Original article

The Relationship between Biochemical and Hemoglobin Results and Quality Index Scores of the Mediterranean Diet of Pregnant Women in the First and the Third Trimester

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Summary. *Introduction:* The mother's nutrition and lifestyle during gestation is very essential for her own health as well as the infant's health. The aim of nutrition during gestation is both to keep the balance of nutrient factor spares in her body through meeting the physiological needs and to provide the necessary energy and nutrient factors for the normal growth of the fetus. *Aim:* This study was conducted with the purpose of analyzing the relationship between the biochemical and hemoglobin results and the quality index scores of the Mediterranean Diet in pregnant in the first and third trimester as well as comparing the biochemical and hemoglobin results of pregnant in the first and third trimester. *Method:* Total 30 pregnant participated in the research who were among 20–35 ages and were followed in a private hospital in Nicosia in Turkish Republic of Northern Cyprus. The demographic characteristics, nutrition habits, behavioral changes for nutrients during gestation were questioned and the anthropometric measurements were done. Also, in the first interview and in the III. trimester pre-prandial blood samples were obtained from the pregnant and analyses were done in a medical laboratory in terms of biochemical (Urea, Alanine amino Tranferase (ALT), Aspartate Amino Transferase (AST), pre-prandial blood glucose (PBG), Thyroid Stimulating Hormone (TSH), Creatinine, Free T4, folic acid, vitamin D (vit.), B_{12} vit.) and hemoglobin analyses were done. The Mediterranean nutrition habit was evaluated by the Mediterranean Diet Quality Index (MDQI). *Results:* When the Mediterranean Diet Quality Index scores of pregnant in I. and III. trimester are analyzed, the average of the Mediterranean Diet Quality Index of I. and III. trimester were found as $x = 7.5 \pm 1.88$, $x = 8.73 \pm 2.08$ respectively, and the minimum score was 3, whereas the maximum obtained score was 12. There has not been a statistically meaningful correlation between the biochemical and hemoglobin findings of the pregnant in the I. trimester and the MDQI scores ($p > 0.05$), whereas there has been a positive way meaningful correlation between the MDQI scores, and the AST values measured in the III. trimester ($p < 0.05$). Also, there has not been a statistically meaningful difference between the vitamin B_{12}, vitamin D, folic acid, free T4, TSH, PBG and urea measured in pregnant in the I. trimester and III. trimester ($p > 0.05$). In addition; there has been statistically meaningful difference between the values of creatinine, hemoglobin, AST and ALT values measured in the I. trimester and III. trimester ($p < 0.05$). *Conclusion:* In order to have healthy child birth and development, the mothers' awareness needs to be raised in terms of protecting their health and also eating balanced and sufficiently due to the increase of the need for more nutrients during the gestation period.

Key words: gestation, diet, Mediterranean, biochemistry, hemoglobin

Introduction

The aim of nutrition during gestation is to provide the necessary energy and nutrient factors for the normal growth of fetus as well as keeping the nutrient factor spares in balance in the body by meeting the nutritional and physiological needs. The malnutrition during gestation causes anemia in pregnant woman and low birth weight in fetus and growth failure as well as maternal diseases and stillbirth risk increase (1). The number of premature births in malnutritioned pregnant women is higher than the normal nutritioned pregnant women. %8.1 of the babies born in America in 2010 are nominal in terms of stillbirth. However, according to Turkey Population and Health Research data in Turkey; in the first gestation the on its own rate was %14.6 and the stillbirth was %3.5 (2).

