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Research Article

Evaluation of post treatment Laboratory changes of megaloblastic anaemia in Urmia

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ABSTRACT

Introduction: The main purpose of this study was to evaluate the post treatment in vitro changes in patients with megaloblastic anemia caused by vitamin B12 deficiency.

Methods: In this cross - sectional study, 89 patients diagnosed with anemia megaloblastic were studied. These patients were studied in terms of age and gender and early laboratory changes such as hemoglobin and MCV (mean cell volume) and the platelet and post treatment laboratory changes such as changes in hemoglobin, MCV, and platelet and LDH.

Results: According to paired samples correlations test, there are significant differences between hemoglobin before and one week after treatment, the MCV before and one week after treatment and PLT before and one week after treatment in men, women and in all patients. But according to t-test there were no significant differences between hemoglobin a week after treatment for men and women, between MCV one week after treatment for men and women and between PLT one week after treatment for men and women.

Conclusion: Given that vitamin B12 is valuable for the body cells, it seems that the screening of this vitamin deficiency is useful for high-risk people such as the elderly, patients who have undergone gastrectomy, HIV patients and those treated with ART. So diseases caused by the deficiency are prevented in different organs.

Key words: Laboratory changes, megaloblastic anemia, vitamin B12, hemoglobin

INTRODUCTION

Generally, 1.62 billion people worldwide are estimated to be suffering from anemia, among them, 43% are in developing countries and 9% in developed countries (1). The average size of red blood cells has long been used as a criterion to classify the type of anemia (2). Microcytosis is defined as red cells being greater than 100 Femtolitre which generally occurs in approximately 3% of the population (3). Macrocytic anemia is divided into two general categories of megaloblastic and non megaloblastic; if there are cells greater than 115 Femtolitre, Anisocytosis, Poikilocytosis and hyper- segmented neutrophils in the peripheral blood smear we may conclude that it is megaloblastic anemia (4). In Megaloblastic cells, nucleus to the cytoplasm ratio is greater than normal which is due to the delayed development of the core compared to the development of the cytoplasm (5). The existence of Vitamin B12 (cobalamin) and folic acid (which is a type of B vitamins) is essential for the production of red blood cells; also it is believed that these vitamins have a key role in the prevention of central nervous system disorders, mood disorders and dementia (6, 7). Anemia caused by nutritional deficiency of vitamin B12 and folic acid is associated with hyperhomocysteinemia (6).

Although it was previously thought that megaloblastic anemia is caused by folate deficiency, later it was found that cobalamin deficiency can also lead to this type of anemia (8). Folate deficiency may be due to nutritional factors, drugs (methotrexate and anticonvulsants), alcoholism and diseases increasing the cell cycle; in addition, cobalamin deficiency can be caused by disorders of the gastrointestinal absorption of this vitamin, certain parasites and some genetic diseases (9 and 10). However, since cobalamin is naturally absorbed by the ileum's internal factors, the most important reason of this vitamin deficiency is autoimmune pernicious anemia (11 and 12). Because cobalamin is made by microbes, the best sources of this vitamin are animal products. While folic acid is found in abundance in many foods, especially in liver and green leafy plants (13-15). The daily requirement for vitamin B12 is in the range of 1 to 2 mg per day (16). B12 deficiency is defined as less Serum levels of vitamin than 150 pmol / L (17). Vitamin B12 deficiency therapy is done by intramuscular administration of cyanocobalamin as one mg daily for a week, then one mg per week for a month and finally one mg every one or two months (16). However, in some countries, cobalamin is prescribed in an edible way but administering intramuscularly still is the most used method (16). Given the importance of this issue and associated complications of anemia and the fact that so far a similar study has not carried out in Iran, we decided to conduct a research in this area which mainly includes laboratory changes therapy. The main objective of this study was to evaluate the post treatment laboratory changes in patients with megaloblastic anemia resulting from vitamin B12 deficiency in the city of Urmia in the past 5 years.

MATERIALS AND PROCEDURES

In this descriptive-analytic study, 89 patients were diagnosed to be with Megaloblastic anemia during the past 5 years in Imam Khomeini hospital of Orumieh. The patients were studied demographically, and were screened for the laboratory changes after treatment. All the patients with Megaloblastic Anemia were diagnosed and studied; and, their laboratory changes in the weekly tests after treatment were evaluated. The patients were studied for their age, gender, and the primary laboratory changes such as hemoglobin levels, MCV, and platelet levels, and the laboratory changes after treatment such as changes of hemoglobin, MCV, platelet and LDH levels. The patients who were diagnosed but were not received medications, or during treatment did not attend the hospital were removed from the study. The changes were recorded, and then, were statistically compared.

