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IMPACT OF DIABETIC MELLITUS ON VITAMIN B12 LEVEL AND COMPLETE BLOOD COUNT IN SUDANESE PATIENTS IN SHENDI LOCALITY

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ABSTRACT
Vitamin B12 deficiency is a common condition which can present with non-specific clinical features, and in severe cases with neurological or haematological abnormalities. This study was carried out to evaluate B12 and CBC in diabetic patients living in Shendi locality. Blood samples were collected from thirty (30) diabetic patients as case group and fourteen (14) healthy subjects as control group were obtained and the study conducted from May to August 2018. The study found statistically significant difference of mean serum concentration of B12 in the case group (384.2pg/ml) and the control group (594.5pg/ml) with *P*.value of (0.000). Hemoglobin in diabetics found to be higher in males than females with *P*. value of (0.03). B12 level is higher in those living in rural area, with a significant variation with *P*. value of (0.01). The study concluded that the B12 significantly decreased in diabetic patients.

KEYWORDS: Diabetes mellitus, B12. CBC, hemoglobin.

INTRODUCTION AND LITERATURE REVIEW
Vitamin B12 deficiency is classically presented as pernicious anaemia, which now accounts for a minority of cases. Vitamin B12 deficiency occurs most often due to food-bound cobalamin malabsorption.[1]

Vitamin B12 (Cobalamin) is a nutrient that helps keep the body's nerve and blood cells healthy and helps make DNA.[2] Adults need only 2.4 micrograms of vitamin B12 each day. Vitamin B12 is found only in foods made from animal products.[3] It is also available from nutritionally fortified yeast, fortified vegetarian foods, such as soy milk, although it is not found in brewer's yeast. It is also synthesizes by bacteria in the colon.[4]

Vitamin B12 is needed for the formation of red blood cells, as well as for DNA synthesis. Lack of vitamin B12 or folate can lead to the production of large, immature, hemoglobin-poor red blood cells, a clinical condition Known as pernicious anemia.[4]

Deficiency of vitamin B12 is also associated with increased levels of methylmalonate and propionate, leading to synthesis of abnormal myelin lipids with consequent myelin degeneration and neurological abnormalities.[5]

Other function of vitamin B12 is the conversion of homocysteine to methionine.[4]

Vitamin B12 is absorbed by two mechanisms—active and passive. About 75% of vitamin B12 in the food is absorbed by active mechanism, which requires the presence of intrinsic factor (IF). In passive mechanism, absorption occurs by diffusion and works when pharmacologic doses of vitamin B12 are ingested; only about 1% of this amount is absorbed by diffusion. After entering into the stomach, vitamin B12 is freed from proteins by the action of pepsin. The vitamin B12-binding proteins are known as R binders and are present in body fluids. Initially vitamin B12 attaches to R-binder to form R-B12 complex. Free B12 then binds to intrinsic factor to form IF-B12 complex.[5]

There are three vitamin B12-binding proteins in plasma are transcobalamin I (TC I), Transcobalamin II (TC II), and transcobalamin III (TC III).[5]

The total amount of vitamin B_{12} stored in the body is (2 to 5 mg) which is adequate for 3 years. The major site of storage is the liver.[5]

Vitamin B_{12} is excreted through the bile and shedding of intestinal epithelial cells. Most of the excreted vitamin

B_{12} is back absorbed in the intestine (enterohepatic circulation).[5]

Deficiency of vitamin B12 is not usually from lack of intake, but rather from lack of absorption. Lack of intrinsic factor can also prevent absorption.[4]

It may take several years to develop deficiency symptoms as vitamin B12 is efficiently recycled. Whether the deficiency is from poor absorption or from a diet low in animal products, onset of symptoms is typically slow.[4]

Folate cannot be properly utilized if vitamin B12 persists. This is because vitamin B12 is needed to convert methyl folate to its active form teterahydrofolate.. If folate or vitamin B12 is absent, symptoms of folate anemia can be present. Folate anemia causes slowed DNA synthesis, which shows up first as defective red blood cells.[4]

