Research Article (Araştırma Makalesi)

Evaluation of Vitamin B12 Levels in Pregnant Population and Relationship with Nutritional Deficiency

Gebe Popülasyonunda Vitamin B12 Düzeyinin Değerlendirilmesi ve Beslenme Yetersizliği ile İlişkisi

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Özet

Amaç: Gebe popülasyonunda trimesterlere göre vitamin B12 düzeyini incelemek, yetersizlik ve eksiklik durumlarında beslenme bozukluğu ile ilişkisini araştırmak, erken teşhisle takviyesini başlamak.

Gereç ve Yöntemler: Üçüncü basamak bir üniversite hastanesi tıp fakültesi Kadın Hastalıkları ve Doğum Anabilim dalına başvuran gebelerin sosyodemografik anket verileri, ultrasonografi verileri, hemogram, biyokimya ve vitamin B12 düzeyleri bakıldı. Verilerin değerlendirilmesinde SPSS 22.0 istatistik programı kullanıldı. P<0.05 anlamlı kabul edildi.

Bulgular: Araştırmamıza 250 gebe dâhil edildi. Yaş ortalaması 26.42±5.86 (18-40 yaş) idi. Katılımcıların ortalama vitamin B12 düzeyi 214.45±83.99 ng/ml (80-656) idi. Katılımcıların vitamin B12 düzeyleri postoc duncan testine göre 1.trimester 2 ve 3 ile anlamlı farklılık içermekte (p<0.05), 2.trimester ve 3.trimester kendi içerisinde anlamlı farklılık içermemekteydi (p=0.968). Sosyoekonomik düzeylere göre vitamin B12 düzeyleri karşılaştırıldığında aylık geliri 3001 Türk Lirası ve üzeri olan grupta 228.336±63.665 ng/ml, aylık geliri 3000 Türk Lirası ve altı olan grup 199.016±45.630 ng/ml olarak bulundu. İki grup arasında anlamlı farklılık mevcuttu (p<0.05). Vitamin B12 düzeylerinin beslenme yetersizliğiyle ilişkisine bakıldığında günlük tam ve/veya yarım porsiyon hayvansal gıda tüketen grubun vitamin B12 düzeyleri 268.27±86.96 ng/ml; dörtte bir porsiyon tüketen ve/veya tüketmeyenlerin 166.34±41.60 ng/ml bulundu. İki grup birbiriyle kıyaslandığında anlamlı farklılık bulundu (p<0.05).

Sonuç: Gebelikte vitamin ve mineral dengesi anne ve fetüs sağlığı açısından çok önemlidir. Vitamin B12 eksiklik ve/veya yetersizlik durumları azımsanmayacak sayılardadır. Gerekli durumlarda erken teşhisle bireye hemen doğru beslenme açısından eğitim verilmelidir. Kar-zarar oranına göre elzem durumlarda folik asit-vitamin B12 kombine ilaçlardan destek tedavisi düşünülmelidir.

Anahtar kelimeler: Gebelik, Malnütrisyon, Vitamin B12 eksikliği

Abstract

Objective: This study aims to examine the level of vitamin B12 according to trimesters in the pregnant population, to investigate its relationship with malnutrition in cases of insufficiency and deficiency, and to start supplementation with early diagnosis.

Material and Methods: Sociodemographic survey data, ultrasonography data, hemogram, biochemistry and vitamin B12 levels of pregnant women who applied to the department of obstetrics and gynecology of a reginal university hospital were examined. SPSS 22.0 statistics program was used to evaluate the data. P<0.05 was considered significant.

