There were differences between those with a 2nd pregnancy and those with 3 or more pregnancies. The GNKQ total score *(p=0.014),* sub-scores, section 1 (dietary recommendations) *(p=0.048),* section 2 (sources of nutrients) *(p=0.008)* were statistically different for the second and third trimester. As the pregnancy experience increased, it was observed that the women took more care of their diet (Table 2).

Considering the number of living children, 143 (42.30%) pregnant women had no children, 120 (35.50%) were pregnant women with 1 child, and 75 (22.8%) participants had more than 2 children. As the number of surviving children increased, the scores of mothers who were thought to have increased motherhood experience tended to increase in the GNKQ, but the difference was not statistically significant *(p=0.066)* (Table 3).

It was observed that some of the pregnant women participated in our study because of the threat of preterm labor and / or premature membrane rupture. The difference between pregnant women without these symptoms in our study was examined. Thirteen (3.84%) were found to have early membrane rupture (EMR) and preterm history. When evaluated with the GNKQ scale, those with a history of EMR were under investigation and treatment due to the threat of preterm labor. Although it was observed that the GNKQ total score and the sources of nutrients, choosing everyday foods, and diet-disease relationships tended to get lower scores, there was not statistical significance between them (Table 4). In our study, it was seen that patients who were interned in the ward because of gestational hyperten-

Table 3. GNKQ scores according to the number of children

Parameters	Number of living children n (%)								
	0 n=143 (42.30%)		1 n=120 (35.50%)		2 n=59 (17.45%)		≥3 n=16 (4.73%)		*p*
Knowledge section (max score)	Mean±SD		Mean±SD		Mean±SD		Mean±SD		
1. Section: Dietary recommendations	9.54	1.70	9.57	1.75	10.11	1.03	9.81	0.98	0.111
2. Section: Sources of nutrients	33.53	8.10	31.73	8.10	33.79	8.28	33.25	4.85	0.242
3. Section: Choosing everyday foods	6.27	1.92	6.10	2.24	6.32	2.20	6.50	2.16	0.841
4. Section: Diet-disease relationships	10.57	4.52	10.98	4.26	10.98	4.26	9.25	4.21	0.145
Total	59.93	10.25	57.12	11.56	61.22	10.58	10.24	4.51	0.066

Table 4. GNKQ scores according to risk of preterm labor / premature membrane rupture / Preeclampsia / Gestational Hypertension

Parameters	Risk of preterm labor (TPL)/ Premature membrane rupture (PMR)							Preeclampsia /or Eclampsia / or Gestational hypertension (PEG)				
	TPL (-) PMR (-) n=246		TPL (+) PMR (-) n=77		TPL (+) PMR (+) n=13		*p*	PEG (-) n=281		PEG (+) n=57		*p*
Knowledge section (max score)	Mean	SD	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
1. Section: Dietary recommendations	9.71	1.61	9.36	1.64	10.38	0.86	*0.061*	9.72	1.56	9.38	1.78	0.145
2. Section: Sources of nutrients	33.31	8.01	32.05	7.99	29.92	8.19	*0.193*	33.65	8.21	29.33	5.95	*<0.001**
3. Section: Choosing everyday foods	6.32	1.99	5.96	2.47	6.07	1.55	*0.410*	6.45	2.02	5.14	2.13	*<0.001**
4. Section: Diet-disease relationships	10.34	4.35	9.84	4.93	9.84	4.91	*0.662*	10.69	4.48	8.03	3.95	*<0.001**
Total	59.74	10.39	57.22	11.91	56.23	8.81	*0.125*	60.56	10.45	51.89	9.37	*<0.001**

**Risk of preterm labor (TPL)/ Premature membrane rupture (PMR)*
** Preeclampsia /or Eclampsia / or Gestational hypertension (PEG)*