Neurological manifestations of vitamin B12 deficiency first presented as paralysis in the extremities..[4]

The causes of vitamin B12 deficiency are dietary deficits**,** which occur in the elderly, chronic alcoholics and vegans[**,** malabsorption syndromes as result of an autoimmune disease.[6]

Several other forms of neuropathy may mimic the findings in diabetic sensory neuropathy and mononeuropathy. Chronic inflammatory polyneuropathy, vitamin B12 deficiency.[7] [8].

Rationale of the study

Diabetes is the fourth most common cause of death in the developed world. Patients with both type 1 and type 2 diabetes are at high risk for the development of chronic complications which may lead to develop anaemia by affecting the level of vitamin B12.

Vitamins deficiency is a common problem worldwide, with vitamin B12 deficiency being recognized as a health concern nearly 100 years ago. This study would help filling the existence gap in knowledge for better management of diabetes.

OBJECTIVES

The general objective: of the current study is evalute vitamin B12 level and the CBC among Diabetes Mellitus the study population.

MATERIALS AND METHOD

This was case control prospective study, conducted in Shendi locality from May to August 2018. It included thirty (30) diabetic patients as case group and fourteen (14) healthy subjects as control group.

Structural questionnaire was used for collection of study population data,

Venous blood sample were collected from each participants.

Any subject with condition that might affect the concentration of vitamin B12 such as pregnancy, anemia, B12 supplementation and liver disease were excluded from the study population.

Complete blood count (CBC) was carried out BY the Mindray_bC3000 hematology automated analyzer**.** Vitamin B12 concentration was measured by TOSOH Bioscience AIA 600.using standard method ad reagents.

Data analysis

All collected data was analyzed using SPSS for windows, version 16, Pearson Chi-Square test was used for categorical data with p value ≤ 0.05 as significant. Analysis of variance (ANOVA) was used for continuous data and the statistical results were presented as means ± SD.

Ethical clearance

Ethical approval for the study was obtained from the Board of the Faculty of Graduates Studies and Scientific Research in Shendi University. Verbal informed consent for participation in the study was obtained from each participant before recruitment into the study.

RESULTS

Table (1): The Means of B12 in Cases and Control.

B123	Number	Mean(pg\ml)	*P*. value
Case	30	384.2±152.5	0.000
Control	14	594.5±132.2	

Table (2): The Mean of B12,Hb, MCV and MCH according to Gender in Diabetic Patients.

Gender	Number	B12	Hb	MCV	MCH
Male	12	414.8	13.3	91.6	28.1
Female	18	437.9	12.2	90.3	27.5
***P*. value**		0.7	0.03	0.5	0.3

Table (3): The mean of B12, Hb, MCV and MCH of Diabetic patients.

Area	Number	B12	Hb	MCV	MCH
City	13	340.7	12.8	91.7	28.5
Rural	17	495.9	12.5	90.2	27.2
***P*. value**		0.01	0.5	0.4	0.07

Table (4): The Mean of B12, Hb, MCV and MCH according to the Duration of diabetes Mellitus.

Duration of DM in years	Number	B12	Hb	MCV	MCH
Less than 4	12	419.9	12.2	89.1	27.7
4-7	9	434.3	12.7	92.5	27.9
More than 7	9	434.7	13.1	91.5	27.6
P. value		0.9	0.3	0.3	0.9

Table (5): The Mean of B12,Hb, Mcv, Mch According To Type of Treatment In Diabetic Patients.

Type of Treatment	Number	Mean	Hb	MCV	MCH
Insulin	12	483	12	90.2	27.3
Metformin	4	379.2	12.3	91.2	27.6
Insulin And Metformin	2	446.5	13.7	98.9	30.5
Others	3	349	14.2	92.8	28.8
metformin and others	5	477	13.2	86.5	26.2
None	5	305.5	12.5	92.4	29
P. value		0.5	0.1	0.05	0.04

Table (6): The Correlation of B12, Hb, MCV and MCH with Body Mass Index in Diabetic Patients.