Results: Two hundred and fifty pregnant women were included in our study. The mean age was 26.42±5.86 (18-40 years). The mean vitamin B12 level of the participants was 214.45±83.99 ng/ml (80-656). According to the postoc duncan test, the vitamin B12 levels of the participants showed a significant difference with the 1st trimester 2 and 3 (p<0.05), while the 2nd and 3rd trimesters did not show a significant difference in themselves (p=0.968). When compared according to socioeconomic levels, vitamin B12 levels of the group with a monthly income of 3001 turkish lira and above was found to be 228.336±63.665 ng/ml, and the group with a monthly income of 3000 turkish lira and below was 199.016±45.630 ng/ml. There was a significant difference between the two groups (p<0.05). Considering the relationship between vitamin B12 levels and nutritional deficiency, vitamin B12 levels were found 268.27±86.96 ng/ml in the group consuming full and/or half servings of animal food daily, and 166.34±41.60 ng/ml in those consuming and/or not consuming a quarter serving. When the two groups were compared with each other, a significant difference was found (p<0.05).

Conclusion: Vitamin and mineral balance during pregnancy is very important for maternal and fetal health. Vitamin B12 deficiency and/or insufficiency are in considerable numbers. When necessary, the individual should be trained in terms of proper nutrition immediately with early diagnosis. Supportive treatment from folic acid-vitamin B12 combined drugs should be considered in essential cases according to the profit-loss ratio.

Keywords: Malnutrition, Pregnancy, Vitamin B12 deficiency

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INTRODUCTION

In humans, nutrients necessary for the body are taken with a balanced and adequate diet. Adequate nutrition becomes even more important during growth and development, pregnancy and lactation. Excess or insufficiency can be seen as a result of the deterioration of a balanced diet. In addition to causing pathologies such as maternal obesity, uncontrolled weight gain, gestational diabetes and preeclampsia, malformations, preterm births and low birth weight may occur due to vitamin and mineral deficiencies in its deficiency (1,2). During pregnancy, the use of essential nutrients such as iron, iodine, folic acid and vitamin B12 increases and their deficiencies may occur. Among these, the most common vitamin deficiencies are folic acid and B12 (1). Vitamin B12 and folic acid are essential vitamins that play a role in DNA (Deoxyribonucleic acid) and RNA (Ribonucleic acid) metabolism and are essential for cell division and growth. Studies have shown that maternal folate and vitamin B12 levels are associated with many factors, and their deficiencies lead to neural tube defects, placenta and fetus anomalies, especially low birth weight (3-5).

In our study, vitamin B12 levels, which are as important as folic acid in the pregnant population, were measured, compared according to gestational week and trimesters, and their relationship with nutritional disorders was investigated. In cases of insufficiency and/or deficiency, it is aimed to regulate the conditions related to malnutrition and to prevent complications that may occur during pregnancy.

MATERIALS AND METHODS

Our study was conducted prospectively in a tertiary university hospital, the Department of Obstetrics and Gynecology. It was conducted in accordance with the declaration of Helsinki by obtaining permission from the Ethics Committee of Kahramanmaras Sütcü İmam University (Decision no: 01 date: 25/05/21). The research sample was composed of 250 voluntary pregnant between the ages of 18-40 who applied to the obstetrics and diseases outpatient clinic between May 2021 and June 2021. Patients who had difficulty in communicating, aged under 18, over 40, with a diagnosis of ectopic pregnancy or molar pregnancy were not included in the study. Sociodemographic and questionnaire (age, socioeconomic status, gestational week, gravida number, parity number, multivitamin use, daily portioned animal food consumption(1 portioned; 1 bowl of yogurt, 1 glass of milk, 1 boiled egg, 60 g of red meat) questions were asked to each pregnant woman by scanning the literature. Week of pregnancy, femur bone length, head circumference and abdomen circumference, nasal root and nuchal thickness was measured in ultrasonographic measurements. The amount of amniotic fluid of the pregnant woman was measured separately in 4 pockets. Whole blood analysis, iron, iron-binding capacity, ferritin, alanine transaminase (ALT), aspartate transaminase (AST), urea, creatinine, Thyroid stimulating hormone (TSH) and vitamin B12 levels were measured. Vitamin B12 level ≥220 ng/ml was considered normal, 219-180 ng/ml insufficiency, and <180 ng/ml deficiency. As a result of literature research, the daily vitamin B12 consumption amount of pregnant women was determined as 2.6 mcg (6). Based on the daily consumption amount, animal food portions that can be changed in themselves were determined and asked in the questionnaire.

