

ORIGINAL ARTICLE

Frequency of Vitamin B12 Deficiency in patients of Pancytopenia

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ABSTRACT

Background: Vitamin B12 insufficiency is prevalent in developing nations. It often causes megaloblastic anemia, but it may also impact the other two cell lines, i.e. platelets and leukocytes (pancytopenia), and may be misdiagnosed as cancer or bone marrow failure. A therapeutic test may be performed, providing a prompt diagnosis and preventing a high death rate.

Aim To find frequency of vitamin B12 deficiency in children having pancytopenia.

Methodology: This cross sectional study was done at Children's Hospital & The Institute of Child Health Lahore in 6 months. This study involved 242 children of 6 months to 14 years age of both genders admitted in Children Hospital Lahore and had pancytopenia on their CBC.

Results: The age of the patients ranged from 6 months to 14 years with a mean of 6.4 ± 2.8 years. There were 111 (45.9%) male and 131 (54.9%) female patients with a male to female ratio of 1:1.2. A total of 6.2% patients were found to have B12 deficiency.

Conclusion: It is concluded that, 6.2% of patients with pancytopenia had a deficiency of B12; thus, patients may be routinely evaluated for pancytopenia and its reasons, since many of them are entirely curable and others are managed.

Keywords: Vitamin B12 deficiency, cobalamin, Pancytopenia, Megaloblastic

INTRODUCTION

Vitamin B12 (cobalamin) insufficiency has long been recognized as a clinical condition^{1,2}. Due to incorrect DNA synthesis, megaloblastic anemia is caused by aberrant maturation of hematopoietic cells¹. Few data exist to indicate that many children in low- and middle-income countries have insufficient vitamin B12 and folate consumption². Clinical B12 insufficiency is shown by typical hematological and neurological symptoms is infrequent. Nevertheless, subclinical insufficiency occurs between 2.5% and 26% of the general population, depending on the criteria used, but the clinical significance is uncertain.³ Cobalamin (vitamin B12) and folic acid are needed for DNA biosynthesis^{1,4}. Insufficiency in any of these vitamins causes the nucleus and cytoplasm of rapidly renewing cells to mature asynchronously^{1,5}.

Vitamin B12 deficiency may result in significant hematologic changes, including pancytopenia, macrocytosis, neutrophil hypersegmentation, and hypercellular bone marrow with blastic differentiation.⁶ Pancytopenia is defined by a reduction in the quantity of at least two types of blood cells. Acute progression of pancytopenia is possible, such as with decreasing blood cell counts in severe sepsis, disseminated intravascular coagulation, or fast hemolysis⁷.

Identification of pancytopenia requires a comprehensive diagnostic strategy tailored to the clinical context. However, numerous etiologies, such as vitamin insufficiency, may also be responsible for this rather frequent occurrence⁸. In Pakistan, it is the third biggest cause of pancytopenia in children, with a prevalence of 19.5%⁹.

Inadequate ingestion of animal foods and pernicious anaemia (loss of intrinsic factor owing to autoimmune atrophic gastritis) are the leading causes of severe vitamin B12 insufficiency in children and adults, respectively, across the globe.¹⁰ Cobalamin deficit in newborns is often caused by a defect in the mother. If the diagnosis is delayed, megaloblastic anaemia, pancytopenia, and failure to thrive may be present, along with neurological abnormalities¹¹.

There have been studies undertaken elsewhere, but not in our environment. These findings will contribute to the current body of knowledge. Policymakers, planners, managers, and practitioners may utilize the findings to implement effective interventions for the benefit of the general community. This research aimed to investigate the prevalence of vitamin B12 deficiency among pancytopenia patients. There have been studies performed elsewhere, but not at our institution. These findings will contribute to the current body of knowledge. Policymakers,

planners, managers, and practitioners may utilize the findings to implement effective interventions for the benefit of the general community.

MATERIALS AND METHODS

This cross sectional study was conducted in Children Hospital & Institute of Child Health Lahore for a period of 6 months. Patients were selected by Non-Probability, Convenience sampling. Sample size is 242, calculated with 95% confidence level and 5% absolute precision considering 19.5% prevalence of B12 deficiency in pancytopenia⁹.

Inclusion Criteria: All the children of 6 months to 14 years age of both genders admitted in The Children Hospital Lahore and had pancytopenia on their CBC.

Exclusion Criteria

- All those children who had received blood transfusion.
- All known cases of leukemia/lymphoma.

Data collection procedure: Questionnaire was used for data collection. After informed consent children 6 months to 14 years, fulfilling the inclusion criteria admitted in The Children's Hospital & ICH Lahore was enrolled. 5cc blood was drawn and sent to the laboratory of The Children's Hospital & ICH Lahore. Their CBC and serum B12 levels was measured. Pancytopenia was labelled when there was a decrease in all the three cellular elements of blood; prevailing when the hemoglobin (Hb) less than 10 g/dl, absolute neutrophil count (ANC) less than $1.5 \times 10^9/L$, platelet count less than $100 \times 10^9/L$.