The healthy generations underpin a healthy society. The main reasons of nutritional problems are; being unable to add the necessary nutrients to the daily nutrition during gestation for breastfeeding and gestation, the reduction in nutrient obtaining due to economical insufficiency, the wrong choice of nutrients due to traditions and the wrong implementations done during preparing and storing the food (3). The sufficient weight gain should be created during gestation. The weight gain below the suggested amount might result in stillbirth or preterm births. Some changes are observed in the woman body during gestation through a new organism formation and growth. Within these changes, the pregnant woman should be more careful in her nutrition during this period in order to meet her and the baby's needs. Therefore, during the gestation the pregnant woman has to be fed sufficiently and in balance in order to provide nutrient and energy factors for the milk preparing for breastfeeding, in order to have a healthy growth and development of the baby in her womb, to keep the spare stores in balance in their body (nutrient factor spares) and to meet her own physiological needs (energy and nutrient factors) (4).

The energy and nutrient factor needs of the pregnant are more than the normal women. During gestation; nutrient substances including iron, vitamin B_{12} and folic acid should be taken. For the aim of taking precautions for pregnant problems and a healthy continuation of gestation period; the importance and necessity of the control of biochemical changes are very essential (5).

The recent studies claim that the most suitable nutrition style for gestation was the Mediterranean diet. As emphasizing the fruit, vegetables, fish and plant based proteins and lipids this nutrition style is suggested for everybody in the society due to its being healthy. The researches show that; the people with the Mediterranean type diet have lower risk of cardio-vascular disease, diabetes, obesity, cancer and other diseases. During the gestation, the Mediterranean type of diet model has been shown as reducing the weight gain in pregnancy as well as ameliorating the health results both for the maternal and the baby (6,7).

Gestation is a physiological case. Although the anatomical, physiological and biochemical changes occur more during gestation; there are changes in the metabolic order and nutrition of many systems of the mother. The most responsible factor for the metabolism increase during gestation is the fetus. Regarding the %20 increase in the oxygen during gestation the basal metabolism speed increases. Within the increased metabolism speed in gestation, the importance of healthy nutrition has increased. The positive linear relationship shown between the maternal weight gain and the infant's weight and also the body mass index before the gestation is because of its effect on the newborn's weight by being independent from the weight gain during the gestation. The total calorie intake in gestation is the most important known nutrition factor on the birth weight (7). According to the results of Nutrition Guide Peculiar to Turkey-2004; 0–250 kcal/day in the I. trimester is suggested to be added to the daily energy for between the ages 19–50 as well as 300kcal/day in the II. trimester and 300kcal/day in the III. trimester (8). The sufficient intake amount of the each of the energy and nutrient factors needed for the body at gestation and their used by the body increases the maternal health level and also this intake reduces the congenital anomalies. As well as a healthiest fetal growth and development, it has been proven that this sufficient intake prevented the possible chronic diseases in the future adulthood period (9).

With regards to this; the aim of this study is to analyze the relationship between the Mediterranean Diet Quality Index scores with biochemical and hemoglobin results in pregnant during the I. trimester and the III. trimester as well as comparing the biochemical and hemoglobin results of pregnant in the I. trimester and the III. trimester.

Material and Methods

Sampling- Sampling Size

30 volunteer pregnant to the research who are on the III. trimester (27–41. weeks) and applied to a private maternity hospital in 2018 April-December in Nicosia in Turkish Republic of Northern Cyprus (TRNC). All the information about the pregnant on the III. trimester was obtained by face-to-face interview technique. The biochemical and hemoglobin values of the I. trimester period of the pregnant on the III. trimester have been obtained from the registered file from the hospital. As a result of the effort analysis, the sampling size was found as 20 which was necessary for the %95 power in the 0.8 effect size on the research group. In case of pregnant leaving and in order to increase the reliability of the research data; 30 pregnant were included to the study group. For eliminating the bias of the subject choice; the pregnant to be included to the adaptation group were chosen randomly.

The inclusion criteria for the research are; being between 18–35 ages, having any chronic illness, having any gestational diabetes, having any multiple gestation, being completely volunteer and when desired they can leave.

Ethical Approval

The study was approved by the Eastern Mediterranean University Scientific Research and Health Ethics Committee in 19.03.2018 with 2018/56-03 numbered decision. Before beginning the study, a confirmation form of being volunteer was obtained from the individuals who were suitable for the inclusion criteria as between the 18–35 ages on the III. trimester and then a questionnaire was implemented by using face to face interview technique.