With respect to the total objective of the study, and evaluating the effects of treatment on the Para clinical markers of the patients with the anemia, and since the improvement of hemoglobin levels is the most important marker in evaluating the results of the treatment, and 100% of the patients were with low hemoglobin levels anemia, and with respect to the study conducted in India that showed this portion after treatment reduced to 53%, altogether 28 patients were needed (80% power, the level of significance of 1%); but, due to the evaluation of other factors in the course of treatment, and because all files were not completed, in this study all 88 patients that were under medications in Imam Khomeini hospital in the 5 years period (2008-2013), were evaluated. Finally, after entering the computer the acquired data were analyzed by SPSS19 Software.

Results:

In this study 17 patients out of 89, had incomplete laboratory data, so they were excluded and the study was conducted on 72 patients. In this study, 40 patients (55.8%) were male and 32 patients (44.4%) were female. The average age of men was 18.9 ± 60.42 years and the average age of women was 21.54 ± 50.43

years. The average age of patients was 20.23 ± 55.98 years as a whole (a minimum of 10, a maximum 95 years and a median of 59 years). The vast majority of patients had general malaise, fatigue, anorexia, some patients had neurological symptoms and symptoms of hemorrhagic and neurologic symptoms such as weakness and numbness of the limbs and organs. Laboratory findings were as follows:

Table1. The mean level and Standard deviation of the laboratory findings on admission in the study population

Laboratory findings	Mean level ± standard deviation (on admission)
Hemoglobin	6.98±2.32
MCV	107.12±15.76
PLT	110.33×10±70.52
LDH	2873.75±2580.35

Table2. Comparison of laboratory findings before treatment based on gender

Laboratory findings	Male	Female
Hemoglobin mean level	6.82±2.38	6.91±2.48
MCV mean level	108.97±14.11	103.44±17.47
PLT mean level	110.90×10±69.93	109.62×10±72.36
LDH mean level	2985.10±3075.43	2734.56±18920.54

Table3. Comparison of the laboratory findings before the treatment and one week after the treatment in males

Laboratory findings	Before the treatment	One weak after the treatment
Hemoglobin mean level	6.82±2.38	9.82±2.47
MCV mean level	108.97±14.11	101.65±11.3
PLT mean level	110.90×10±69.93	159.42×10±86.55

According to the paired samples T- test there were significant differences between hemoglobin before and one week after treatment (p= 0.000), the MCV before and one week after treatment (p=0.000) and the PLT before and one week after treatment (p=0.000) in men.

Table4. Comparison of laboratory findings before the treatment in females

Laboratory findings	Before the treatment	One weak after the treatment
Hemoglobin mean level	6.91±2.48	9.67±1.73
MCV mean level	103.44±17.47	95.59±19.99
PLT mean level	109.62×10±72.36	168.54×10±159.99

In this study, we examined the mean levels of the laboratory findings before the treatment, and after the treatment according to the patients' genders. The results showed that:

Hemoglobin mean levels in 72 patients before the treatment, and one weak after the treatment were 6.88±2.41 g/l, and 9.67±2.05 g/l. According to statistical paired sample test, there is a significant difference between hemoglobin levels before and after the treatment (P=0.000).

PLT mean levels before the treatment, and after the treatment were 110.33*10±70.52, and 163.26*10±123.13, respectively.

According to statistical paired sample T-test, there is a significant difference between PLT levels before and after the treatment (P=0.000).

Table5. Comparison of the laboratory findings before the treatment, and on weak after the treatment

Laboratory findings	Before the treatment	After the treatment	p. value
Hemoglobin mean level	6.88±2.41	9.67±2.05	0.000
MCV mean level	106.49±15.81	99.30±15.76	0.000
PLT mean level	110.33×10±70.52	163.26×10±123.13	0.000

Hemoglobin mean levels one week after the treatment in males and females were 9.69±2.31, and 9.65±1.71respectively.

According to statistical T-test, there is no significant difference between hemoglobin levels one week before the treatment in the males and the females (P=0.92).

MCV mean levels one week after the treatment in males and females were 102.17±11.20, and 95.71±19.67respectively.

According to statistical T-test, there is no significant difference between MCV levels one week before the treatment in the males and the females (P=0.08).

PLT mean levels one week after the treatment in males and females were 157.70*10±88.15, and 170.21±157.67respectively.

According to statistical T-test, there is no significant difference between PLT levels one week before the treatment in the males and the females (P=0.67).

