



iJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 6 Issue: VII Month of publication: July 2018

DOI: <http://doi.org/10.22214/ijraset.2018.7030>

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Frequency of Vitamin B₁₂ Deficiency in apparently Healthy Elderly in Sudan

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Abstract:

Background

Vitamin B12 is one of the important vitamins in human body, its store in liver and mainly can be obtained from animal resource food, so vegetarians always should have replacement as it role in cell formation and nerves as well. Decreased B12 absorption could be due to malabsorption which occurs with pancreatic insufficient and courseany surgery, intestinal disease and trophic gastritis, which increases with so that is why elder populations normally develop low absorption and decline in many organs function with time, so this study aimed to evaluate B12 status among apparently healthy elder people in Khartoum-Sudan.

Material and method

Apparently health elderly 100 subjects voluntarily enrolled and gave permission of blood collection and measuring of plasma level of B12 by means of chemiluminescent immunoassay (CLIA) . Hemoglobin (Hb) concentration also measured in the process by means of hematology analyzer Mindray BC300.

Result

The data obtained, revealed that B12 inversely correlated with age and there was no different in its levels according to gender.

Conclusion

So apparent healthy could be deceptive as B12 level low didn't present with obvious symptoms yet or missed, it recommended to set routine analysis for elder population include B12 and replacement for low level to avoid predicted damage due to its deficiency in the body.

Keyword: B12, Sudan, Hb, of chemiluminescent immunoassay, CLIA

I. INTRODUCTION

Vitamin B12 is a water-soluble vitamin that is naturally present in some foods, added to others, and available as a dietary supplement and a prescription medication. Vitamin B12 exists in several forms and contains the mineral cobalt ^{1,2}, so compounds with vitamin B12 activity are collectively called “cobalamins”. Methylcobalamin and 5-deoxyadenosylcobalamin are the forms of vitamin B12 that are active in human metabolism³. It is a dietary essential⁴, required for proper red blood cell formation, neurological function, and DNA synthesis ¹⁻³. Vitamin B12 functions as a cofactor for methionine synthase and L-methylmalonyl-CoA mutase. Methionine synthase catalyzes the conversion of homocysteine to methionine ³⁻⁵. Methionine is required for the formation of S-adenosylmethionine, a universal methyl donor for almost 100 different substrates, including DNA, RNA, hormones, proteins, and lipids. L-methylmalonyl-CoA mutase converts L-methylmalonyl-CoA to succinyl-CoA in the degradation of propionate ^{3-5,6}. A deficiency of vitamin B12 impairs DNA synthesis in any cell in which chromosomal replication and division are taking place ⁷. Vitamin B12 (cobalamin) deficiencies are no longer a rare disease but a relatively common disease, whose prevalence increases with aging⁸⁻⁹ 3-4. Vitamin B12 deficiency is a common problem worldwide, 5 an early sign of deficiency of these vitamins is megaloblastic anemia. The main storage site for vitamin B12 is the liver. Deficiencies in vitamin B12 can occur due to the lack of intrinsic factor (pernicious anemia), malabsorption of vitamin B12, deficiencies in the diet, or metabolism of vitamin B12 by intestinal parasites. The diagnosis of vitamin B12 deficiency is confirmed by a low plasma concentration of this vitamin. Prompt replacement of vitamin B12 is indicated in patients who are found to be deficient ⁷. Vitamin B12 deficiency symptoms include fatigue, weakness, constipation, loss of appetite, and weight loss beside anemia ¹⁻⁶⁻¹⁰. Neurological changes, such as numbness and tingling in the hands and feet, can also occur ³⁻¹¹, also difficulty maintaining balance, depression, confusion, dementia, poor memory, and soreness of the mouth or tongue ¹². The neurological symptoms of vitamin B12 deficiency can occur without anemia, so early diagnosis and intervention is important to avoid irreversible damage ⁵. In higher-income countries, the

major risk factor for developing B12 deficiency is the well-characterized autoimmune disease ¹³⁻¹⁴⁻¹⁵. In addition, important risk factors are gastrointestinal surgery, such as gastric bypass or removal of the terminal ileum, which compromise the absorption of B12. In low-income countries, B12 deficiency is largely due to a low intake of B12 rich foods of animal origin, but possibly also to gastrointestinal infections and infestations, and host-microbiota interactions¹⁶. Contributing risk factors include *Helicobacter pylori* infection, intestinal bacterial overgrowth, poor food intake, alcoholism, smoking and long-term use of drugs, such as proton pump inhibitors, histamine H2 receptor antagonists and metformin. Various disorders, including malaria, HIV infection and tuberculosis ¹⁷.