Table 5. GNKQ scores and pregnancy outcomes and folate intakes

Parameters	Hospitalization time					Folate Intake (FI) (at least 400 mcg/ a day)				
	> 3 day (n=132)		≤ 3 day (n=206)		*p*	FI - (n=108)		FI + (n=230)		*p*
Knowledge section (max score)	Mean	SD	Mean	SD		Mean	SD	Mean	SD	
1. Section: Dietary recommendations	9.14	1.83	10.00	1.34	*P<0.001**	9.05	1.73	9.95	1.45	*<0.001**
2. Section: Sources of nutrients	30.25	6.21	34.64	8.59	*P<0.001**	28.3	5.43	35.06	8.17	*<0.001**
3. Section: Choosing everyday foods	6.01	2.18	6.37	2.03	*P=0.125*	5.77	2.14	6.44	2.04	*0.006**
4. Section: Diet-disease relationships	8.47	4.07	11.37	4.41	*P<0.001**	7.90	3.93	11.34	4.34	*<0.001**
Total	53.96	8.24	62.40	10.92	*P<0.001**	51.22	6.79	62.80	10.30	*<0.001**

**Statistical significance*

sion, preeclampsia, and eclampsia GNKQ scores were lower than in the other patients *(p<0.001)*.

When the pregnant women were asked as to whether they received regular ≥400 mcg / day folate from the first month of pregnancy, it was observed that those with regular folate intake had higher GNKQ scores *(p<0.001)*. As the level of knowledge in the direction of healthy nutrition increased, the use of folic acid for the protection of fetal health was increased. When pregnant women are evaluated according to the duration of hospitalization, there was a significant difference between GNKQ the total scores of patients who were hospitalized for more than 3 days and those hospitalized for 3 days or less *(p<0.001)* (Table 5).

Some parameters of the sociodemographic characteristics of the pregnant women in our study were exam-

Table 6. GNKQ scores and pregnant women in sociodemographic parameters

Parameters	Profession / Job							Graduation degree						
	Housewife (n=217)		Employee (n=67)		White-collar (n=54)		*p*	Elementary education (n=132)		Secondary education (n=137)		Undergraduate / Graduate (n= 69)		*p*
Knowledge section (max score)	Mean	SD	Mean	SD	Mean	SD		Mean	SD	Mean	SD	Mean	SD	
1. Section: Dietary recommendations	9.83	1.40	9.20	2.14	9.57	1.49	*0.018**	9.78	1.33	9.48	1.92	9.81	1.35	0.235
2. Section: Sources of nutrients	32.99	8.01	32.16	7.80	33.61	8.43	*0.604*	30.71	6.77	34.00	8.45	35.02	8.49	*<0.001**
3. Section: Choosing everyday foods	6.17	2.13	6.41	1.93	6.25	2.14	*0.698*	6.19	2.21	6.21	2.07	6.34	1.94	0.879
4. Section: Diet-disease relationships	10.29	4.36	9.13	4.43	11.42	4.91	*0.020**	9.99	4.47	9.67	4.37	11.85	4.52	0.030*
Total	59.29	10.62	57.07	10.18	60.87	11.83	*0.142*	56.68	8.83	59.45	11.69	63.04	11.12	*<0.001**

**Statistical significance*

ined. The number of pregnant women with an undergraduate or above degree was 69 (20.41%); the number of pregnant women in the secondary education range was 137 (40.53%); the number of pregnant women in the primer education was 132 (39.05%). GNKQ total score *(p<0.001)*, diet of disease (section 2) *(p<0.001)* and diet-disease relationships (section 4) *(p=0.030)* subscale scores increased as the range increased. Simply having more education was an important factor regarding high diet knowledge. Having well job was also important factor for well being in dietary recommendations *(p=0.018)* and diet-disease relationships *(p=0.020)* (Table 6).

The pregnant women were divided into three groups according to their education level. As the level of education increased, it was observed that GNKQ scores increased. In this study, it was observed that, especially the third sub-section (diet foods) and fourth sub-section (diet-disease relationships) affected the feeding habits of pregnant women. When the family structure was questioned, pregnant women living in the nuclear family; GNKQ total scores were higher in the extended family (Table 7).