Staticical Analysis

SPSS 22.0 was used for statistical analysis. The compliance of the data to normal distribution was evaluated using the Shapiro-Wilk test. Categorical data were analysed using the Chi-Square test. Analysis of the difference between data in group comparisons was applied with the ANOVA test. Continuous data were expressed as mean±standard deviation (SD) values and categorical data as number (n). $P<0.05$ value was considered statistically significant.

RESULTS

Two hundred and fifty pregnant volunteers were included in this study. Analysis results revealed that the average age of the participants is 26.42±5.86 years, the minimum (min) age is 18 and the maximum (max) age is 40 years. Vitamin B12 levels of the pregnant women in our study were found to be 214.45±83.99 ng/ml (min 80.00, max 656.00 ng/ml). Considering the vitamin B12 level of pregnant individuals included in our study, 102 (40.8%) pregnant individuals were at the deficiency level (<180 ng/ml), 54 (21.6%) were at the insufficiency level (180-220 ng/ml), 94 (37.6%) of the pregnant individual was found within normal (>220 ng/ml) limits (**Table 1**).

When vitamin B12 levels were compared according to socioeconomic levels, the group with a monthly income of 3001 Turkish Liras and above was 228.336±63.665 ng/ml, and the group with a monthly income of 3000 Turkish Liras and below 199.016±45.630 ng/ml. There was a significant difference between the two groups

Table 1. Vitamin B12 levels, multivitamin use and animal foods intake of pregnant individuals participating in the study			
	Groups	**n**	**Percent (%)**
Vitamin B12	<180 ng/ml	102	40.8
	180-219 ng/ml	54	21.6
	≥220 ng/ml	94	37.6
Multivitamin use	I use regularly	138	55.2
	Sometimes I hesitate	72	28.8
	No. I don't use	40	16
Animal foods intake	I eat full portion daily	98	39.2
	I eat half portion daily	20	8
	I eat quarter of portion daily	100	40
	I don't eat	32	12.8

(p<0.05). The level of vitamin B12 was 216.015±61.520 ng/ml in gravida two or less, and 183.354±45.340 ng/ml in those with three or higher numbers. There was a significant difference between the two groups (p<0.05). The level of vitamin B12 was found to be 209.064±51.480 ng/ml in parity one and lower number, 187.647±44.382 ng/ml in those with two or higher numbers. There was a significant difference between the two groups (p<0.05). When the vitamin B12 level of pregnant individuals participating in our study was compared according to trimesters, a significant difference was found between the groups (p<0.05). Postoc duncan test was used to determine which one differed among trimester groups. Accordingly, the level of vitamin B12 of pregnant women in the 1st trimester (0-14 weeks) was found to be 261.25 ng/ml, the level of the pregnant women in the 2nd (15-28 weeks) and 3rd (29-weeks) trimesters was 186.04 and 192.10 ng/ml, respectively. It contains significant difference (p<0.05). Vitamin B12 level (261.25) of pregnant women in the first trimester was normal, and the level of vitamin B12 of pregnant women in the second and third trimesters was found to be insufficient (180-220 ng/ml). When the pregnant women in the 2nd and 3rd trimesters are compared, there is no significant difference (p=0.968). (**Table 2**)

As another statistical analysis, the comparison of vitamin B12 levels by age group was examined. Vitamin B12 levels were divided into three groups as 18-24 years, 25-32 years and over 32 years of age were compared. The vitamin B12 level of pregnant women in the 18-24 age group was found to be lower (159.27±93.80 ng/ml) compared to the other groups (p<0.05). The postoc duncan test was used to compare the groups of 25-32 years and above 32 years of age. Accordingly, there was no significant difference between the two groups (p=0.579) (**Table 2**).