Nutrition is an important determinant of health in elderly patients. Over the past decade, the importance of nutritional status has been increasingly recognized in a variety of morbid conditions including cancer, heart disease, and dementia in persons over the age of 65 ¹⁸⁻¹⁹⁻²⁰⁻²¹⁻²², there is no uniformly accepted definition of malnutrition in the elderly but some common indicators include involuntary weight loss, abnormal body mass index, specific vitamin deficiencies, and decreased dietary intake ²³. Malnutrition in older patients is regularly underdiagnosed ²⁴.

II. MATERIAL AND METHOD

This cross sectional study enrolled among one hundred (100) elderly subjects, who were apparently healthy, whole blood samples were collected under hygienic conditions in ethylene diamine tetra acetic acid (EDTA) for Hb measurement, which conducted by means of hematology analyzer Mindray BC 300, which works with principle of electric impedance and light scatter. And heparinized blood containers, plasma later collected and preserved at -20C⁰ till time of analysis, which performed at Alneelain University-faculty of medical laboratory science by means of chemiluminescent immunoassay (CLIA), which is a competitive binding immunoassay with automated sample pretreatment to determine the level of B12, chemiluminescence immunoanalyzer and analysis conducted according to the manufacturer (Mindray trademark-China). Data analysis was conducted using statistical package of social science (SPSS) program version 21.

III. RESULT

100 elderly subjects were involved in this study, their age mean \pm SD was 71.7 \pm 6.92 years, they were 66 male and 34 females, hemoglobin concentration mean \pm SD was 11.39 \pm 2.26g/dl as in table 1

Table (1) mean of age and Hb among study group

Variables	Minimum	Maximum	Mean \pm SD
Age	60.00	89.00	71.7 \pm 6.92
Hb	4.00	15.70	11.39 \pm 2.26

Considering normal range of B12, 56 % of subjects presented normal levels of B12, while 44% were considered at deficient level of B12 as in table 2

Table (2) prevalence of B12 deficiency among study group

Variable	Frequency	Percentage (%)
Normal	56	56.0
Deficiency	44	44.0
Total	100	100.0

Gender distribution for B12 levels, 36 (54%) of males were with normal levels and 30 (45%) were with deficient levels, females were 20 (58.8%) normal levels and 14 (41.2%) with deficiency of B12 as in table 3.

Table (3) distribution of B12 deficiency in older subject according to gender

Gender	B12 Status		Total
	Normal	Deficiency	
Male	36 (54.5%)	30 (45.5%)	66 (100.0%)
Female	20 (58.8%)	14 (41.2%)	34 (100.0%)
Total	56 (56.0%)	44 (44.0%)	100 (100.0%)
P-value	0.424		

Elder subjects were sorted to age range 60-75 years (75 subjects), 48 of them with normal levels of B12 and 27 subjects with deficient and 76-90 years (25 subjects), 8 have normal B12 level and 17 with deficiency levels. As in table 4

Table (4) distribution of B12 deficiency in older subject according to age

Age	B12 Status		Total
	Normal	Deficiency	
60-75 Years	48 (48.0%)	27 (27.0%)	75 (75.0%)
76-90 Years	8 (8.0%)	17 (17.0%)	25 (25.0%)
Total	56 (56.0%)	44 (44.0%)	100 (100.0%)
P-value	0.005		

Comparison levels of B12 among male and females elderly people did not give a significant difference as in table 5

Table (5): comparison of B12 levels among genders

Gender	Mean±SD	P-value
Male	181.53±24.79	0.916
Female	182.29±48.79	

Significant difference p value <0.05

B12 level, when compared between age ranges, 60 -70 years and more than 70 years, it brought significant difference as p value was 0.007 as in table 6

Table (6): range of elder age comparison

Age	Mean±SD	P-value
60-70 Years	191.24±36.05	0.007
More than 70 Years	172.71±30.83	

Significant difference p value <0.05

Considering hemoglobin concentration among elders, they divided to 3 levels, all of them presented with normal mean of B 12 levels and no significant difference obtained as in table 7.

