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Evaluation of the Relationship between Food Neophobia and Nutritional Status in Pregnant Women

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Abstract

Introduction: Pregnancy is the critical process in which the requirements of the foetus and pregnant woman are met. The factors affecting the requirements, craving and food neophobia are important factors due to the prevent risk of nutrient deficiencies.

Materials and methods: Research was completed with women in the gynecology services of research hospitals in Northern Cyprus. Questionnaire was used to determine the data, general information, dietary habits, food neophobia and nutritional status. Food neophobia-P scale was used to determine food neophobia and a daily food consumption record was used to determine nutritional status. Nutrient intake level detailed with BEBIS and data was evaluated with SPSS.

Results: Study was completed with 140 women with a mean age of 29. Reported that 43.6% of women decreased the consumption of some foods or beverages, while 52.1% increased it. Most frequently reduced food is fish, and beverage is caffeinated beverages. Most consumed food group is dairy products. Food neophobia scale score was 39.47, and generaly were in neutral classification, 13.6% were found to be neophobic. Although there is no significant relationship between food neophobia scores and daily requirements but the relationship between nutrients in themselves is consistent with nutritional principles.

Conclusion: Half of the participants change the consumption of certain foods and exhibited neophobic behaviour. Although no significant relationship was found between food neophobia and requirements, the increase rate of participants with neophobic characteristics constitutes a risk factor for nutrient deficiencies. Finally, the importance of nutrition with nutritional diversity should be emphasised.

Keywords: Pregnancy Period, Nutrition, Food Neophobia

1. Introduction

A good future is realised through the transmission of healthy individuals for generations. The creation of healthy generations begins with adequate and balanced nutrition of the pregnant woman and the ability to meet her daily nutrient and energy requirements (Tsakiridis, 2020) [17]. Pregnancy defines a critical period of life in which additional nutrients are required to meet the metabolic and physiological requirements of the pregnant woman as well as the increasing needs of the growing fetus (Aliwo, 2019) [1]. As a result of changing psychological and physiological processes during this period, it affects daily energy and nutrient requirements. The age of the pregnant woman, number of pregnancies, disease history, inadequate and unbalanced nutrition can be given as examples. At the same time, as a result of changing carbohydrate, protein and fat metabolism, health problems such as anaemia, constipation and cravings that will affect the daily energy and nutrient requirements of the pregnant woman (Krause, 2020). During pregnancy, food preferences change with craving, which is called excessive desire or aversion to a food, and the risk of energy and nutrient deficiency occurs (Orloff, 2016) [9]. In addition, the concept of food neophobia, which is thought to affect diet quality and energy and nutrient adequacy in many age groups and different life periods, has recently attracted attention due to the risk of affecting nutrient deficiencies during pregnancy (Ucar, 2018) [18]. Food neophobia is explained as the condition of avoiding food and fear of consuming food (Pauperio, 2014) [10]. At the same time, food neophobia is thought to be developed as a protective mechanism by resisting the consumption of foods that are thought to be harmful to the body as well as the reluctance to eat new or unfamiliar foods. As a result, it is associated with limiting food diversity and diet quality and having negative effects (Hazley, 2022) [5].

In this study, it was aimed to investigate the foods that pregnant women who were followed up and/or applied to the obstetrics and gynaecology services of training and research hospitals in Northern Cyprus preferred to consume or avoided consuming during pregnancy compared to pre-pregnancy. At the same time, as a secondary objective, it was aimed to determine whether they had developed neophobia against foods. In addition, determining the presence of nutrient deficiencies that develop as a

result of changes in food consumption is among the study objectives. As a result, this study has the feature of being a guide for the steps to be taken to improve the nutritional status of pregnant women living in Northern Cyprus.

2. Materials and methods
General Scope of Work and Participants
The study was carried out by the researchers with the face-to-face interview technique by taking all protection measures in order to reduce the risk of transmission due to the COVID-19 pandemic and quarantine process and to keep coronavirus protection strategies at the highest level. For participants who refused to participate in the face-to-face interview technique, data were collected by providing online interviews in the google meet environment. The study was conducted with pregnant women aged 18 years and over who were followed up and/or applied to the obstetrics and gynaecology services of training and research hospitals in Northern Cyprus between January 2021 and May 2021. In this study, which was carried out in accordance with the principles of voluntariness and confidentiality, individuals who were under 18 years of age, incompletely completed the questionnaire form, inconsistent answers or left the questionnaire form incomplete were excluded from the study. Among the pregnant women who were followed up or who applied, 156 people were reached, but when the participants who did not accept to participate in the study and who did not meet the study criteria were excluded, the study was completed with 140 people. Ethics committee approval was obtained for the research protocol (YDU/2020/86-1237).

