Original Article

Vitamin B12 Deficiency without Anemia in the Middle- and Old-Aged Population in Sulaymaniyah City

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Abstract

Background: In our laboratory, we received many cases of Vitamin B12 deficiency without anemia, and we observed that the deficiency is more prominent in females than males. It is well known that Vitamin B12 deficiency is usually associated with macrocytic anemia. However, the clinical importance of Vitamin B12 insufficiency without any hematological abnormality is underestimated in the Sulaymaniyah city population. Thus, the aim of this study is to assess the frequency of Vitamin B12 deficiency with normal complete blood counts (CBCs), especially in the middle- and old-aged population. **Materials and Methods:** Within the period from April 2018 to April 2019, the patients came to the Dr. Hisham Alrawi Private Laboratory for Vitamin B12 level estimation; the CBCs for all patients with Vitamin B12 deficiency have been collected. We selected patients with low-level Vitamin B12, which were 149 patients, aged 30 years and above. Normal serum Vitamin B12 value in our laboratory is 191–633 pg/ml according to the e411 Roche competitive-binding luminescence immunoassay system. CBC has been collected were done for all patients with Vitamin B12 deficiency by Orphee Mythic 18 Hematology Analyzer. **Results:** The mean of their age is 64 years, and the mean of hemoglobin (Hb) level is 12.1 g/dL, whereas the mean of Vitamin B12 level is 131.3 pg/ml. About 74 (49.6%) of them have anemia, and 75 (51.4%) are with the normal CBC parameters. The mean of the Hb in females is with the normal range (12.1 g/dL), whereas the mean of the Hb in the males is lower than the normal range (12 g/dL). **Conclusions:** Vitamin B12 deficiency is common in middle and old age in Sulaymaniyah city, especially in females. Thus, screening programs for B12 levels estimation for this age group are recommended to avoid expected complications.

Keywords: Anemia, blood analysis, Sulaymaniyah city, Vitamin B12

Introduction

Vitamin B12 (cobalamin) is essential for protein synthesis, cell proliferation, and optimal systemic function, particularly for the nervous system and blood. Moderate Vitamin B12 deficiency is common even with the normal hematological parameters.[1] Vitamin B12 is obtained only from a dietary source, and it is an essential vitamin for DNA synthesis in the body.[2]

The main causes of cobalamin deficiency are food-cobalamin malabsorption (53%), pernicious anemia (33%), insufficient nutritional Vitamin B12 intake (2%), and postsurgical malabsorption (1%).[3] Vitamin B12 deficiency is well known as a cause of megaloblastic anemia and peripheral neuropathy, especially in the elderly patients.[4]

Several studies showed that 3%–5% of the population has a Vitamin B12 deficiency. Sometimes, peripheral neuropathy symptoms may appear before megaloblastic anemia, and the frequency of this medical problem is not estimated well in the Sulaymaniyah city population whether at middle or old age.[5]

The total Vitamin B12 measurement is still the method of choice for Vitamin B12 deficiency evaluation in spite of limitations in the sensitivity and specificity for this test. Clinical signs of Vitamin B12 deficiency can be seen in people with Vitamin B12 concentrations within the reference range.[6]

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In general, there are a significant number of cases with Vitamin B12 deficiency with normal complete blood count (CBC), especially in females.[7] For that purpose, we designed this study to estimate the Vitamin B12 deficiency of these cases which might be helpful to increase the awareness of the physicians and the neurologists in this city about the importance of early diagnosis of Vitamin B12 deficiency to avoid any complications that may be hard to deal with in the late diagnosis, although holoTC concentration for B12 deficiency estimation is not available in our laboratory, which is considered as the earliest marker for B12 store deficiency.

Materials and Methods

Study design

In our laboratory, we have observed a significant number of cases with Vitamin B12 deficiency with normal CBC, especially in females; thus, we reviewed all the results of Vitamin B12 tests which were ordered for patients in our laboratory from April 2018 to April 2019, and we selected patients with low-level Vitamin B12. Normal serum Vitamin B12 value in our laboratory is 191–633 pg/ml according to the e411 Roche competitive-binding luminescence immunoassay system.[8] CBC has been done for all patients with Vitamin B12 deficiency by Orphee Mythic 18 Hematology Analyzer (ORPHEE MEDICAL, Przeźmierowo, Poland).

Ethical consideration

The study was conducted in accordance with the ethical principles that have their origin in the Declaration of Helsinki. It was carried out with patients' verbal and analytical approval before the sample was taken. The study protocol and the subject information and consent form were reviewed and approved by a local ethics committee.

Statistical analysis

The data were automatically analyzed by the machines, and we only used Microsoft Excel to determine the percentages.

Results

During this study, a total of 149 patients with Vitamin B12 deficiency have been selected, and CBC was done for all of them. The mean of their age is 64 years, and the mean of hemoglobin (Hb) level was 12.1 g/dL, whereas the mean of Vitamin B12 level was 131.3 pg/ml [Table 1]. The mean of the Hb in females was with the normal range 12.1 g/dL [Table 2], whereas the mean of the Hb in males was lower than the normal range, 12 g/dL [Table 3]. We found that 74 (49.6%) of them were with anemia, and 75 (51.4%) were with the normal CBC parameters. The statistical correlation between anemic patients and non anemic patients with B12 deficiency is also shown in Table 4.

