

Research article



Study of the Relationship of Vitamins B12 Deficiency and Effect on Children

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Abstract | The term “vitamin B12” refers to a particular class of cobalt-containing corrinoids that have biological activity in humans. Cobalamins are another name for this class of corrinoids that are biologically active. The commercially available version of vitamin B12 used in food supplements and food fortification is called cyanocobalamin. The primary cobalamins found in foods are hydroxo-, methyl-, and 5'-deoxyadenosyl-cobalamins. Some processed foods may include sulphotocobalamin, which has a sulphite ligand chelated to the central cobalt atom in the corrin ring. Methods: There were 30 sick children and 30 healthy children among the pediatric patients that were admitted to the hospital throughout a 4-month period (April 2022 to July 2022). Each patient's case information was collected and recorded. Whereas the results of the peripheral smear were used to identify vitamin insufficiency. levels, leukocyte in complete blood count, hemoglobin (Hb), mean erythrocyte volume (MCV), platelet values, ferritin, Results: We believe it would be acceptable to check the vitamin B12 levels in kids clinics with unidentified neurological, respiratory, gastrointestinal, or cardiac problems. Conclusion: The findings demonstrated that children with vitamin B12 deficiencies, particularly young children, had poor motor development, which is a significant issue that most children experience. As there is a strong correlation between them, it also causes anemia, poor motor development, and severe nerve damage. This disease has been seen to spread in low-income countries where the majority of children are malnourished and vitamin B12 is required to create red blood cells and participate in the synthesis of RNA that is deficient.

Keywords: Vitamin B12 deficiency. White blood cell (WBC).

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INTRODUCTION

A child normally gains about 5 pounds in weight and two to three inches in height from the time they are one year old until they reach adolescence. Children during this time spontaneously alter their dietary intake to match during periods of rapid growth they consume more food. Than during slow periods and during periods of rapid growth they appear to be voracious at times, but not always they appear to survive on water and air growing steadily as a youngster involves gradually the demand for all vitamins and minerals is rising. Unfortunately, some time children's food lacks essential nutrients diets are occasionally and not usually regularly absolutely unhealthy (Van et al., 2021).

Cobalamin, often known as vitamin B12, is a water-soluble vitamin that is necessary for the body to synthesize both DNA and RNA. Both erythropoiesis and the myelination of the central nervous system depend on it. Since the body cannot generate it, the food must contain it. Only foods with an animal origin have enough of this vitamin (Riggs et al., 1996).

One of the most prevalent vitamin deficiencies is a vitamin B12 insufficiency. It occurs more frequently in underdeveloped nations. In fact, 40% of children are affected by it. The deficiency can happen at any age, especially in people who need high nutritional intake. It could be caused by a flaw in intracellular usage, an anomaly in its absorption, or a lack of intake (Dror and Allen, 2008).

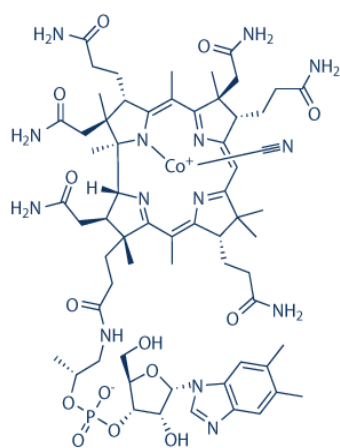


Figure 1: Structure of vitamin B12

Water -soluble B-complex vitamin called biotin aids in the body's metabolization of proteins and the breakdown of glucose. Vitamin B7 or vitamin H is other names for biotin (Bailey et al., 1994).

The human body can benefit from biotin in many ways, including lowering cholesterol, controlling blood sugar, improving skin health, and strengthening hair and nail (Craig, 2009).

Cobalamin, also known as vitamin B12 (vitB12), is essential for the production of DNA, hematopoiesis, and myelination. Thus, vitamin B12 insufficiency results in a variety of symptoms, including megaloblastic anemia, pancytopenia, neurologic symptoms, or anemia. Although it could be severe B12 deficiency can manifest without any symptoms. The creation and repair of genetic DNA, the production of red blood cells and nerve cells, as well as the maintenance of healthy hair, skin, and nails are all made possible by vitamin B12 (Umasanker et al., 2020).