Data Collection Tools
In this study, in which the data were collected by face-to-face interview technique or online interview technique and questionnaire form, it was aimed to determine how the nutrient adequacies of pregnant women were affected by the fear of consuming foods during pregnancy and the presence of change in their eating habits. Information about the study was obtained with a questionnaire form. The questionnaire form consisted of 3 sections. These sections are the section including sociodemographic characteristics and general information, the food neophobia scale section and the section where nutritional status is determined.

Sociodemographic characteristics and general information
Sociodemographic characteristics and general information section included information such as age, gestational week, supplements used, diagnosis of chronic disease, and dietary habits. The questions were communicated to the participants by the researcher in the form of closed-ended questions and they were requested to report their answers by self-assessment. Participants were able to tick more than one option in the questions determining the supplements used, chronic disease diagnosis and some dietary habits in the general information section of the questionnaire form.

Food Neophobia Scale (FHS-P)
The food neophobia-p scale developed for use during pregnancy was used to determine the condition of avoiding food and fear of consuming food. The FNS-P provided information about the participants' attitudes towards their desire to consume foods during pregnancy. This scale, which has received validity and reliability in different countries (Pauperio, 2014) [10], has not been applied in the Turkish population before and was applied for the first time in this study. This scale developed for pregnant women consists of 10 questions. This scale includes the following questions: 'I always try new and different foods', 'I do not trust new foods', 'I will not eat a food that I do not know what is in it', 'I like foods from different countries', 'It feels very strange to consume foods from different countries', 'I try a new food at dinner parties', 'I am afraid of consuming foods that I have never consumed before', 'I am very selective among the foods I consume', 'I eat almost everything' and 'I like to try restaurants from different countries'. The scale is a 7-point Likert-type scale and the questions are evaluated with a scoring system. The scoring system is scored as strongly agree (7 points), agree (6 points), somewhat agree (5 points), undecided (4 points), somewhat disagree (3 points), disagree (2 points), strongly disagree (1 point). According to this scoring system, a minimum score of 10 and a maximum score of 70 points can be obtained from the food neophobia scale. It has been defined that as the participants' score on the scale increases, their fear of eating new foods also increases (Previato, 2015) [12]. Individuals with a fear of new foods scale score $< x \pm$ 1S were evaluated as individuals who liked new foods/neophilic, $x \pm$ 1S as neutral, and $> x \pm$ 1S as individuals with high fear of new foods/neophobic.

Determination of Nutritional Status
A 24-hour retrospective food consumption record was taken to determine the nutritional status and nutrient adequacy levels. The 24-hour food consumption record method, which is one of the methods used to analyse the meal patterns of individuals on the basis of food groups and nutrients, was preferred among the data collection tools of this study (Krause, 2020). Food and Food Photo Catalogue was used to determine the consumption amounts of foods in the food consumption record. The measurements and weights of the beverages and foods that the participants declared through the catalogue were determined by means of the catalogue as standard. As a result of the food consumption records obtained, Computer Assisted Nutrition Programme, Nutrition Information System 6 (BEBIS 6) full version programme was used to determine the daily energy and nutrient intake amounts. The energy and nutrient intake adequacy levels of individuals were evaluated according to Turkey-specific nutrition guide 2015 values (TÜBER-2015). Nutrient intake adequacy levels were accepted as <67% inadequate, 67% - 133% adequate and >133% excessive intake levels.

Statistical evaluation of the data
Statistical Package for the Social Sciences - SPSS package programme version 21.0 was used for statistical evaluation of the research data. Descriptive statistics were used to determine the characteristics of the sample. For this purpose, arithmetic mean (x), standard deviation (SD), median and lower-upper values of the quantitative data obtained were determined. The qualitative data obtained were expressed as frequency and percentage. The correlations between food neophobia scale scores and energy and nutrients and within energy and nutrients were analysed by Spearman test.