Demographic Information. The questionnaire was evaluated with a demographic information form which was prepared for demographic information such as; age of pregnant women, educational status, chronical illness existence, illnesses, using any medicine, giving birth before, on which week is the gestation, the first gestation age, gestation number and gestation age.

Dietary Habits. Within the nutrition habit questioning form; nutrition habits were evaluated such as skipping a meal status, which meal was skipped, daily water consumption amount and coffee / tea consumption.

Anthropometric Measurements. A handy digital and sensitive to 0.5 kg scale was used to evaluate the body weight (*Tanita Bc 730*). The height of pregnant was measured when they were standing still on the wall, legs are adjoin, head is on the Frankfort plane (eye corner and above the earlap are on the same level and parallel to the ground) through inflexible measure. Also, the birth weight before the gestation was asked and the Body Mass Index (BMI k/m^2) was calculated. The BMI was calculated by dividing the body weight (kg) by the square of the height (m) (10).

Behavioral Changes for Nutrients in Gestation. For evaluating the behavioral changes for nutrients in gestation we prepared a questioning form, and we evaluated the consumption changes of nutrients such as milk, egg, vegetables-fruit, yogurt, fish and chicken. Those parameters were recorded as increased, decreased and not changed.

Biochemical Variables and Hemoglobin. In the first interview, the pre-prandial blood glucose samples were taken by the hospital nurses from the pregnant who accepted participating to the study and were analyzed in the medical laboratory of the same hospital. The analyses were done according to the findings of some biochemical variables (urea, Alanine Amino Transferase- ALT, Aspartate Amino Tranferase- AST, pre-prandial blood glucose- PBG, Thyroid Stimulating Hormone-TSH, Creatinine, Free T4, folic acid, vitamin D, vitamin B_{12} and hemoglobin.

The Quality Index of the Mediterranean Diet. The Mediterranean Diet Quality Index was developed by Serra-Majem et. al. for determining some principles related with the Mediterranean nutrition style to evaluate the nutrition habits and it consists of 16 questions. 12 questions of this index were positive and 4 of them are negative featured. When "yes" is answered for the positive featured questions the respondent gets +1 point, whereas if the answer for negative featured questions are answered as "yes" they get -1 point. By the sum of those points the scores are obtained as varying from 0–12. If the total point is ≥8 the diet is optimal Mediterranean diet (good), between 4–7 means it needs to be improved for being suitable for the Mediterranean diet (median), if the point is ≤3 it means very low nutrition quality (low) (11).

Statistical Analysis

In the statistical analysis of the research data, data analysis package program as Statistical Package for Social Sciences (SPSS- SPSS Inc., Chicago, IL, USA) 24.0 was used. The alpha significance level of the research has been determined as α=0,05. For the aim of determining the hypothesis tests to be used in the research, the consistence of the data set for the normal distribution was analyzed with Shapiro-Wilk test which provides more reliable results when the subject number is lesser. As the data set did not consist with the normal distribution, the non-parametric hypothesis tests were used.

Results

Table 1. illustrates the distribution of socio-demographic features of the participant pregnant as %26.67 is 25 age and below, %43.33 is 26–29 age and

Table 1. The socio-demographic features of pregnant women (n=30)

	number (n)	**percentage (%)**
Age ($\bar{x}$ = *27.77±3.35*)		
25 age and below	8	26.67
26-29 age	13	43.33
30 age and above	9	30.00
Educational status		
High school graduate	5	16.67
Bachelors graduate	21	70.00
Graduate	4	13.33
Chronic Illness		
No	30	100.00
Medicine regularly used in the last 1 year		
No	28	93.33
Yes	2	6.67
Giving birth before		
No	23	76.67
Yes	7	23.33
First gestation age ($\bar{x}$ = *26.23±2.46*)		
25 age and below	12	40.00
26-29 age	15	50.00
30 age and above	3	10.00
Number of gestation		
One	22	73.33
Two	8	26.67
Gestation week ($\bar{x}$ = *29,83±2,15*)		
27-29	15	50.00
30-32	11	36.67
33-35	4	13.33

