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ORIGINAL ARTICLE

Frequency of Vitamin Cobalamin Deficiency in Macrocystic Anemia Cases Reporting at Tertiary Care Hospital

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ABSTRACT

Objective: The purpose of this study is to determine the frequency of vitamin cobalamin deficiency in macrocystic anemia cases reporting at tertiary care Hospital.
Study Design: Cross-sectional
Place and Duration: In Medicine department of DHQ Teaching Hospital, Sargodha and DHQ Hospital, Dera Ismail Khan for the duration of six months from August 2021 to January 2022.
Methods: Total 210 cases of macrocytic anemia of both genders with ages 18-62 years were presented. Age, sex, and body mass index were among the specific demographics of the enrolled cases that were documented after receiving informed written consent. Ante-cubital fossa blood was sampled for 5 mL. To estimate the amount of vitamin cobalamin using an ELISA test kit, samples were centrifuged and sera were collected. SPSS 24.0 was used to analyze all data.
Results: Among 210 cases, 130 (61.9%) were males and 80 (38.1%) females in this study. 70 (33.3%) cases had ages 18-35 years, 90 (42.9%) had ages 36-50 years and 50 (23.9%) had ages >50 years. Mean BMI of the presented cases was 24.66±14.49 kg/m^2. We found that 180 (85.7%) patients had deficiency of cobalamin and 30 (14.3%) cases had normal cobalamin. Among 180 cases of cobalamin deficiency, 70 (38.9%) patients were severe, border line was found in 45 (25%) cases and deficient cases were 65 (36.1%).
Conclusion: We concluded in this study that patients with macrocystic anemia had higher number of vitamin cobalamin deficiency found in 85.7% cases. Majority of the patients were deficient and had severe deficiency of cobalmin.
Keywords: Vitamin Cobalamin, Macrocystic Anemia, Severe Deficiency

INTRODUCTION

A clinical condition known as vitamin B12 (cobalamin) insufficiency has long been recognised. Megaloblastic anaemia is caused by defective DNA synthesis, which leads to aberrant hematopoietic cell maturation. For the production of DNA, two vitamins, folic acid and cobalamin (vitamin B12), are necessary. The nucleus and cytoplasm of quickly renewing cells mature at different times when one of these vitamins is deficient. This asynchrony affects the hematopoietic system and causes pancytopenia, intramedullary hemolysis, aberrant nuclear maturation with normal cytoplasmic maturation, apoptosis, inefficient erythropoiesis, and typical morphological abnormalities in the blood and marrow cells. [1,2] There are indications that the illness is more widespread than previously thought[3], however there is very little Indian data on this[4], notably from the eastern sections encompassing Bengal and the eastern states. Recent Pubmed searches with the terms "vitamin B12 deficiency" or "pernicious anaemia" and "India" did not turn up any research from this region of the nation. However, research on vitamin B12 insufficiency has come from various areas of India. [4,5,6]

Iron deficiency and congenital hemolytic anaemia are among the frequent causes of anaemia in this region, respectively. Three consecutive cases of severe anaemia needing blood transfusions were later confirmed to be vitamin B12 deficient. This led us to believe that vitamin B12 insufficiency could be more prevalent in this area than we had first anticipated. This motivated us to conduct a study despite our inadequate setup. We conducted a prospective research between March 2013 and August 2013 to track the prevalence of vitamin B12 insufficiency and anaemia in our hospital and to record the clinical signs and dietary habits of those who were afflicted.[5,6]

In clinical settings in Pakistan, megaloblastic anaemia is frequently observed. The incidence, underlying causes, and accompanying symptoms of it on the Indo-Pak subcontinent have, however, only been the subject of a few thorough reports [7]. We previously noted that vitamin B12 insufficiency was a prominent factor in the development of megaloblastic anaemia in patients who received treatment at the Aga Khan University Hospital for anemias caused by vitamin deficiencies. [8,9] Since that time, very few thorough studies on the causes of megaloblastic anaemia, including folate and vitamin B12, have been conducted in this area.

Pernicious anaemia, on the other hand, is a frequent cause of Vitamin B12 insufficiency, particularly in people of European or African heritage. However, dietary Vitamin B12 deficiency is a major issue in the Indian subcontinent, Mexico, Central and South America, and some regions of Africa. [10,11]

Most occurrences of MA in other developing nations are brought on by a dietary shortage in FA, B12, or both. The other developing causes of MA include malabsorption, alcohol, medicines, infections, pernicious anaemia brought on by a deficit in an intrinsic factor, pregnancy and breastfeeding, and alcohol. [12] In older research, FA insufficiency was thought to be more frequent than Vitamin B12 deficiency as a cause of MA; however, more recent studies from India and other nations have found Vitamin B12 deficiency.

Cobalamin shortage first shows up in the rapidly reproducing bone marrow before other tissues. A vitamin called cobalamin is water soluble. Malnutrition, which is brought on by parasite infestation, intestinal malabsorption, and other factors, is highly frequent and results in nutritional deficiencies of the vitamin cobalamin. The requirement for folic acid and cobalamin rises during pregnancy and also the growing children experience a similar situation. Some of the reasons for cobalamin insufficiency include parasite infestation, gut malabsorption, gastric achlorhydria, terminal ileum, and pancreatic diseases. An intestinal parasite known for depleting cobalamin is fish tapeworm (Diphyllobothrium latum). [13,14] Cobalamin insufficiency is extremely common yet underreported, especially in underdeveloped nations. The frequency of cobalamin insufficiency is substantial, according to a small number of published studies[15], and further study is required. This example of neglect prompted the current study to be carried out in order to assess the prevalence of cobalamin deficiency in macrocytic anaemia cases reported at a tertiary care hospital.