3. Results
A total of 156 pregnant women were reached in this study

which was conducted to determine the food consumption preferences, fear of consuming food and nutrient deficiencies that may develop due to the changing physiological and psychological process during pregnancy. When the participants who refused to participate in the study for various reasons were excluded, the study was completed with 140 pregnant women. The mean age of the participants was 29 years (minimum 22; maximum 38 years) and the mean gestational week was 23.81 (minimum 6; maximum 39 weeks). When the diagnosed disease histories of the participants were examined, it was determined that 25% of them had at least 1 health problem diagnosed by a doctor. The most common health problems were hypothyroidism and allergy and/or allergic asthma with a rate of 17.1%. These diseases were followed by rheumatism (14.1%), gastrointestinal system problems (8.6%), oedema (8.6%) and hypertension (5.7%). When we look at the distribution of the participants according to their occupational groups, 22.1% of them work in the business sector, 19.4% work as teachers and 16.4% are housewives.

Table 1 summarises the dietary habits of pregnant women. The rate of pregnant women who had the habit of skipping main meals was 13.6% and the most frequently skipped meal was breakfast (63.2%) followed by lunch (42.1%). The most common reasons for skipping the main meal were nausea and lack of habit, 52.6% and 47.4%, respectively. It was found that almost all of the participants had the habit of taking snacks and almost half of them (46.6%) took snacks twice a day. When the changing food preferences of the participants during pregnancy were analysed, it was found that 43.6% decreased the consumption of some foods or beverages and 52.1% increased the consumption of some foods. The most frequently decreased foods were fish (29.5%) and eggs (14.8%), while the most frequently decreased beverage type was caffeinated beverages with a rate of 27.9%. Among the reasons for the reduction of these foods, 73.8% believed that they were harmful, followed by nausea and vomiting problems during pregnancy with a rate of 39.3%. The most frequently consumed food and/or beverage types were dairy products (49.8%), sugar and foods with high sugar content (31.5%) and meat and meat products (20.5%). Among the reasons for increased consumption, belief in the benefits of food with 64.4% and craving with 58.9% were noteworthy (Table 1).

Table 1: Evaluation of dietary habits and changing food preferences of pregnant women

	N	%
Skipping Main Meal Habit		
Yes	19	13.6
No	121	86.4
The most frequently skipped main meal (n:19)*		
Breakfast	12	63.2
Lunch	8	42.1
Dinner	2	10.5
Reasons for skipping main meals*		
Nausea	10	52.6
Not My Habit	9	47.4
Lack of Time	3	15.8
Other	1	5.3
Have a snack		
Yes	133	95.0
No	7	5.0
Reason for not taking snacks*		
Nausea	4	57.1
Shortage of Time	1	14.3
Not Feeling Hunger	1	14.3
Frequency of snacks (n:133)		
1 time a day	10	7.5
2 times a day	62	46.6
3 times a day	38	28.6
More than 3 times a day	23	17.3
Foods and/or Drinks Reduced from Consumption During Pregnancy		
Yes	61	43.6
No	79	56.4
Type of Food and/or Beverage Consumption Reduced (n:61)*		
Raw Vegetables	3	4.9
Other	8	13.1
Sugar, white flour or foods made from these foods	8	13.1
Egg	9	14.8
Meat and derivatives	6	9.8
Fish	18	29.5
Packaged ready-made products	9	14.8
Offal and delicatessen products	7	11.5
Gas-forming vegetables	6	9.8
Alcoholic beverages	11	18.0
Caffeinated beverages (coffee, tea, etc.)	17	27.9
Acidic drinks	4	6.6
Reasons for not consuming foods and/or beverages with reduced consumption (n:61)*		
Nausea and Vomiting	24	39.3
Don't believe the harm	45	73.8
Lack of access to food	2	3.3
Environmental pressure	2	3.3
Other	6	9.8
Food and/or Beverage with Increased Consumption		
Yes	73	52.1
No	67	47.9
Type of Food and/or Beverage Consumption Increased (n:73)*		
Fish	5	6.8
Meat and meat products	15	20.5
Green leafy vegetables	13	17.8
Dairy Products	36	49.8
Egg	11	15.1
Bread and products	7	9.6
Sugar and foods with high sugar content	23	31.5
Nuts in the shell	2	2.7
Other	5	6.8
Reasons for consuming foods and/or beverages with increased consumption (n:73)*		
Belief in the benefits of food	47	64.4
Nausea and vomiting	5	6.8
Environmental Guidance	6	8.2
Cravings	43	58.9
Other	2	2.7
*more than one option is marked.		