$\bar{x}$ = Average

%30.0 is 30 age and above the age group with the age average 27.77±3.35. %70.0 of the pregnant university graduates with no chronic illness and %76.67 of them did not give a birth. Also, the first gestation age average is 26.23±2.46 and %70.0 of them had normal birth, %73.33 of them had one gestation. %50.0 of them were on the 27–29th week of the gestation whereas %36.67 of them were on the 30–32nd week of the gestation and lastly %13.33 of them were on the 33–35th weeks in their gestation.

On Table 2; the distribution of some of the nutrition habits of the participant pregnant are given and %40 of the women did not skip a meal, %6.67 skipped a meal and %53.33 of them sometimes skipped a meal. %55.56 of the skippers skipped the lunch meal. %60.0 of the pregnant consumed daily 8–12 glasses of water whereas %76.67 of them consumed tea-coffee.

On Table 3; the descriptive statistics about the anthropometric measures of the pregnant included to the research and their body weight before gestation was $\bar{x}$=63.87±7.68 kg, on the III. trimester it was $\bar{x}$=71.32±7.28 kg. The height was $\bar{x}$=164.83±5.48 cm and before gestation the BMI values were found as $\bar{x}$=24.15±3.15 kg/m^2.

Table 4. illustrates the findings of The change in the tendency of consuming some of the nutrients in included pregnant in the research on the III. trimester according to the I. trimester before gestation and to the I. trimester.

Table 2. Nutrition habits of pregnant women

	Number (n)	**Percent (%)**
Skipping a meal		
Skipping	2	6.67
Non-skipping	12	40.00
Sometimes	16	53.33
Skipped meal		
Morning	4	13.33
Noon	10	33.33
Night	4	13.33
Amount of water consumed per day(glass)		
4-6	2	6.67
6-8	8	26.67
8-12	18	60.00
Other	2	6.67
Coffee-tea consumption		
Consuming	23	76.67
Not consuming	7	23.33

Table 3. Anthropometric measurements of pregnant women (n=30)

	$\bar{x}$	**S**	**Min**	**Max**
Before Gestation Body weight (kg)	63.87	7.68	49	76
III. Trimester Body weight (kg)	71.32	7.28	53	83
Height (cm)	164.83	5.48	155	178
Before Gestation İ (kg/m2)	24.15	3.15	18.86	31.9

kg: Kilogram, cm: centimeter, m^2:metre square, BMI: body mass index, $\bar{x}$: average, S: standard deviation, Min: minimum value, Max: Maximum value

When Table 4 is analyzed, there is an increase in the consumption of milk as %50,0 on the I. trimester of the pregnant as well as in egg as %56,67 and in yogurt with %46.'7. However, there is a reduction in legume consumption with %63.33, as well as %56.67 of them in red meat, %56.67 in chicken, %43.33 in fish and lastly the reduction in coffee and tea consumption with %70.0. Also, there is no change in yellow vegetables and red vegetables with %83.33, %83.33 in green vegetables, %70.0 in bread and %53.33 of them had no change in cereal consumption.

On the III. trimester of the participant pregnant, there is an increase in the consumption of milk with %50.0, 50.0 in egg, %53.33 in yogurt, %56.67 in fruit, %40.0 in red meat, %46.67 in fish whereas, there is reduction in the consumption of coffee with %53.33 and %50.0 in tea. Also, there is no change in the consumption of legume with %66.67, %70.0 in yellow vegetables, %90.0 in red vegetables, %80.0 in green vegetables, %43.33 in chicken, %66.67 in bread, %53.33 in cereals and lastly %50.0 in oily seeds.