Discussion

The majority of Vitamin B12 deficient patients with anemia were female in middle- to old-aged patient group. The worldwide prevalence of Vitamin B12 deficiency is not certainly known.[9] The prevalence is also not known in our locality, but this study shows that Vitamin B12 deficiency is common, especially without anemia. The mean of the age in the males in this study is higher than females, and this difference could explain that the higher frequency of anemia in females is due to the age rather than the Vitamin B12 deficiency. The mean corpuscular volume value in the anemic patients in this study was within the normal range, and this is another indication that the anemia is mostly due to aging or due to the systemic illness rather than the Vitamin B12 deficiency. With absence of anemia and probably other symptoms in a significant number of patients with Vitamin B12 deficiency as shown in this study and others, the question which needs to be answered here and in other places is whether we need to do a screening program for Vitamin B12 deficiency for middle- and old age groups, especially for females as far as the frequency of anemia is low. Currently, there are no published screening asymptomatic adult guidelines for Vitamin B12 deficiency.[10]

Conclusions

This is the first study to address the associated Vitamin B12 deficiency in Sulaymaniyah City, Northern Iraq, with the mean range of 131.3 pg/ml. The study demonstrated that the prevalence of Vitamin B12 deficiency in females is associated with normal Hb level, whereas associated with abnormal levels of Hb in males.

Recommendation

According to this study, the Vitamin B12 estimation screening program for middle- and old-aged females is recommended for early detection to avoid many Vitamin B12 deficiency-related sequels that may occur in this asymptomatic group. This screening

Table 1: Analyzed data for hematological parameters and Vitamin B12 in selected patients

Calculation	Parameter								
Total (n=149)	Age	RDW	MCHC	MCH	MCV	HCT	Hb	RBC	B12
Mean	64.286	13.145	32.714	26.939	83.837	36.837	12.165	4.465	131.357
Median	70.000	12.800	33.000	27.000	83.000	39.000	12.800	4.700	135.000
SD	16.1684	1.6716	1.3385	2.0454	7.6058	5.2652	1.7334	0.7809	37.7731
Minimum	31.0	11.0	29.0	20.0	70.0	17.0	6.3	1.5	55.3
Maximum	100.0	19.9	36.0	32.0	113.0	44.0	14.7	5.5	189.1

SD: Standard deviation, RDW: Red cell distribution width, MCHC: mean corpuscular hemoglobin concentration, MCH: Mean corpuscular hemoglobin, MCV: Mean corpuscular volume, HCT: Hematocrit, Hb: Hemoglobin, RBC: Red blood cells

Table 2: Analyzed data for hematological parameters and Vitamin B12 in female patients

Calculation	Parameters								
Female (n=70)	Age	RDW	MCHC	MCH	MCV	HCT	Hb	RBC	B12
Mean	52.300	13.595	32.350	25.900	80.450	36.600	12.030	4.575	127.865
Median	49.000	12.950	33.000	27.000	82.000	38.000	12.250	4.550	134.400
SD	13.3539	2.2696	1.3089	2.1497	4.7292	3.6187	1.6000	0.4077	35.6759
Minimum	31.0	11.6	29.0	20.0	70.0	28.0	8.1	3.9	60.3
Maximum	78.0	19.9	34.0	28.0	86.0	40.0	13.6	5.2	185.1

SD: Standard deviation, RDW: Red cell distribution width, MCHC: mean corpuscular hemoglobin concentration, MCH: Mean corpuscular hemoglobin, MCV: Mean corpuscular volume, HCT: Hematocrit, Hb: Hemoglobin, RBC: Red blood cells

Table 3: Analyzed data for hematological parameters and Vitamin B12 in male patients

Calculation	Parameter								
Male (n=79)	Age	RDW	MCHC	MCH	MCV	HCT	Hb	RBC	B12
Mean	72.552	12.834	32.966	27.655	86.172	37.000	12.259	4.390	133.766
Median	75.000	12.700	33.000	28.000	83.000	39.000	12.800	4.700	143.000
SD	12.3998	1.0248	1.3224	1.6535	8.3754	6.2106	1.8417	0.9582	39.5925
Minimum	45.0	11.0	30.0	23.0	71.0	17.0	6.3	1.5	55.3
Maximum	100.0	15.8	36.0	32.0	113.0	44.0	14.7	5.5	189.1

SD: Standard deviation, RDW: Red cell distribution width, MCHC: mean corpuscular hemoglobin concentration, MCH: Mean corpuscular hemoglobin, MCV: Mean corpuscular volume, HCT: Hematocrit, Hb: Hemoglobin, RBC: Red blood cells

Table 4: Shows significant correlation between the anemic patients and non anemic patients with B12 deficiency

Group Statistics						
	HCT	N	Mean	Std. Deviation	Std. Error Mean	p-value
B12	<41% men <37 women	81	131.624	39.3254	6.3794	0.316
	41 - 51% men 37- 48% women	68	130.436	33.5478	10.1150	
Group Statistics						
	Hb	N	Mean	Std. Deviation	Std. Error Mean	p-value
B12	<13.0 g/100ml men <12.0 g/100ml women	74	127.588	44.1577	9.0137	0.015
	13.0 - 17.2 g/100 ml men 12.0-15.6 g/100ml women	75	134.976	30.9370	6.1874	
Group Statistics						
	RBC	N	Mean	Std. Deviation	Std. Error Mean	p-value
B12	<4.4 million/ml men <3.9 million/ml women	59	122.611	46.9264	15.6421	0.199
	4.4-5.8 million/ml men 3.9-5.2 million/ml women	90	133.325	35.8153	5.6629	
	MCV	N	Mean	Std. Deviation	Std. Error	p-value
B12	<80 fl	17	148.100	15.3601	5.8056	0.146
	80 - 94 fl	120	130.520	39.2549	6.2067	
	>94 fl	12	89.500	38.4666	27.2000	

program may be extended to all of the results which show a significant number of asymptomatic patients with Vitamin B12 deficiency, especially for old age.

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Conflicts of interest

There are no conflicts of interest.

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