Food neophobia is defined as an aversion to the consumption of certain foods and beverages. The food neophobia scale was used to evaluate the cases of craving, reluctance or hesitation in consuming foods due to belief in the benefit/harm of a food or cultural habits in pregnant women. As a result, the average food neophobia scale score of pregnant women was found to be 39.47 (±3.09). The lowest score obtained from this scale was 27 and the highest score was 46. According to these results, although the majority of the participants (73.6%) were classified as neutral towards food, 13.6% were determined as neophobic (Fig 1).
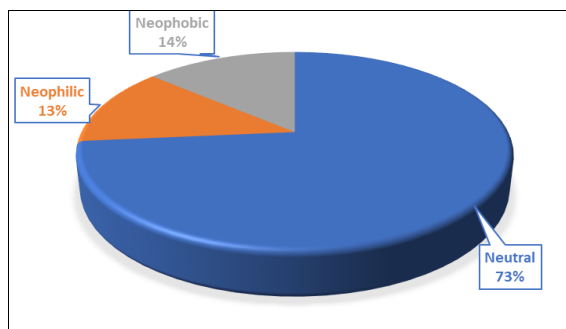
Fig 1: Food neophobia scale score classification of pregnant women

Food consumption records were taken to determine the nutritional status of the pregnant women and the results of the correlation between daily energy and nutrients and the food neophobia score of energy and nutrients are shown in Table 2. However, no statistically significant correlation was found between food neophobia scores and daily energy and nutrient consumption amounts (p>0.05). The relationship between the nutrients was found to be compatible with the principles of nutrition during pregnancy and summarised in

Table 2. When the adequacy percentages of some nutrients of pregnant women were analysed to determine the nutritional status, it was shown in Figure 2 that most nutrients were taken at an adequate level. In Figure 2, iron and folate are the nutrients whose deficiency is the most striking, but 95.7% of pregnant women use nutritional supplements and the most frequently used supplements include 95.5% multivitamin, 38.1% folic acid and 11.6% iron. These results explain that folic acid and iron requirements were met.
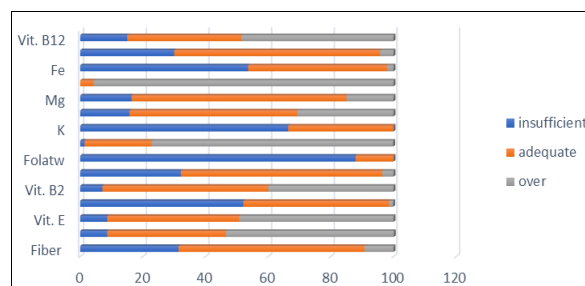

Fig 2: Classification of adequacy levels of some nutrients in pregnant women included in the study

Table 2: Correlation results between daily energy and nutrient intake of pregnant women and food neophobia score

	FHS score	Energy	Prot.	Fat	CHO	Fiber	Col.	Vit. A	Vit. E	Vit. B1	Vit. B2	Vit. B6	Folate	Vit. C	K	Ca	Mg	P	Fe	Zn	Vit B12
FHS-score	1																				
Energy	.032	1																			
Protein	.015	.769**	1																		
Fat	.048	.902**	.581**	1																	
CHO	-.046	-.294**	-.354**	-.569**	1																
Fiber	-.009	.518**	.210*	.629**	-.347**	1															
Col.	-.052	.583**	.591**	.589**	-.471**	.212*	1														
Vit. A	-.040	.437**	.221**	.510**	-.253**	.301**	.281**	1													
Vit. E	.074	.529**	.220**	.616**	-.289**	.838**	.250**	.335**	1												
Vit. B1	.084	.659**	.567**	.531**	-.139	.330**	.375**	.343**	.313**	1											
Vit. B2	.054	.748**	.683**	.613**	-.179*	.207*	.518**	.327**	.251**	.726**	1										
Vit. B6	-.017	.037	.070	-.032	.086	.046	-.049	.003	.080	.055	.078	1									
Folate	.077	.600**	.452**	.534**	-.172*	.323**	.408**	.336**	.350**	.836**	.633**	.147	1								
Vit. C	.076	.285**	.111	.253*	.025	.238**	.172*	.288**	.277**	.364**	.290**	-.068	.469**	1							
K	.003	.746**	.674**	.615**	-.175*	.330**	.415**	.428**	.360**	.855**	.780**	.086	.792**	.442**	1						
Ca	.087	.617**	.548**	.512**	-.176*	.070	.330**	.318**	.109	.532**	.773**	.075	.480**	.260**	.610**	1					
Mg	.048	.745**	.625**	.655**	-.233**	.461**	.382**	.426**	.481**	.829**	.715**	.113	.745**	.342**	.882**	.574**	1				
P	.048	.783**	.802**	.638**	-.301**	.270**	.584**	.290**	.276**	.703**	.807**	.094	.600**	.251**	.758**	.834**	.763**	1			
Fe	.105	.225**	.235**	.187*	-.083	.127	.240**	.098	.080	.330**	.235**	.014	.189*	.097	.222**	.117	.281**	.266**	1		
Zn	.032	.656**	.745**	.486**	-.175*	.093	.512**	.156	.134	.385**	.607**	.003	.270**	.059	.449**	.374**	.437**	.583**	.261**	1	
Vit. B12	.043	.607**	.700**	.508**	-.288**	.183*	.555**	.239**	.166*	.418**	.669**	.021	.239**	.076	.492**	.391**	.444**	.581**	.268**	.810**	1