Table (7): levels of Hb and B12 concentration among elders.

Hb	Mean±SD	P-value
4-9 g/dl	185.25±18.11	
9-12 g/dl	182.45±29.02	0.901
>12 g/dl	193.80±57.27	0.715

Significant difference p value <0.05

Correlation of Hb and age, revealed a negative one, as with aging, levels of hemoglobin decline , R= -0.102 and no significant difference as p value > than 0.05, as in figure 1.

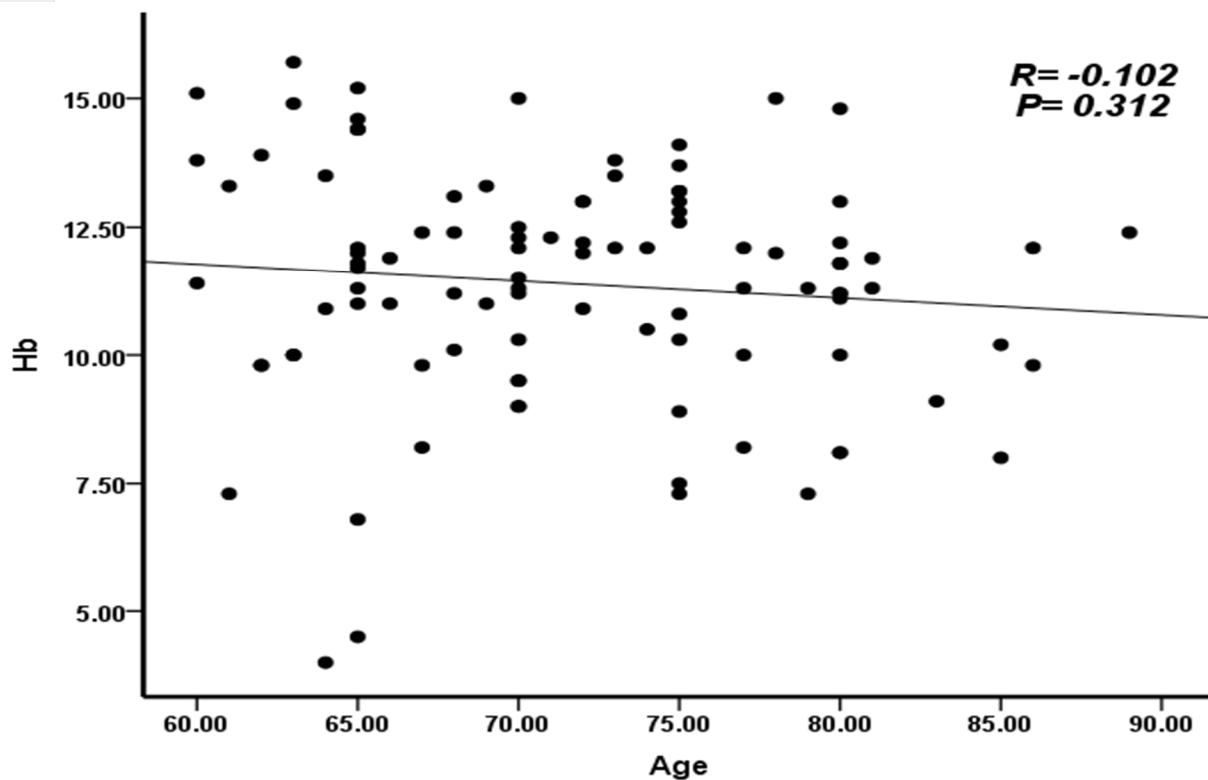


Figure (1) correlation between age and Hb level

Consider age of subjects, B12 level was inversely correlated with age ($R = -0.412$, P -value 0.002) this indicates that an increasing in age will lead to decrease in B12 level as in figure 2