	B12	Hb	MCV	MCH
BMI Pearson Correlation	0.118	0.218	-0.139	0.024
***P*. value**	(0.118)	(0.247)	(0.464)	(0.899)

DISCUSSION

The present study intended to evaluate the level of B12 in Sudanese diabetic patients in Shendi locality in River Nile state in Northern Sudan.

The study found the mean serum concentration of B12 in case group was (384.2pg/ml) compared to (594.5pg/ml) of control group with *P*. value of (0.000) as in table (1), which indicated a significant reduction in B12 level in diabetic patients, this result agreed with findings obtained by Davis Kibirige and Raymond Mwebaze in 2013, who concluded that vitamin B12 deficiency is highly prevalent among Diabetic patients.[9]

The Mean concentration of B12 pg, Hb g/dl, MCV fl and MCH pg were in Male (414.8, 13.3, 91.6, 28.1) compared to Female (437.9, 12.2, 90.3, 27.5) in female patients respectively). There was statistically insignificant difference of vitamin B12 as regard to the gender as in table (2) with *P*. value of (0.70).

According to residents of diabetic patients the mean of B12, Hb, MCV and MCH for those live in Shendi town and represented (43%) of the case group were (340.7,12.8, 91.7, 28.5), compared to those living in rural areas and represented (57%) of the case group (495.9,12.5, 90.2,27.2) respectively. The result is insignificant in all except B12 mean concentration, which was lower in patients living in the city with *P*. value of (0.01) as depicted in table (3). This findings can be attributed to relatively nutrients rich food items available at rural areas as opposed to those calories dense food items in the urban.

Analysis of data showed statically insignificant difference in the mean concentration of B12, Hb, MCV, MCH in relation to the duration of diabetes as appeared in table (4).

The MCV was significantly higher with *P*. value of (0.05) in patients who are using Insulin and Metformin as shown in table (5).

There was no correlation between body mass index and the level of B12, Hb, MCV and MCH as depicted in table (6).

CONCLUSION

There were significant reduction in B12 level in diabetic patients compared to healthy control group, with higher Hb concentration in male diabetic patients. The B12 level was lower in patients who living in Shendi town compared to those living in rural areas. The duration of Diabetes Mellitus had no effect on B12 level.

Recommendations

According to the findings of the current study, it could be recommended that nutritional counseling and B12 supplementations should be considered for every diabetic patients.

REFERENCES

1. Shipton, M.J. and J. Thachil, *Vitamin B12 deficiency–A 21st century perspective.* Clinical Medicine, 2015; 15(2): 145-150.
2. Michal, G., *Biochemical pathways: an atlas of biochemistry and molecular biology. 1999*, New York Heidelberg: Wiley.
3. Murphy, S.P. and L.H. Allen, *Nutritional importance of animal source foods.* The Journal of nutrition, 2003; 133(11): 3932S-3935S.
4. Blake, S., *Vitamins and minerals demystified*, 2008: McGraw-Hill.

5. Kawthalkar, S.M., *Essentials of haematology*, 2012: JP Medical Ltd.
6. Smith, P., *Vitamin B12 Deficiency: Causes, Evaluation and Treatment.*
7. Amanullah, D.M., *MEDICAL BIOCHEMISTRY AND BIOTECHNOLOGY*. 14th March, 2012.
8. Fowler, M.J., *Microvascular and macrovascular complications of diabetes.* Clinical diabetes, 2008; 26(2): 77-82.
9. Kibirige, D. and R. Mwebaze, *Vitamin B12 deficiency among patients with diabetes mellitus: is routine screening and supplementation justified?* Journal of Diabetes & Metabolic Disorders, 2013; 12(1): 17.