**Correlation was found statistically significant at 0.01 level.
*Correlation was found statistically significant at 0.05 level.
Abbreviations FNScore: Food Neophobia Score Value, Prot: ProteinCHO: Carbohydrate, Col. : Cholesterol, K: Potassium, Ca: Calcium, Mg: Magnesium, P: Phosphorus, Fe: Iron, Zn: Zinc, Vit.: Vitamin
Units: Energy (kcal), protein (g), fat (g), KH (g), fiber (g) Cholest. (mg), Vitamin A (mcg), Vitamin E (mg), Vitamin B1 (mg), Vitamin B6 (mg), Folic Acid (mcg), Vitamin C (mg), K (mg), Ca (mg), Mg (mg), P (mg), Fe (mg), Zn (mg), Vitamin B12 (mcg)

4. Dıscussıon

As a result of the changing physiological and psychological process during pregnancy, the food consumption preferences of each pregnant woman may differ and/or she may have fear of consumption or excessive desire (craving) for any food. In this study, we investigated the foods that pregnant women who were followed up and/or applied to the obstetrics and gynaecology services of training and research hospitals in Northern Cyprus preferred or avoided consuming during pregnancy compared to pre-pregnancy.

At the same time, it was tried to determine whether they developed neophobia against foods as a result of the changing physiological and psychological process. In addition, nutrient deficiencies that may develop as a result of changes in food consumption were determined. This study sheds light on the steps to be taken to improve the nutritional status of pregnant women living in Northern Cyprus.

When the meal patterns of the pregnant women included in the study were examined, it was determined that 86.4%

regularly consumed breakfast, lunch and dinner, but 13.6% skipped at least 1 main meal. In addition, 95% reported that they had a snack between main meals. Stravik *et al* (2019) reported that 94%, 86% and 97% of women consume breakfast, lunch and dinner regularly daily, respectively; 23% snack between meals, 11% frequently skip meals and 13% have irregular eating habits (Stravik, 2019). In this study, it was determined that 52.1% of pregnant women increased the amount of consumption of some foods and 43.6% decreased the consumption of some foods or beverages when the increased needs during pregnancy were taken into consideration. According to these results, the most frequently increased foods and/or beverages during pregnancy compared to pre-pregnancy were milk and products (49.8%), sugar and foods with high sugar content (31.5%) and meat and products (20.5%), while the most frequently decreased foods/drinks were fish (29.5%), eggs (14.8%) and caffeinated beverages (27.9%). (2016) reported that pregnant women did not change the amount and types of food they consumed, but the consumption of meat, fish, fruit and some vegetables during pregnancy was lower than before pregnancy. At the same time, it was found that pregnant women mainly consumed cereals and legumes in their diets (Zerfu, 2016) [20]. In another study, an increase in the consumption of fruits (51%) and vegetables (40.8%) and a decrease in the consumption of tea (26.1%) and red meat (21%) were shown among the foods/drinks that changed during pregnancy. In addition, a decrease in white meat and fish consumption was reported (20.1% and 27%, respectively). When the frequency of food consumption during pregnancy was evaluated, it was found that the most frequently consumed foods were bread (85.3%), butter (66.2%), cheese (67.5%) and milk-yogurt (57.9%), while the foods that were never consumed were molasses (41.4%), butter (41.1%), meat products such as salami and sausage (40.8%), fish (20.4%), red meat (13.1%) and white meat (12.4%) (Eren, 2015) [3]. In another study, similar results were obtained and it was reported that pregnant women included vegetables and fruits, milk and derivatives and whole grain products more frequently in their diets during pregnancy. However, eliminating meat and its derivatives from their diets was found to be more frequent than including them more frequently in their diets. In addition to these, other data showing similar results with our study in this study are that pregnant women include foods with high sugar content in their diets more frequently during pregnancy and reduce the frequency of consumption of caffeinated beverages (Forbes, 2018) [4]. According to the results of another study, the rate of dietary diversity of pregnant women was found to be 55.7% and it was reported that the most frequently consumed foods were legumes, nuts and starchy foods (Yeneabat, 2019) [19]. In another study on dietary diversity of pregnant women, similar results were obtained and inadequate dietary diversity was associated with maternal education status and nutritional knowledge (Aliwo, 2019) [1]. As a result of a study conducted in India, it was determined that the preference of pregnant women for various foods in their diets decreased over time compared to previous years. These foods include cereals, vegetables, fiber, nuts, dairy products and sugar. In addition, it has been reported that the consumption rate of unhealthy foods has also decreased over time (Nguyen, 2021) [8].