In our study, when the relationship between vitamin B12 level and nutritional deficiency was examined, it was found that those who consumed a full and/or half portion of animal food daily were 268.27±86.96 ng/ml,

Table 2. Comparison of vitamin B12 levels of pregnant individuals participating in the study by trimesters and averages of age				
Trimester (Pregnancy week)	**Vitamin B12 blood Levels (ng/ml)**	**n**	**Standard Deviation**	**p***
1 (0-14)	261.250	88	33.165	<0.05
2 (15-28)	186.049	82	54.696	
3 (29-)	192.100	80	112.145	
Age	**Vitamin B12 blood Levels (ng/ml)**	**N**	**Standard Deviation**	**p***
18-24	159.273	88	93.809	<0.05
25-32	233.146	82	72.792	
>33	256.000	80	58.838	
Total	214.456	250	83.993	

*ANOVA

and those who consumed a quarter portion and/or did not consume it were 166.34±41.60 ng/ml. When the two groups were compared, a significant difference was found (p<0.05) (**Table 3**).

A bidirectional correlation analysis was performed between the vitamin B12 level of pregnant individuals included in our study and nutrition deficiency, and a significant negative correlation was found. The rate of nutrition deficiency increased in pregnant individuals with low vitamin B12 levels. Correlation rates, respectively, were found as 1st trimester r= -0.663, 2nd trimester r= -0.639, and 3rd trimester r= -0.684. When the correlations of three separate trimesters were compared with each other in groups, there was no significant difference (p=0.689) (**Table 4**).

DISCUSSION

Vitamin B12 is one of the essential vitamins in many production reactions in the human body, especially DNA synthesis. This requirement is gradually increasing in infancy and childhood, especially in pregnancy (1,5). Vitamin B12 level 162 (64.8%) of 250 pregnant women participating in our study was found to be at insufficiency and/or deficiency level, and 88 (35.2%) were found to be normal. In the literature, Ozdemir et al. in the study on assessment of B12 level in pregnant women in 2018, 74% of pregnant women, Lai et al. in his study on vitamin B12 level in pregnant women in 2019, vitamin B12 insufficiency or deficiency was found at a rate of 56% (7,8). In another study by Siddikua et al in 2016, vitamin B12 levels of 66% of pregnant women were found to be insufficient (9). In the study of Finkelstein et al. In 2017, vitamin B12 deficiency was found in 51% of pregnant individuals (10). In the study of Du et al., vitamin B12 was deficient in 69.6% of the pregnant women (11).We think that it is caused by the use of vitamin B12 as well as folic acid in the synthesis of DNA due to organogenesis in infant development during pregnancy.

A deficiency in vitamins and minerals occurs due to the deterioration of nutritional balance during pregnancy. In their study on the effect of vitamins on maternal health in 2013, Kabaran et al. found a significant relationship between nutritional disorder and vitamin deficiency (12). In another study conducted by Unsur et al. in 2020, it was shown that nutritional deficiency during pregnancy was associated with a vitamin B12 level (13). In another study by Dwarkanath et al., vitamin deficiency develops due to malnutrition during pregnancy (14). In our study, it was determined that the vitamin B12 level of pregnant women with deficiency and/or insufficiency was lower than the other group and contained a significant difference (p<0.05). Again, in our study, the correlation between nutritional deficiency and vitamin B12 was examined. A significant negative correlation was detected. When the trimesters were analysed one by one, a significant negative correlation was found in all three trimesters. When the group correlations were compared, no significant difference was found (p=0.689). We think that this situation occurs as a result of impaired nutritional balance during pregnancy due

Table 3. Comparison of vitamin B12 levels of pregnant individuals participating in the study by nutritional disorder