It contributes by generating energy from carbs, supporting healthy neuron function, balancing appetite, encouraging development, and maintaining excellent muscular tone. Additionally, it affects how electrolytes enter and exit muscle and nerve cells. Specific enzymes, thiamine phosphotransferase, quickly convert thiamin to its active form, thiamin pyrophosphate (TPP), in the brain and liver (Jain et al., 2015).

In addition to preventing difficulties in the neurological system, brain, muscles, heart, stomach, and intestines, vitamin B12 aids in the body's production of the primary energy-carrying molecule ATP. Additionally it affects how electrolytes enter and exit muscle and nerve cells (Kirik and Catrak 2021).

Table 1: lists the daily recommended intakes of each B vitamin in milligrams (mg) or micrograms (mcg) (mg)

Vitamins	Intake for adults and children ages
Thiamin (B1)	1.2 mg
Pyridoxine (B6)	1.7 mg
Cobalamin (B12)	2.4 mcg

METHODS

Samples were taken from 30 child boys and girls with vitamin deficiencies, whose ages ranged from 5 to 15 years. Along with weakness, loss of appetite, stunted development, uncontrollable movements, and other symptoms of vitamin B12 deficiency, such as delayed speech, difficulty interacting with others, tremor, seizures, behavioral issues, and other symptoms that have been identified. It was the period of work 4 months period (April 2022 to July 2022). The children were divided into two groups according to age. The first group ranges from boys and girls between 5 -10 years of age, and the second group is between 10 -14 years old, The results were compared with the normal ones, whose ages also ranged from 5-10 years and 10-14 for both sexes boys and girls for a period of., taking into account the need to diagnose the symptoms of vitamin deficiency. Meanwhile, a B12 deficit was identified. Additionally, measurements were made of ferritin, hemoglobin, white blood cells, and platelets in both sexes and in both sick and healthy children. 1.5 ml of venous blood was taken in to Complete blood counts (CBC), peripheral smears, and serum vitamin B12 levels are all measured using EDTA vials using Advia Centaur XP immunoassay systems.

RESULTS

Poverty and malnutrition can lead to vitamin B12 deficiency. Lack of vitamin B12 in children is a serious preventable health problem. issue with public health that could have long-term neurological effects repercussions if not diagnosed in time. It frequently goes unreported. The majority of the kids were vegetarians, and some of them showed signs of lethargy and weight loss, which are frequent in vitamin B12 deficiency, with younger kids showing more weight loss. In older kids, hematological anomalies were more common. Despite diverse dietary habits, estimation of vitamin B12 levels is a crucial part of evaluating kids with anemia.

Samples were taken from both male and female sick children for 30 patients, and then compared to healthy 30 youngsters. According to age, the children were split into two groups. Boys and girls in the first group ranged in age from 5 to 10 years, while those in the second group ranged in age from 10 to 14 years, following the special-

ized physician diagnosis of the illness, 30 patients' examination results at the time of diagnosis who took part in the research, The healthy children were also divided into two groups according to their age and the most prevalent problematic the patient suffers hypotonic and fading were noted as physical examination findings. a lack of growth and development in the skin and mucosa.

After a complete blood picture was done, it was found , Regarding white blood cells, White blood cell (WBC) counts ranged from the average are (7.6 ± 2.5) in the age group of 5-10 years old youngsters. When compared to healthy subjects of the same age and sex, these values are viewed as low.

Results for aged 10 to 14 years ranged for white blood cell (WBC) are (6.9 ± 2.5) respectively were also judged low when compared to healthy males and females of the same age.

Children between the ages of 5 -10 had hemoglobin (Hb) average values are (7.3 ± 2.9) while children between the ages of 10 - 14 had (Hb) average values are (6.3 ± 3.3) . When compared to the children of the same age who are in good health, these levels are viewed as poor. When compared to healthy children of the same ages, Age-related hemoglobin readings were used to define anemia.

For children 5 - 10 years old ferritin average values ranged from (37.8 ± 3.3) . Youngsters ferritin average readings varied from 10 - 14 years and from (36.1 ± 2.3) .

Mean corpuscular volume (MCV) when compared to healthy children of the same age and sex, the values MCV, which average ranged from (66 ± 3.5) for age 5-10 years and average are (57 ± 9.1) for Children between the ages of 10 - 14, are seen to be low when compared to healthy control. Mean corpuscular hemoglobin (MCH) when compared to the healthy control of the same age and sex the average of values are (27.2 ± 3.5) for age 5-10 years and (25.3 ± 4.5) for age 10-15 years this value is very low when compared with healthy controls.