Table 5. shows the Mann-Whitney U test results related to the comparison of cohesiveness of the Mediterranean diet quality index with some chemical findings on the I. trimester and the III. trimester of the pregnant women.

When Table 5. is analyzed, there is a statistical meaningful difference ($p<0,05$) between the measured ALT and AST values on the I. and the III. trimester with the cohesiveness levels of the Mediterranean diet quality index of the pregnant women. The measured ALT and AST values on the I. and the III. trimester of the pregnant who show good cohesiveness to the Mediterranean diet, are higher than the women who show bad cohesiveness to the diet.

There is no difference between the B12, vitamin D, hemoglobin, folic acid, Free T4, TSH, PBG and urea measured on the I. and the III. trimester with the

Table 4. The change in the tendency of consuming some of the nutrients in pregnant women on the III. trimester according to the I. trimester before gestation and to the I. trimester (n=30)

	I. Trimester						III. Trimester					
	Not changed		Increased		Decreased		Not changed		Increased		Decreased	
	n	%	n	%	n	%	n	%	n	%	n	%
Milk	8	26.67	15	50.00	7	23.33	10	33.33	15	50.00	5	16.67
Egg	9	30.00	17	56.67	4	13.33	12	40.00	15	50.00	3	10.00
Legume	11	36.67	0	0.00	19	63.33	20	66.67	2	6.67	8	26.67
Yoghurt	11	36.67	14	46.67	5	16.67	13	43.33	16	53.33	1	3.33
Fruit	6	20.00	18	60.00	6	20.00	12	40.00	17	56.67	1	3.33
Yellow vegetables	25	83.33	3	10.00	2	6.67	21	70.00	8	26.67	1	3.33
Red vegetables	25	83.33	4	13.33	1	3.33	27	90.00	2	6.67	1	3.33
Green vegetables	25	83.33	2	6.67	3	10.00	24	80.00	6	20.00	0	0.00
Red meat	6	20.00	7	23.33	17	56.67	16	53.33	12	40.00	2	6.67
Chicken	6	20.00	7	23.33	17	56.67	13	43.33	11	36.67	6	20.00
Fish	10	33.33	7	23.33	13	43.33	14	46.67	14	46.67	2	6.67
Coffee	8	26.67	1	333	21	70.00	11	36.67	3	10.00	16	53.33
Tea	9	30.00	0	0.00	21	70.00	13	43.33	2	6.67	15	50.00
Bread	21	70.00	3	10.00	6	20.00	20	66.67	9	30.00	1	3.33
Cereals	16	53.33	9	30.00	5	16.67	16	53.33	14	46.67	0	0.00
Oily seeds	11	36.67	8	26.67	11	36.67	15	50.00	12	40.00	3	10.00

n: number, %: percentage

Table 5. The comparison of the cohesiveness of the Mediterranean diet quality Index with some chemical findings of pregnant women in the I. Trimester and III. Trimester (n=30)