Data analysis procedure: The information collected was analyzed by using statistical software SPSS -20. The quantitative variables like age was presented as mean and SD. Chi square test was employed and p value ≤ 0.05 was considered significant. Data was presented in the form of tables and diagrams.

RESULTS

Patients varied in age from 6 months to 14 years, with a mean of 6.42.8 years. The mean age of patients was 6.39 ± 2.80 years. There were 111 male patients (45.9%) and 131 female patients (54.9%), for a male to female ratio of 1:1.2. The mean height and weight of these patients were 114.65 ± 15.66 cm and 20.18 ± 5.79 kg. The mean Hb was 8.61 ± 0.84 while the mean TLC and Platelet was 2.59 ± 0.79 and 63.02 ± 20.88 . There were 70 (28.9%) cases who had history of breast feeding while 172 (71.1%) cases were not breast fed. A total of 6.2% of individuals with pancytopenia had a deficit in B12.

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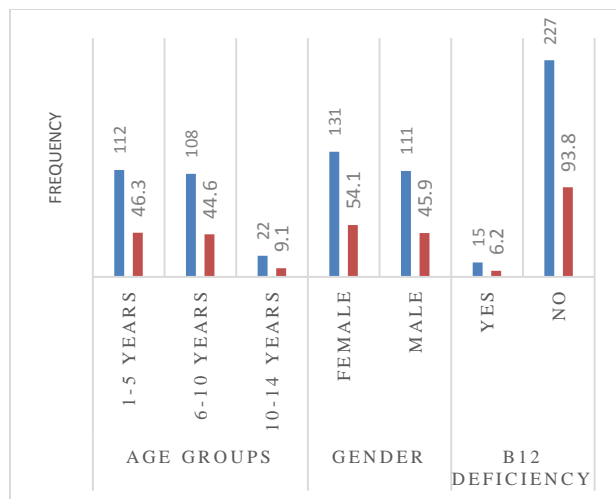
Table 1: Descriptive statistics of quantitative data

	Age (years)	Height (cm)	Weight (kg)	Hemoglobin (g/dl)	TLC	Platelet
Mean	6.39	114.65	20.18	8.61	2.59	63.02
Std. Deviation	2.80	15.66	5.79	0.84	0.79	20.88
Minimum	2.00	84.00	11.00	7.10	1.10	25.00
Maximum	12.00	140.00	30.00	10.00	3.90	94.00

Table 2: Frequency distribution of Gender, age and B12 deficiency

		Frequency	Percent
Age groups	1-5 years	112	46.3
	6-10 years	108	44.6
	10-14 years	22	9.1
Gender	Female	131	54.1
	Male	111	45.9
B12 deficiency	Yes	15	6.2
	No	227	93.8

Fig-1: Frequency distribution of Gender, age and B12 deficiency



DISCUSSION

Pancytopenia is a trio of observations that emerge from a variety of illness processes. It is characterised as a reduction in the quantity of all three formed components of the blood¹². Vitamin B12 deficiency due to malnutrition is prevalent in underdeveloped regions of the globe.¹³

In the current investigation, 6.2% of individuals with pancytopenia were found to have B12 insufficiency. According to reports, B12 deficiency contributes for 16%-61% of Pancytopenia patients¹⁴⁻¹⁷.

The majority of patients reported poor eating habits, including dietary taboos, low food quality, and self-avoidance of required meals. The higher incidence of megaloblastic anaemia has been attributed to the high prevalence of nutritional anemias in India. Due to geographical and societal similarities, dietary anemias may also contribute to the increasing prevalence of megaloblastic anaemia in some parts of Pakistan¹⁸.

In a study conducted in Malaysia, 64% of patients with megaloblastic anaemia exhibited pancytopenia.¹⁹ Only 13.7% of instances of pancytopenia in patients with megaloblastic anaemia were recorded in a research that was carried out in New York. This indicates that the prevalence of pancytopenia has decreased in Western nations²⁰. According to a recent research, Vitamin B12 and Folic Acid shortage is a crucial component in the suppression of bone marrow in malnourished children. Our results showed that folic acid deficit was much lower in females and Vitamin-B12 in men²¹.

Megaloblastic anaemia is one of the health issues that is becoming more prevalent on a worldwide scale as a result of deficiencies in folic acid and vitamin B12. This problem is also

becoming more widespread. Vegetarianism is a leading source of vitamin B12 deficiency, which in turn may lead to elevated levels of homocysteine in the blood. If it is not recognised or treated in a timely manner, a lack of vitamin B12 may result in potentially fatal issues inside the human body. These issues can manifest in a variety of ways, making it difficult to diagnose. In patients who appear with anaemic symptoms including pallor and weakness and/or are found to have pancytopenia following further inquiry, doctors should have a high index of suspicion for vitamin B12 deficiency. This should be done as much as feasible.