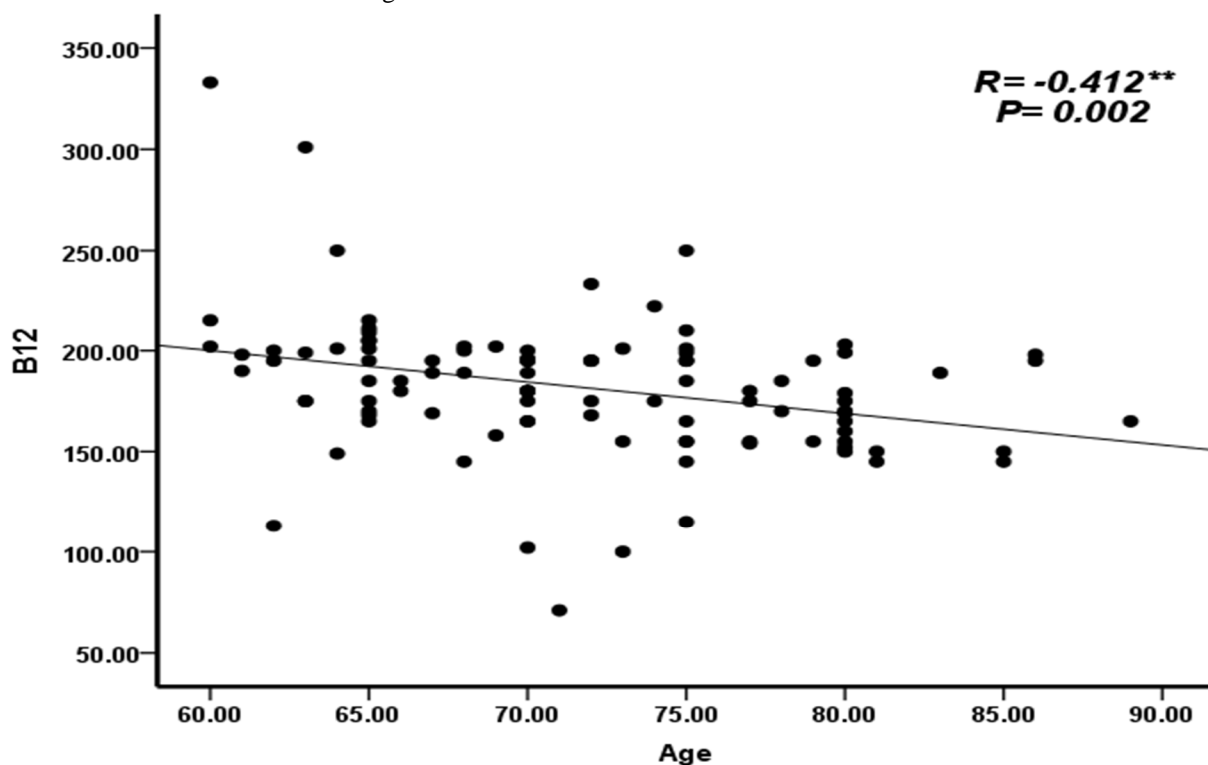


Figure (2) correlation between age and b12 level

Positive correlation obtained between B12 level and hemoglobin levels as in figure 3