The women were asked about where they learned the information about their nutrition. Only 104 (30.76%) of the pregnant women had received information from health personnel. Most of the media reported that they received information from the media (46.15%). Only the difference between the scores ob-

Table 7. GNKQ scores and husband's profession and family structure for the pregnant women

Parameters	Husbands profession							Family structure for pregnant women				
	Self-employed (n=125)		Employee (n=154)		White-collar (n=59)		*p*	Nuclear family (n=295)		Extended family (n= 43)		*p*
Knowledge section (max score)	Mean±SD		Mean±SD		Mean±SD			Mean±SD		Mean±SD		
1. Section: Dietary recommendations	9.64	1.61	9.57	1.73	9.96	1.14	*0.272*	9.66	1.60	9.69	1.61	0.899
2. Section: Sources of nutrients	32.27	7.54	32.72	8.18	34.84	8.46	*0.116*	33.36	8.17	29.93	6.24	0.009*
3. Section: Choosing everyday foods	5.63	2.11	6.65	1.96	6.40	2.12	*<0.001**	6.20	2.03	6.46	2.49	0.440
4. Section: Diet-disease relationships	9.40	4.30	10.62	4.81	11.05	3.86	*0.025**	10.34	4.52	9.58	4.40	0.302
Total	56.95	10.34	59.64	10.92	62.27	10.46	*0.005**	59.60	11.01	55.67	8.21	0.025*

Table 8. Where the pregnant women heard their diet knowledge before today

Parameters	TV. Radio (n=156)		Health professionals (n=104)		Web pages (n=52)		Book. Journal (n=26)		*p*
Knowledge section (max score)	Mean±SD		Mean±SD		Mean±SD		Mean±SD		
1. Section: Dietary recommendations	9.60	1.55	9.97	1.38	9.57	1.90	9.00	1.89	0.035*
2. Section: Sources of nutrients	33.15	7.74	32.93	8.54	33.00	7.87	*31.42*	8.23	0.793
3. Section: Choosing everyday foods	6.24	2.20	6.20	1.91	6.19	2.21	6.38	2.02	0.981
4. Section: Diet-disease relationships	9.93	4.43	10.74	4.71	10.28	4.46	10.03	4.24	0.565
Total 338	9.66	1.60	32.92	8.03	6.23	2.09	*10.24*	4.51	0.615

**Statical significance*

Table 9. Pregnant women's age, Body Mass Index (BMI), and p scores

Parameters	Mean	Median	SD	Min	Max	*P*				
						1. Section: Dietary recommendations	2. Section: Sources of nutrients	3. Section: Choosing everyday foods	4. Section: Diet-disease relationship	Total
Age	30.09	30.50	5.95	18	41	*0.028*	*0.155*	*0.992*	*<0.001**	*0.001**
BMI	25.77	27.16	8.64	18.24	45.52	*0.661*	*0.141*	*0.926*	*0.955*	*0.235*

**Statical significance*

tained from the dietary recommendations was significant *(p=0.035)* (Table 8).

In our study, the difference between age and GNKQ scores was significant, and as the age increased, the scores of the age group increased and the knowledge and awareness levels of the young women started to reach better levels *(p=0.001)*. When pre-pregnancy BMIs (before pregnancy) were questioned, no significant difference was found between the GNKQ scores, suggesting that women of conception age do not have adequate nutritional education and are unable to regulate their lives (Table 9).

Discussion

Considering that diet behavior is very complex, attempts to understand this in terms of nutritional knowledge in pregnant women should start with a clear understanding of awareness. Pregnant women tended to focus on a particular area of knowledge, such as fat or cholesterol. Furthermore, they had a wide range of information, but the correct information was not on a systematic basis. These criteria provide a different perspective to research results in pregnant women by looking at the information-behavior relationship in the field of nutrition.