CONCLUSION

It is concluded that, 6.2% of patients with pancytopenia had a deficiency of B12; thus, patients may be routinely evaluated for pancytopenia and its reasons, since many of them are entirely curable and others are managed.

REFERENCES

- Sen K, Sinhamahapatra P, Lalhmachhuana J, Ray S. A Study of Clinical Profile of Vitamin B12 Deficiency with Special Reference to Dermatologic Manifestations in a Tertiary Care Hospital in Sub-Himalayan Bengal. *Indian J Dermatol.* 2015;60(4):419.
- Ng'eno BN, Perrine CG, Whitehead Jr RD, Subedi GR, Mebrahtu S, Dahal P, et al. High prevalence of vitamin B12 deficiency and no folate deficiency in young children in Nepal. *Nutrients.* 2017;9(1):72.
- Green R, Allen LH, Björke-Monsen A-L, Brito A, Guéant J-L, Miller JW, et al. Vitamin B12 deficiency. *Nature Reviews Disease Primers.* 2017;3(1):17040.
- Samson JC, Karuppanan U, Ganesan H, Velusamy S, Thangaraj P. Vitamin B12 deficiency, its prevalence and haematological manifestations-A study in a tertiary care hospital. *Ind J Pathol Oncol.* 2018;5(2):230-6.
- Sanchez J, Zheng Y, Lee B, Whitfield A, Feerick J. A Pediatric Case of Severe Vitamin B12 Deficiency Presenting as Transaminitis. *Authorea Preprints.* 2022;DOI: 10.22541/au.164873289.95171540/v.
- Konda M, Godbole A, Pandey S, Sasapu A, editors. Vitamin B12 deficiency mimicking acute leukemia. *Baylor University Medical Center Proceedings;* 2019: Taylor & Francis.
- Sharma R, Nalepa G. Evaluation and Management of Chronic Pancytopenia. *Pediatr Rev.* 2016;37(3):101-11.
- Depuis Z, Gatineau-Sailliant S, Ketelstegers O, Minon J-M, Seghaye M-C, Vasbien M, et al. Pancytopenia Due to Vitamin B12 and Folic Acid Deficiency—A Case Report. *Pediatric Reports.* 2022;14(1):106-14.
- Jan AZ, Zahid B, Ahmad S, Gul Z. Pancytopenia in children: A 6-year spectrum of patients admitted to Pediatric Department of Rehman Medical Institute, Peshawar. *Pak J Med Sci.* 2013;29(5):1153.
- Stabler SP. Vitamin B12 deficiency. *New Eng J Med.* 2013;368(2):149-60.
- Michael Whitehead V. Acquired and inherited disorders of cobalamin and folate in children. *British J Haematol.* 2006;134(2):125-36.
- Ahmad A, Idrees M, Afridi IG, Rehman G. To determine etiology and frequency of pancytopenia in pediatric population and compare it with other studies. *Khyber J Med Sci.* 2016;9(2):186-9.
- Gauchan P, Giri BR, Bhatta U. Vitamin B12 Deficiency Presenting as Pancytopenia with Hepatosplenomegaly in an Infant. *J Nepal Paediatr Society.* 2020;40(1):60-3.
- Aziz T, Ali L, Ansari T, Liaquat HB, Shah S, Ara J. Pancytopenia: megaloblastic anemia is still the commonest cause. *Pak J Med Sci.* 2010;26(1):132-6.
- Robert C, OH David L. Brown. Vitamin b12 Deficiency. *Am Fam Physician.* 2003;67(5):979-986.
- Blank U, Karlsson G, Karlsson S. Signaling pathways governing stem- cell fate. *Blood.* 2008; 111(2):492-503.
- Mishra D, Kohli A, Yadav RB, Nayak D. Megaloblastic anemia: a common cause of pancytopenia in children. *Indian J Pathol Microbiol.* 2007;50(2):447-448.
- Makheja KD, Maheshwari BK, Arain S, Kumar S, Kumari S. The common causes leading to pancytopenia in patients presenting to tertiary care hospital. *Pak J Med Sci.* 2013;29(5):1108-1111.
- Modood-ul-Mannan, Anwar M, Saleem M, Wigar A, Ahmad MA. Study of serum vitamin B12 and folate levels in patients of megaloblastic anemia in northern Pakistan. *J Pak Med Assoc.* 1995;45:187-188.
- Stabler SP, Allen RH. Vitamin B12 deficiency as a worldwide problem. *Annual review of nutrition.* 2004;24:299.
- Anwer J, Mustafa G, Khalid S, Younis S, ul Haq R, Tayyab HM. Vitamin B 12 and Folic Acid Deficiency among Malnourished Children with Pancytopenia. *Professional Med J.* 2020;27(02):348-52.