Table6. Comparison of laboratory findings before the treatment and one week after the treatment based on gender

Laboratory findings	Males	Females	p. value
Hemoglobin mean level	9.65±1.71	9.69±2.31	0.92
MCV mean level	95.71±19.67	102.17±11.20	0.08
PLT mean level	170.21±157.67	157.70×10±88.15	0.67

DISCUSSION AND CONCLUSION:

According to the paired samples correlations test there were significant differences between hemoglobin before and one week after treatment (p= 0.000), the MCV before and one week after treatment (p=0.000) and the PLT before and one week after treatment (p=0.000) in men. In women, there were significant differences between hemoglobin before and one week after treatment (p=0.000), the MCV before and one week after treatment (p=0.05) and the PLT before and one week after treatment (p=0.03). Also in all patients of the study there were significant differences between the hemoglobin before treatment and after treatment (p=0.000), the MCV before treatment and after treatment (p=0.000) and the PLT before treatment and after treatment (p=0.000). Aron et al. (2005) examined the laboratory effects and response to therapy in patients with vitB12deficiencyin India. In this study, the average of hemoglobin was 11.4 and the average of MCV 103.1 was Femtolitre. After treatment with vit B12, 54% of 63 patients indicated improvement effects, 14% didn't indicate any significant changes and 32% didn't indicated any recovery effects (18). Wong CW et al. In a study, concluded that low levels of vitamin B12 -less than 100pmol / L- in elderly patients causes a significant increase in macrocytosis (19). Belicia et al. found that the levels of vitamin B12 serum in patients with gastric cancer and in patients who undergo total gastrectomy compared to patients who undergo subtotal gastrectomy is very low, in contrast homocysteine levels in these patients is higher than subtotal gastrectomy group(20). Hu Y, et al concluded that this vitamin deficiency in patients receiving gastrectomy usually starts after 15 months (21). Gadgil M et al. conducted a study and concluded that that administration of B12 vitamin and folic acid during pregnancy can be effective in improving the anthropometric measures because high levels of folate to vitamin B12 caused low birth weight, head circumference and chest circumference (22). Dwarakanath P et al. found that risk of small fetus for gestational age (SGA) increases if pregnant women have low intakes of folic acid and vitamin B12 in the first trimester (23). A review article had checked vitamin B12 deficiency in vegans; the deficiency in children less than 7 years old was up to 45%, in children older than 7 years old and adolescents ranged from 0% to 33.3%, in pregnant women -considering the trimester of pregnancy- varied from 17% to 33% and in adults and the elderly it rangedfrom from 0% to 86.5%. The amount of the deficiency, especially in people who did not use meat and animal products (vegan), was more severe, therefore they concluded that these people use especially these vitamins to prevent deficiency (24). Singh K, et al. found in their study that the long-term use of metformin In diabetic patients lead to vitamin deficiency and symptoms of neuropathy caused by deficiency of vitamin B12 (25). Ko sh, et al. concluded in their study that in diabetic patients, the relative risk for Vit B12 deficiency with a daily intake of 2000-

1000 mg metformin per day and more than 2000 mg per day compared to the intake of less than 1,000 mg, was 2.52 and 3.8 respectively. The relative risk for vitamin B12 deficiency in these patients, and in those who had used metformin for 4 and 10 years and those used it more than 10 years compared to patients who consumed for less than 4 years, was 4.65 and 9.21, respectively (26). Demir N, et al. found that the most skin related Vitamin B 12 deficiencies were hyperpigmentation and atrophic glossitis that after three months of treatment, 87.7% of patients with hyperpigmentation and 97.5% of patients with atrophic glossitis were cured (27). Kalita J, et al found that in nerve biopsy of patients with vitamin B12 deficiency, axonal degeneration was early levels, chronic axonopathy and demyelination were in advanced stages of vitamin B12 deficiency. Finally they came to the conclusion that the administration of cyanocobalamin improves neuromuscular transmission, with improvement in symptoms after 6 months to (28). Semeere AS, et al. found that the prevalence of vitamin B12 deficiency is higher in HIV patients and in patients who receive ART treatment (29). Balfour A, et al. concluded that for a reduction of every 100 +CD4 cells per microliter, vitamin B 12 reduced for 21 pmol/L (30).

Conclusion:

Given that vitamin B12 have different functions in the body's cells, it seems that the screening of this vitamin deficiency in high-risk people such as the elderly, patients who have undergone gastrectomy, HIV patients, and those treated with ART, is useful to prevent diseases the deficiency causes in the body.

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