Studies have shown that having good nutrition knowledge and showing a positive attitude with a healthy diet does not always result in high diet quality (8-10). Our study also found that pregnant women were well fed and received nutritional education. However, when evaluated using the GNKQ, they were not able to achieve high scores. In order for future generations to be healthy, systematic training should be planned to increase the knowledge and awareness levels of pregnant women about diet. Due to potential health risks, it is important that women comply with the principles of healthy nutrition during pregnancy. Unfortunately, although women reported positive changes in lifestyles during pregnancy, it was shown that their dietary intake and knowledge did not meet the recommended food and nutrient intake for pregnancy.

The highest scores were achieved in the first section of the GNKQ (dietary recommendations) in previous studies (9,10). In our study, it was also observed that the pregnant women obtained the highest score in the first part. They answered most commonly; 'Which of these breads contain the most vitamins and minerals? The women in our study results most commonly answered: 'wholegrain.'

In the literature, studies on the intake of fruits, vegetables, iron, and sodium found that the participants had sufficient knowledge (11, 12). In our study, pregnant women stated that they had increased the intake of fruits, vegetables, and iron for healthy eating habits, and that they had reduced the intake of fat and salt. However, their knowledge of meat consumption, vitamin D intake, and glucose consumption was not sufficient. The findings suggest that these nutrients should be targeted in future interventions in this population. Nutritional information is among the determinants that increase the quality of diet (12-14). Positive attitudes towards healthy nutrition are constantly associated with high dietary quality. In our study, diet quality was higher in pregnant women with good nutritional information. The family may have a positive effect on eating habits with regard to developing healthy dietary habits among women in societies.

Pregnancy is a life event that triggers a long-term review of nutritional problems. Factors that can follow the trimesters in pregnancy and affect the nutritional awareness among these passages were evaluated in previous studies. However, the practical or clinical effects of differences in nutritional awareness have not been established (15-17). In addition, a recent Australian study showed that diet quality decreased as pregnancy progressed (18). In our study, the nutrition information level did not increase with the pregnancy trimester. The GNKQ scores tended to decrease as the pregnancy progressed. Besides, in our study, it was evaluated according to the number of pregnancies between pregnant women. Although there was a statistically significant difference between the GNKQ total scores *(p=0.014)*, it has not been determined that there was a practical and clinical effect.

It is important for health professionals to realize that pregnancy is one of the unique opportunities for women to be informed about nutrition. This increased awareness can benefit maternal, fetal, and baby health. It can also have positive consequences for postnatal

nutrition because the gains acquired during pregnancy are of great importance for families and society.

Vitamins and minerals are essential for healthy functioning of the body, fetal growth, and development (19). Preterm action, small for gestational age (SGA), low birth weight (LBW), premature rupture of membranes, and risk of preeclampsia increase in nutritional insufficiencies. Insufficient nutritional knowledge, low zinc intake, iron deficiency, and LBW are associated with premature rupture of membranes (20, 21). Especially in middle- and low-income countries, women have poor nutritional knowledge, and lack of nutritional deficiencies for ongoing health during pregnancy. However, multiple-micronutritient supplementation (MMN) is not required, and nutritional information should be encouraged to increase the nutritional level of pregnant women (21-23). In our study, GNKQ scores were lower among pregnant women at risk for preterm labor and those with EMR than in those without these problems. Preeclampsia, gestational hypertension, followed by eclampsia and those who continued treatments had lower GNKQ scores for nutritional knowledge than healthy pregnant women In order to be able to correct prenatal outcomes, adequate training should be provided and diet regulation should be implemented.

Studies have shown that folic acid information is limited in pregnant women. Most women in previous studies were aware of the need to take a folic acid supplements to prevent fetal spina bifida. However, less than half knew what dose and when to take folic acid (24, 25). In our study, there was a lack of awareness of the need to take folic acid and information about how often the women would be checked. In addition, folic acid replacement was also shown to be negligible even in those with high knowledge levels in the GNKQ. One benefit of raising nutritional awareness is the increased use of folic acid to prevent fetal neural tube defects in pregnant women.