Hematocrit (HCT) when compared to the healthy control of the same age and sex the average of values are (18.4 ± 4.1) for age 5-10 years and (14.4 ± 3.1) for age 10-15 years this value is low when compared with healthy controls.

Lymphocytic when compared to the healthy control of the same age and sex the average of values are (5.2 ± 1.8) for age 5-10 years and (4.1 ± 2.4) for age 10-15 years this value is very low when compared with healthy controls.

Vitamin B12 average were (61 ± 3.1) for the children from 5-10 years. And average (64 ± 1.1) for age 10-14 These val-

ues are low when compared with healthy subjects When means were compared, mean serum B12 levels were significantly associated with, hemogram and platelet counts. The diagnosis of vitamin B12 deficiency can be helped by measuring vitamin B12 levels. In general, normal serum B12 levels range from 200 to 900 pg/mL, and values below 80 are almost usually symptomatic of vitamin B12 insufficiency.

Table 2: Complete blood count and vitamin B12 parameters for boys and girls age 5-10 and healthy control

Parameter	Healthy control N=15 Age 5-10 mean $\pm$ sd	Vitamin B12 deficiency N=30 Age 5-10 meam $\pm$ sd	P-value
B12 (ng/L)	300 $\pm$ 24.2	61 $\pm$ 3.1	<0.001
WBC (10 ³ /UL)	8.5 $\pm$ 4.5	7.6 $\pm$ 2.5	<0.001
HB (g/dl)	11 $\pm$ 1.4	7.3 $\pm$ 2.9	<0.001
MCV (fl)	81 $\pm$ 1.4	66 $\pm$ 3.5	<0.001
MCH (pg)	90 $\pm$ 5.2	27.2 $\pm$ 3.5	<0.001
HCT (%)	33 $\pm$ 6.1	14.4 $\pm$ 3.1	<0.001
LYMPHOCYTE (10 ³ /UL)	9 $\pm$ 4.4	5.2 $\pm$ 1.8	<0.001
FERRITIN (μ g/L)	89 $\pm$ 5.6	37.8 $\pm$ 3.3	<0.001

Table3: Complete blood count and vitamin B12 parameters for boys and girls age 10-14 and healthy control

Parameter	Healthy control N=15 Age 10-15 mean $\pm$ sd	Vitamin B12 deficiency N=30 Age 10-15 meam $\pm$ sd	P-value
B12 (ng/L)	425 $\pm$ 13.1	64 $\pm$ 1.1	<0.001
WBC (10 ³ /UL)	9.3 $\pm$ 4.2	6.9 $\pm$ 2.5	<0.001
HB (g/dl)	11 $\pm$ 1.2	6.3 $\pm$ 3.3	<0.001
MCV (fl)	85 $\pm$ 2.3	57 $\pm$ 9.1	<0.001
MCH (pg)	93 $\pm$ 4.2	25.3 $\pm$ 4.5	<0.001
HCT (%)	33 $\pm$ 3.2	38.4 $\pm$ 4.1	<0.001
LYMPHOCYTE (10 ³ /UL)	10 $\pm$ 4.1	4.1 $\pm$ 2.4	<0.001
FERRITIN (μ g/L)	92 $\pm$ 4.1	36.1 $\pm$ 2.3	<0.001

DISCUSSION

Increasing emphasis in healthcare on disease prevention rather than disease treatment. Anemia is determined by the values of Hb, MCV and RBC in the complete blood count. Iron deficiency anemia is mostly indicated by low Hb levels in combination with reduced MCV levels, which is referred to as microcytic anemia (Antony, 2003) were examined and found to have a severe vitamin B12 deficiency.

cy. These individuals had modifications in hematological markers as cytopenia elevated MCV, and MPV, which are typical and obvious in vitamin B12 insufficiency (Roumeliotis et al., 2012). The most likely cause of macrocytic anemia is a vitamin B12 deficiency. It is already known that B12 deficiency can lead to low results in other blood series besides anemia. Iron deficiency was present together with Vitamin B12. The prevalence of vitamin B12 insufficiency in kids is considerable (McLean et al., 2009).

A significant issue and a preventative factor in neurological morbidity 5 to 14-year-old kids were involved, and In order to prevent long-term effects of vitamin B12 insufficiency in the unborn child, testing for the condition and supplementing should start as early in pregnancy as possible, according to the rising occurrence in the young age groups (Balci et al., 2016).