Nutrition Status	Vitamin B12 blood Levels (ng/ml)	n	Standard Deviation	p*
I eat full and/or half portion daily	268.271	118	86.967	<0.05
I eat quarter portion and/or I don't eat	166.348	132	41.606	
Total	214.456	250	83.993	

*ANOVA

Table 4. Correlation analysis of vitamin B12 levels of pregnant individuals included in the study and malnutrition (n=125)

	r*	p*	p**
Trimester 1 (n=44)	-0.663	<0.001	0.689
Trimester 2 (n=41)	-0.639	<0.001	
Trimester 3 (n=40)	-0.684	<0.001	
Total (n=125)	-0.737	<0.001	

*Spearman Correlation Analysis
**ANOVA

to reasons such as nausea, decreased appetite and food choices. The impairment of nutritional balance and the decrease in vitamin levels cause a further decreases in appetite and decreased immunity in pregnant women. We think that these two situations are linked to each other in a vicious circle and support each other.

When vitamin B12 levels were compared according to socioeconomic levels, it was found that the group with a monthly income of 3001 Turkish Liras and above was higher than the group with a monthly income of 3000 Turkish Liras and below. In the study of Du et al., the vitamin B12 level of pregnant women living in rural areas with low socio-economic status was found to be lower than those living in the city center (11). We think that this is due to the fact that pregnant women with a high economic level are also at a high socio-cultural level, and access to animal foods is more convenient, more advantageous in terms of balanced and regular nutrition.

The vitamin B12 level of the gravida two and less numbered ones was found to be higher than those with three or higher numbers. There was a significant difference between the two groups ($p<0.05$). The vitamin B12 level of those with parity of one or less was found to be higher than those with two or more. There was a significant difference between the two groups ($p<0.05$). The reason for this may be that individuals are more attentive and paying attention to themselves in their first pregnancy, and in cases of more than one pregnancy, they cannot spare enough time for themselves due to having children.

When we look at the comparison of vitamin B12 levels according to trimesters, Chery et al. study in the literature found that vitamin B12 decreases as the trimester progresses (15). Koebnick et al. Examined the comparison of vitamin B12 according to trimesters in their study on B12 levels during pregnancy and found that vitamin B12 levels decreased as the trimesters progressed (16). In the study of Sukumar et al. in England, it was found that vitamin B12 levels decrease as the trimesters progress (17). Our results confirm the literature with similar findings. While the vitamin B12 level was normal in the first trimester, the vitamin B12 level was low in the second and third trimesters. A significant difference was identified between trimesters. This may be due to the fact that beta HCG (human chorionic gonadotropin), known as the pregnancy hormone, increased and peaked in the first 14 weeks, and decreased eating and drinking due to stimulation of the nausea center during the peak period. Since eating and drinking is not fully affected in the first trimester, vitamin B12 deficiency may be less common compared to other trimesters.

In conclusion, vitamin and mineral balance during pregnancy is very important for maternal and fetal health. Folic acid support, which is among the group recommendations of our Ministry, should not be disrupted. As a result of our research and the literature review, it is necessary to closely monitor vitamin B12 levels and folic acid intake. Vitamin B12 deficiency and/or insufficiency in pregnant women is considerable. When necessary, the individual should be trained in terms of proper nutrition immediately with early diagnosis. Supportive treatment from folic acid-vitamin B12 combined drugs should be considered in essential cases according to the profit-loss ratio.

Conflict of Interest Statement: The authors of the article declare that there is no conflict of interest.

Contribution Rate Statement Summary: Idea / Concept: MB, BK Design: MB, BK / Data collecting: BK / Analysis: MB / Literature review; Writing the article MB

Ethical Approval: Ethical consent was obtained from the Ethics Committee of Kahramanmaras Sütcü İmam University (Decision no: 01 date: 25/05/21). This study have been conducted in accordance with the Helsinki Declaration of Principles.

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