	The Mediterranean diet	n	I. Trimester				III. Trimester			
			$\bar{x}$	s	Z	p	$\bar{x}$	s	Z	p
Urea	Median	7	22.33	9.26	0.768	0.774	22.60	7.59	0.259	0.266
	Good	23	23.61	5.89			25.42	6.37		
ALT	Median	7	17.50	10.65	0.050	0.048*	18.56	9.58	0.027	0.025*
	Good	23	25.47	7.97			27.77	8.74		
AST	Median	7	18.79	6.30	0.037	0.037*	19.97	5.72	0.044	0.042*
	Good	23	24.84	6.68			25.23	6.40		
PBG	Median	7	88.57	1.99	0.413	0.441	89.29	3.40	0.431	0.441
	Good	23	89.43	4.25			88.39	13.20		
TSH	Median	7	2.60	1.81	0.961	0.962	2.81	1.70	0.624	0.631
	Good	23	2.39	1.10			2.59	1.14		
Creatinine	Median	7	0.94	0.20	0.844	0.848	0.83	0.21	0.922	0.924
	Good	23	0.94	0.23			0.85	0.17		
FreeT4	Median	7	1.00	0.24	0.062	0.061	1.14	0.11	0.475	0.501
	Good	23	1.18	0.24			1.05	0.23		
Folic acid	Median	7	9.21	5.49	0.291	0.311	10.13	5.17	0.825	0.848
	Good	23	11.78	5.25			10.31	5.33		
Hemoglobin	Median	7	13.26	1.98	0.185	0.190	12.64	1.49	0.229	0.245
	Good	23	12.31	2.32			11.53	1.79		
Vit D	Median	7	17.67	5.49	0.462	0.471	18.31	5.04	0.659	0.666
	Good	23	19.40	5.72			19.34	5.28		
B12 vit	Median	7	409.43	145.96	0.220	0.226	402.00	88.85	0.941	0.962
	Good	23	354.35	111.96			397.35	124.12		

cohesiveness levels of the Mediterranean Diet Quality Index of the pregnant ($p>0,05$).

As illustrated on the Table 6; when the correlations between the biochemical findings of the I. and the III. trimester of the pregnant with the Mediterranean Diet Quality Index scores are analyzed; it is found that; there is no statistically meaningful correlation between the Mediterranean Diet Quality Index scores with the biochemical findings measured on the I. trimester of the pregnant ($p>0.05$).

There is a statistically meaningful positive-way correlation between the AST values measured on the III. trimester and the Mediterranean Diet Quality Index of the pregnant ($p<0.05$). The more the scores of the Mediterranean Diet Quality Index of the pregnant increase, the more the AST values measured on the III. trimester increase. Except for the AST measured on the III. trimester and the scores of the Mediterranean Diet Quality Index, there are not meaningful correlations between the other biochemical findings of the pregnant ($p>0.05$).

Discussion

Gestation is a physiological situation. However, due to the rapid growing fetus and the placenta, there are essential changes in the pregnant woman. For taking precautions for the problems of the pregnant woman and for a healthy continuation of the gestation period; the control of the biochemical and hemoglobin values is important and very necessary. Regarding; this study

Table 6. The correlations between the Mediterranean Diet Index scores and biochemical and hemoglobin findings of pregnant women in the I. Trimester and III. Trimester (n=30)

		The Mediterranean Diet Quality Index	
		I. Trimester	**III. Trimester**
Urea (mg/dL)	r	-0.028	0.007
	p	0.884	0.972
ALT (U/L)	r	0.260	0.269
	p	0.165	0.150
AST (U/L)	r	0.352	0.371
	p	0.056	**0.044¥**
PBG (mg/dL)	r	0.018	0.016
	p	0.925	0.934
TSH (uIU/mL)	r	0.086	0.052
	p	0.653	0.784
Creatinine (mg/dL)	r	-0.026	0.082
	p	0.891	0.665
Free T4 (ng/dL)	r	0.253	-0.121
	p	0.177	0.524
Folic acid (ng/mL)	r	0.138	-0.057
	p	0.468	0.766
Hemoglobin (g/dL)	r	0.001	0.030
	p	0.997	0.873
Vit D (ng/mL)	r	-0.046	-0.069
	p	0.809	0.717
B12 vit (pg/mL)	r	-0.165	0.054
	p	0.384	0.777

p<0.05, ¥: Pearson Correlation Analysis

aims to compare the biochemical and hemoglobin results of the pregnant on the I. and the III trimester as well as analyzing the biochemical and hemoglobin results with the Mediterranean diet quality index scores in pregnant on the I. and the III. trimester. At the same time; the behavioral changes for the nutrients, nutrition habits and the anthropometric features of the pregnant individuals were analyzed. The recent studies claim that the most suitable nutrition type for the gestation was the Mediterranean diet. As emphasizing the proteins based on fruit, vegetables, fish and plant with oils, this nutrition type is suggested for everybody in the society because of its being healthy. The researchers show that the risk of getting chronic illness is lower in the people who are fed with the Mediterranean type. In this study; the Mediterranean Diet Quality Index was used in order to evaluate the Mediterranean type nutrition model in gestation (6). The research has been the first study to be conducted on the pregnant in the Turkish Republic of Northern Cyprus.