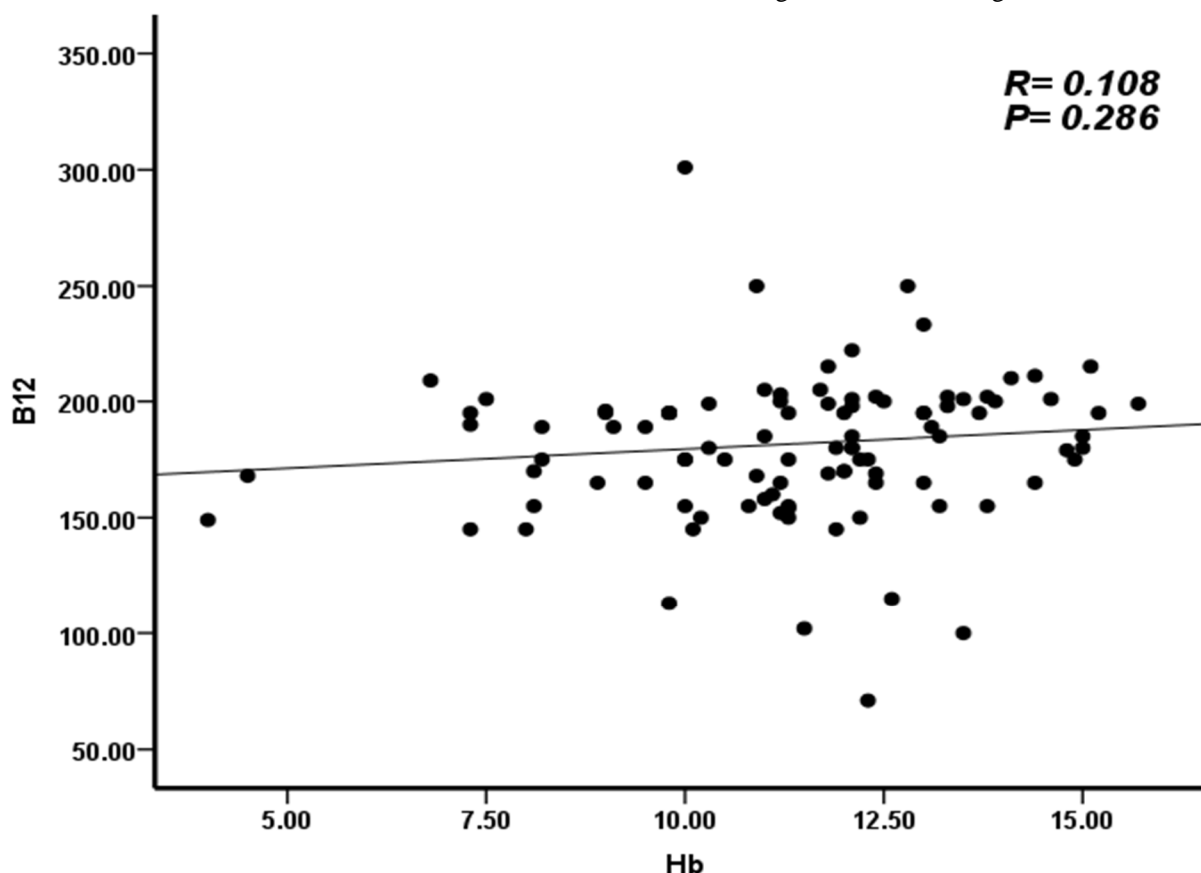


Figure (3) correlation between Hb and b12 level

IV. DISCUSSION

This study was conducted to assess vitamin B12 among apparently healthy elderly individuals in order to evaluate their health status though B12 levels, even with absence of symptoms specific to deficiency if it occurs. Around the world the elder people always under focus to maintain them healthy to live long enough without complication of aging, nutritional side always a gate to achieve that goal, as with aging, subjects normally tend to lose their appetites and normal physiological functions in body systems. Study in new Mexico involved. Equal numbers of male and female were healthy elder population, who were voluntarily enrolled and they were assessed for vitamin B12 level, which was low among male than females and no signs or symptoms of B12 deficiency were presented though ²⁵, these partially in agreement with our study, goal and process, but differs in findings of B12 levels among males and females, as no significant difference was obtained. In this study also low B12 found among 44% of involved elder subjects, and 54% were presented normal levels of B12, these in agreement of an Australian study concerned about elder health and assessed B12 among other parameters, low serum B12 was found in 22.9% ²⁶. Considering life cycle, B12 levels differs thought this study, as age sorting to range of 60-70 years and above 70 years brought significant difference, which in agreement of the review conducted concerned about old adults and vitamin B12 concentrations, it revealed the difference of levels among difference life cycle ²⁷. Age and B12 levels were reversely correlated in this study, which in agreement of study conducted though subjects ranged between 22 and 93 years, the lowest levels of vitamin B12 found the elder contributors of the study ²⁸. Hemoglobin level positively correlated vitamin B12 levels, this similar of findings of many studies as well ²⁹⁻³⁰.

V. CONCLUSION AND RECOMMENDATION

Apparently health status can't be exclude low levels of vitamin B12 and more concern about elder population should be a base plan to maintain them healthy as much as it could be achieved to avoid extra suffering beside the physiological changes bound to aging though time.

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