The youngsters were on a vegetarian diet. The majority of the kids ate a varied diet. Unlike the well-known our research did not uncover any conclusive evidence of a relationship between vegetarianism and a tendency to vitamin B12 insufficiency. link vitamin B12 deficiency and vegetarianism. This could be multiple-factored. Counting the amount of animal products consumed be carried out in our investigation. Despite the fact that the family was used to the child may have only sometimes consumed non-vegetarian meals. Vegetarian diet and might have died from a lack of vitamin B12 (Jones et al., 2007). As with pyridoxine (vitamin B6) and folic acid (vitamin B9), vitamin B12 is a cofactor in the transformation of homocysteine into methionine. It also contributes to the structural and functional integrity of myelin, hematopoiesis, and DNA and RNA synthesis, among other things. Symptoms of its deficiency are primarily neurological and hemological. In children and adults with vitamin B12 deficiency, epilepsy is a rare illness. Other organs, however, might be impacted (Atay et al., 2014).

The most frequent reason for cobalamin insufficiency is malabsorption. diseases causing insufficient cobalamin absorption include atrophic gastritis, insufficient pepsin or gastric secretion, insufficient proteolytic digestion, and atrophy of the gastric parietal cells. Other causes of cobalamin deficiency due to malabsorption include long-term anti-acid therapy, insufficient pepsin or gastric secretion, and insufficient pepsin or gastric secretion (Pawlak et al., 2013).

Health care professionals who are looking after pregnant or nursing mothers and their newborns should assess vitamin B12 status and take a comprehensive food history, especially in the case of vegetarian mothers and their children, in order to prevent vitamin B12 insufficiency (Duong et al., 2015).

Natural sources of vitamin B12 include dairy products, eggs, meat, particularly red meat. Fortified meals like infant formula, cereals, and soy products are among the additional sources. Although vitamin B12 deficiency is relatively uncommon, it is crucial to identify the condition because of the potentially harmful neurologic effects. As demonstrated in our two patients and several case studies, the majority of clinical symptoms of vitamin B12 insufficiency quickly go away when vitamin B12 is replaced. The neurologic abnormalities typically become better within a few weeks. Only a few case studies with ambiguous B12 supplementation duration are used to determine the developmental prognosis of these children months and years later; additional follow-up (Zeeshan et al., 2017).

For the synthesis of DNA and for the metabolism of fatty acids, B12 is necessary for the conversion of methyltetrahydrofolate to tetrahydrofolate. Megaloblastic anemia and potentially permanent neuropathy and neuropsychiatric abnormalities are prevented by the early detection and treatment of B12 deficiency.

It can be challenging because some kids have picky eating habits. to convince them to take a food supplement. A number of There are numerous chewable pills for kids on the market, additionally some liquid goods. Finding the trick is to one that your child enjoys sufficiently to take a conflict. Don't anticipate one chewable multiples, either. vitamin to supply a proper amount of each essential nutrients (Chakraborty et al., 2018).

Economic status, plasma folate, ferritin, and hemoglobin were all lower in individuals with low levels of plasma vitamin B-12 than in those with appropriate levels. Additionally, they consumed fewer foodstuffs with added vitamin B-12. Economic status was a covariate, therefore larger households' greater incomes are explained by complementary foods high in vitamin B-12 are methods for lowering the prevalence of insufficiency (De Bruyne and Ito, 2018).

However, the researchers created a ground beef dish that was well-accepted every day for nine months in the intervention study that followed, suggesting meat consumption from or before this age is undoubtedly doable and would increase these kids' intakes of iron and vitamin B-12. (Ran-daccio et al., 2010). Following vitamin B12 replacement, hematological signs entirely disappear, but neurologic indications may linger; for this reason, prompt diagnosis and treatment are crucial.

There are only a few natural sources of B12 (milk, cheese, and eggs), as B12 can only be produced by bacteria. As a result, foods of plant origin do not contain B12. B12 deficiency is now found to be rather frequent in children and adults, despite earlier being thought to be incredibly rare

(Reilly and Ilich, 2016).

CONCLUSION

The body requires two different types of vitamins: fat-soluble vitamins and water-soluble vitamins, both of which function well in the body. Nobody can dispute the importance of these vitamins for the body at all ages, and depending on the vitamin, age, and health state of the individual, a shortage of them can cause significant harm to certain body sections. Although nothing can replace a healthy, balanced diet, taking vitamin and mineral supplements on a daily basis may assist to ensure that you are getting enough of the essential nutrients.

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CONFLICT OF INTEREST

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