When the anthropometric features of the pregnant are analyzed; there has been an increase in the body weight on the III. trimester compared to before the gestation. In terms of behavioral changes to the nutrients of the pregnant women, there has been an increase in the consumption of milk with the value of %50.0 compared to before the gestation as well as increase %56.67 in egg and %46.'7 in yogurt. Following these consumptions; there has been a reduction in the consumption of legume with the value of %63.33 and

%56.67 in red meat, %56.67 in chicken, %43.33 in fish and %70.0 in coffee and tea consumption. However, there has been no change in consumption of some nutrients with the values as; %83.33 in yellow and red vegetables, %83.33 in green vegetables, %70.0 in bread and lastly %53.33 in cereal consumption.

On the III. trimester; %50.0 of the pregnant increased the milk consumption, %50.0 egg, %53.33 yogurt, %56.67 fruit, %40.0 red meat and %46.67 fish consumption. Whereas %53.33 of them reduced the coffee and %50.0 tea consumption. Also, there is no change in the legume consumption with the value of %66.67, %70.0 in yellow vegetables, %90.0 in red vegetables, %80.0 in green vegetables, %43.33 in chicken, %66.67 in bread, %53.33 in cereals and lastly %50.0 in oily seeds consumption.

There is no difference between the values of urea, PBG, TSH, Free T4, folic acid, vitamin D and vitamin B_{12} measured on the I. and the III. trimester of the pregnant whereas, there is a difference between the values of ALT, AST, Creatinine and the Hemoglobin. While the ALT and the AST values measured on the III. trimester of the pregnant were found higher compared to before the gestation; the Creatinine and the Hemoglobin values found lower compared to before the gestation. The suitability or cohesiveness to the Mediterranean diet of the pregnant on the III. trimester was found as optimal according to the Mediterranean Diet Quality Index scores. When the relationship between the Mediterranean Diet Quality Index scores with the biochemical findings on the I. trimester and on the III. trimester is analyzed; it has been found that there is no relationship between the biochemical findings measured on the I. trimester with the Mediterranean Diet Quality Index scores of the pregnant women. A positive-way relationship was found between the Mediterranean Diet Cohesiveness (suitability) with the AST values measured on the III trimester whereas there is no relationship found between the hemoglobin and the biochemical parameters.

The body weight increase average in pregnant found to be 7.45 kg. The suggested body weight increase for the pregnant are from 9 to 12 kilograms. If the minimum increase value was 7 kg, it is accepted (12). We believe that the pregnant women's having the Mediterranean type nutrition habit might cause the body weight increase value to be on the limits. Also, the Mediterranean type nutrition model in gestation has been shown as reducing the weight gain as well as enhancing the health results both for the baby and the maternal (6). The weight gain of the pregnant in this research has been on the minimal level in which we believe it can cause positive effects on the birth weight of the baby.

ALT and AST are the enzymes produced in the liver (13). Those enzymes might increase in the liver due to various reasons. In the conducted studies; the increase of AST and ALT had a direct relationship with the BMI. As the BMI increases the ALT and AST values increase (14). We believe that, the increasing weight gain from the I. trimester to the III. trimester might cause the ALT and the AST values to be higher than before the gestation.

The anemia in gestation is defined as the Hb concentration to be below the 11 g/dl according to the World Health Organization's criteria (15). The Hb concentration of the pregnant in this research had decreased in the III. trimester compared to the I. trimester but on the III. trimester the Hb value was not below 11 g/dl. As the gestation weeks increase the baby's O_2 consumption increases so this Hb value's decreasing is expected.