Food neophobia score scores, which are defined as the state of hesitation towards the consumption of certain foods and beverages, were evaluated in this study and according to the results obtained, it was determined that 13.6% of pregnant women living in Northern Cyprus were neophobic, although the majority (73.6%) were classified as neutral towards foods. Pauperio *et al* (2014) [10] used the FHS-P scale in pregnant women and reported that it is a useful form to determine neophobic characteristics during pregnancy. In this study, they found that higher education level and non-adolescent pregnancy reduced the risk of food neophobia (Pauperio, 2014) [10]. In a systematic review of studies related to food neophobia, it was argued that food neophobia is partially genetically based, but is related to socioeconomic factors, education level, income level, and urbanisation. It was reported that the incidence of food neophobia would decrease with the improvement of these environmental factors. It has been reported in this systematic study that food neophobia is associated with low diet quality index, although there is no statistically significant relationship, it may also be associated with obesity and nutrient deficiencies (Rabadan, 2021) [13]. In this study, it was evaluated whether there was a relationship between food neophobia and daily energy and nutrient consumption amounts, and no statistically significant relationship was found, contrary to previous studies.

In addition, when the adequacy percentages of some nutrients of pregnant women were analysed to determine the nutritional status of the sample of pregnant women living in Northern Cyprus, it was determined that most nutrients were taken at an adequate level. Iron and folate were found to be the nutrients with the most striking deficiency. However, since 95.7% of the pregnant women used nutrient supplements, it can be said that their daily requirement is met. In a study conducted in French Guiana and Haiti, it was reported that 81% of pregnant women were at risk of at least 1 micronutrient deficiency, 46% were at risk of at least 2 micronutrient deficiencies and 18% were at risk of at least 3 micronutrient deficiencies (Duclau, 2021) [2]. In a study, it was reported that daily intakes of all nutrients except vitamin A thiamine and niacin decreased between years (Nguyen, 2021) [8]. According to another study, it was determined that the intake levels of micronutrients such as folate, iron, calcium, vitamin D, iodine and selenium of pregnant women were inadequate, the intake of total fat and saturated fat from macronutrients was above the daily requirement, and the percentage of fiber intake was 77.6% (Saunders, 2019) [15]. In another study, similar results were obtained in relation to micronutrients (Lee, 2012) [6]. Mohammed *et al* (2022) [7], in a comprehensive review on maternal diet and nutritional status, reported that pregnant women did not meet their daily requirements for calcium, iron and vitamin D in the results of the studies they examined related to micronutrient intake levels (Mohammed, 2022) [7].

5. Conclusıon
Many factors such as changing physiological and psychological processes during pregnancy, beliefs about the benefit or harm of food, etc. may increase or decrease the desire for a food. This may lead to a change in food choices and affect the quality of diet. In this study, which included pregnant women living in Northern Cyprus, we shed light on the changing food preferences of pregnant women during pregnancy, fear of food in this process and the effect of this change on nutrient adequacy. As a result, almost half of the

participants decreased or increased the consumption of some foods for various reasons. Although most of the participants were neutral towards nutrients, there were participants who exhibited neophobic behaviour. Although no significant relationship was found between food neophobia and nutrient deficiencies, the increase in the proportion of participants with neophobic behaviour constitutes a risk factor for nutrient deficiencies. Therefore, health policies should be developed to prevent nutrient deficiencies that may develop by emphasising the importance of food diversity and adequate and balanced nutrition during pregnancy.

6. Acknowledgements

7. References

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