In many studies, it is stated that the education level of participants has a significant effect on GNKQ scores (26, 27). Our study showed that women with high education levels had more nutritional information and healthy nutrition efforts *($p<0.001$)*. At the same time, the scores of working women tended to be higher than those of non-working women. This seems to be both a logical and consistent finding.

In the literature, it was found that the level of quality nutrition of the pregnant women with low socioeconomic level was low (27, 28). In our study, GNKQ scores of women with high family income were higher *($p=0.005$)*. The family structure of a husband, wife, and children living in a nuclear family achieved higher scores *($p=0.025$)*.

Recent studies showed that nutrition education was insufficient in pregnancy. Therefore, increasing awareness and understanding of dietary rules can be an important step in increasing women's ability to assess diet quality against a 'healthy, balanced diet' as defined by the Australian Dietary Guidelies (ADG). This can then force women to make positive nutritional changes. Previous research suggests that primary healthcare providers during pregnancy may be the most appropriate to provide this information (28-30). However, it may require additional resources such as time and training. The effectiveness of such strategies among women who believe that their diet quality is low but their diet is healthy can be affected by their desire to increase nutritional information and a healthy diet. Our study shows that diet changes are minimal. In general, although almost two-thirds of women are reported to make dietary changes especially for pregnancy, the degree to which diet quality changes before pregnancy cannot be determined from the available data. Furthermore, in our study, the number of women whose knowledge came from media such as television and radio was high, and the scores were moving dramatically towards better levels.

The findings of this study show that there is a need for greater emphasis on nutritional counseling and education in order to optimize the quality of nutritional habits of pregnant women. It was observed that pregnant women had limited nutritional knowledge, which could lead to less nutritional intake. Primary healthcare providers, family physicians, general practitioners, obstetricians, nurses, and midwives are in a position to reach the community to provide nutritional information. Diet quality was poor in the pregnant women in our study.

Nutritional knowledge and attitudes were found to be important determinants of diet quality. It has been shown that nutrition interventions that encour-

age healthy eating habits in pregnant women should focus on developing the determinants of diet behavior. Training and forms should be prepared and put into practical use for pregnant women. In order to contribute to the improvement of fetal and maternal health, it is seen that nutrition education should be given importance in pregnant women.

Limitations

Nutritional education should be given to women during pregnancy and in the preconception period. However, in our study, it was not possible to provide this training. Furthermore, more studies are needed to facilitate access to healthy food sources and to increase their use. Finally, the majority of women in this study were aware of some areas of dietary recommendations; however, the responses of pregnant women to the scale showed that they had limited knowledge about the rules of diet for healthy nutrition during pregnancy. Although the women reported positive changes in their eating habits, they did not have enough diet information to meet their nutritional requirements during pregnancy.

Conclusion

Our findings show that evaluating pregnant women with the GNKQ and providing nutritional education will be beneficial on pregnancy outcomes. The use of iron, folic acid, and nutritional education in low- and middle-income populations should be encouraged to improve preterm labor, low birth weight, systemic arterial hypertension, and possibly reduce premature births.

This study showed that pregnant women had limited knowledge about balanced nutrition rules. Nutritional guidelines and nutritional counseling provided in practice were not clear enough. Objective-oriented strategies should be developed in order to increase the awareness about the rules of quality nutrition in pregnancy. The findings also emphasize that a small number of women receive nutritional advice as part of their pregnancy care. It is necessary to increase effective nutrition programs and campaigns for pregnant women. Babies should be provided with a healthy start to life and routine nutrition counseling should be promoted as part of pregnancy care.

Implications for research

Based on the results from our subgroup analysis, further research can be conducted. Studies should be performed to better understand the basic nutritional status of pregnant women and how they can affect pregnancy and birth outcomes after increasing nutritional knowledge. In addition, determination of the most appropriate formulation for vitamin and mineral supplements such as folic acid, iron, and zinc may have practical implications. Vitamin, mineral supplementation, and nutritional education supplementation will be useful to better understand maternal and fetal health.

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