In a study conducted by Klibride et. al., (16); the Hb level in anemic pregnant was found as 9.9 g/dL, and in non-anemics it was 12.2 g/dL and they also found that in anemics vitamin B_{12} level was lower than 200 pg/mL and they claimed that, during gestation and breastfeeding period the iron, folic acid and vitamin B_{12} should be seriously checked. In this study also, the vitamin B_{12} level of the pregnant on the I. trimester was found as 367.20 pg/m whereas on the III. trimester it was 398.43 pg/m. Although this increase was found meaningless, it is two times than the results of Kilbride et. al., (16). As the tea and coffee consumption frequency increases vitamin B_{12} absorption reduces (17). In terms of nutrition habits of the pregnant women, the reduction in the consumption of tea with %50 value and consumption of coffee with %53 value might have caused an increase in the level of vitamin B_{12}. In addition, we believe that the increase in the consumption frequency of the animal origin food (milk, yogurt, red meat) on the III. trimester of the pregnant might cause the increase of this value.

Due to growth of maternal erythropoiesis and fetus, the sufficient intake of the folic acid in gestation is very essential. The folic acid has a role in the nucleic acid synthesis and its deficiency can increase the risk of neural tube defect, preterm birth and low birth weight and causes intrauterine growth retardation (18). The serum folic acid level for the normal healthy individuals is known as 6–15 ng/mL (19). In this study the pregnant had average folic acid values on the I. trimester as 11.18±5.32 ng/mL whereas on the III. trimester the average was found as 10.27±5.20 ng/mL. These values' being on the suggested limits provide the pregnant woman to continue their metabolic activities and it has great importance in terms of baby's development. In addition to the Mediterranean type nutrition the pregnant have taken nutrient supplement containing B_{12}, vitamin D and folic acid.

The insufficient level of the intake of the micro and macro nutrient factors in gestation period is very important for the health of the fetus. The vitamin D deficiency during gestation causes hypocalcemia, rickets and late ossification in the infant (20). The Committee of Nutrient and Nutrition of the U.S.A claimed that the 1,25 hydroxy in gestation and breastfeeding increased the level of vitamin D therefore; additional intake was suggested for the gestation and breastfeeding by considering the calcium absorption increases. In this study, there was not a decrease in vitamin D values on the I. and the III. trimester of the pregnant as well as preserving that value. Since the pregnant had a gynecological follow-up by the same doctor, they used the same additional supplement in addition to the sufficient and balanced nutrition during the gestation. Thanks to this additional nutrient supplement that included rich vitamins, especially B_{12}, vitamin D, folic acid the parameters were preserved or increased which are necessary for pregnant and baby health.

The Mediterranean diet emphasizes fruit, vegetables, fish and plant based proteins with oils. It has been observed that, the pregnant on the III. trimester have consumed more fruit, vegetables and fish and this increase is a factor for the Mediterranean Diet Quality Index scores to be on the optimal level.

In this study; the relationship between the biochemical and hemoglobin values with the Mediterranean type nutrition habits of the pregnant were analyzed as well as their differences according to their trimester periods. Biochemical parameters and hemoglobin levels are not the only factors related with the nutrition. In the future studies we believe that; the analysis of the effect of other factors (medicine use, intrauterine weight, etc.) on biochemical and hemoglobin values in pregnant would offer an insight into the literature.

Conclusion

The nutrient needs of the pregnant must be determined by considering many factors such as; age, physical activity status, weight at the beginning of gestation, the sufficiency degree of the nutrient stores, etc. Additional nutrient substances should be given such as iron, folic acid, vitamin B_{12}, B_6 for breastfeeding mothers, a healthy child and smooth fetal development. For sufficient and balanced nutrition provision, the Mediterranean type nutrition model should be suggested in order to meet the pregnant should be informed about the nutrition and gestation as well as about the effect of nutrition in gestation on the baby's health.

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