MATERIAL AND METHODS

This cross-sectional study was conducted at Medicine department of DHQ Teaching Hospital, Sargodha and DHQ Hospital, Dera Ismail Khan for the duration of six months from August 2021 to January 2022 and consisted of 210 cases. Age, sex, and body mass index were among the specific demographics of the enrolled cases that were documented after receiving informed written consent. Diabetics, patients with liver, thyroid, lung, or heart disorders, as well as those with chronic diarrhea, were excluded. Subjects who recently had meat and liver in their diets were also not included.

Throughout the course of the trial, proper record-keeping procedures were followed and biodata and blood tests results were kept private. Volunteers were advised that there would be no cost or loss associated with the cobalamin test, and that the results would never be made public. To assist with subject screening, medical personnel were requested. Macrocytic anaemia was deemed to exist at MCV 100 fl. Consultant haematologist made the diagnosis. After a tourniquet was securely tied, blood samples were taken under aseptic conditions from the ante-cubital fossa. Alcohol-swab sterilisation of the anterior cubital fossa. A 5 ml BD Disposable syringe was used to obtain a venesection blood sample of 5 ml (BD) Serum was extracted from 2 ml using a centrifuge, and full blood counts were performed on 3 ml using tubes containing NaF. Sera were collected to estimate the amount of vitamin B12 using an ELISA test kit. Cobalamin levels were classified as normal at 240 ng/ml, borderline deficiency at 170-240 ng/ml, deficiency at 170 ng/ml, and severe deficiency at 100 ng/ml. In SPSS (version 24.0), 10 continuous and categorical variables were entered, and they were evaluated using the Student t-test and Chi-square test, respectively, at 95% confidence intervals (P 0.05).

RESULTS

Among 210 cases, 130 (61.9%) were males and 80 (38.1%) females in this study. 70 (33.3%) cases had age 18-35 years, 90 (42.9%) had age 36-50 years and 50 (23.9%) had age >50 years. Mean BMI of the presented cases was 24.66±14.49 kg/m^2. (table 1)

Table-1: Included patients with detailed demographics

Variables	Frequency	Percentage
Gender		
Male	130	61.9
Female	80	38.1
Age (years)		
18-35	70	33.3
36-50	90	42.9
>50	50	23.9
Mean BMI (kg/m^2)	24.66±14.49	

Most common symptoms were loss of weight, brittle nails, fast heartbeat, shortness of breath, fatigue and pale skin among all 210 patients.(figure 1)

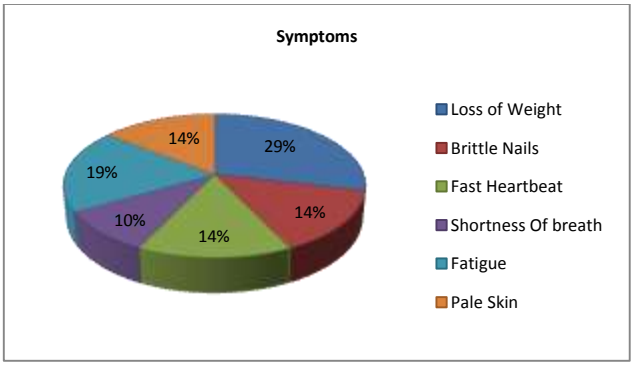

Figure-1: Association of symptoms among macrocystic anemia patients

We found that 180 (85.7%) patients had deficiency of cobalamin and 30 (14.3%) cases had normal cobalamin.(figure 2)

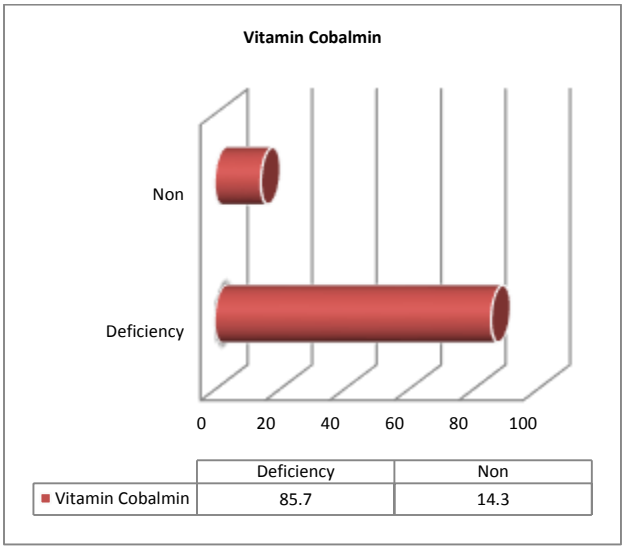

Figure-2: Frequency of vitamin cobalamin deficiency among all cases

Among 180 cases of cobalamin deficiency, 70 (38.9%) patients had severe, border line was found in 45 (25%) cases and deficient cases were 65 (36.1%).(table 2)

Table-2: Severity of vitamin cobalamin deficiency

Variables	Frequency (180)	Percentage
Vitamin Cobalamin Deficiency		
Borderline (170-240 pg/dl)	45	25
Deficient (<170 pg/dl)	65	36.1
Severe (<100 pg/dl)	70	38.9
Total	180	100

DISCUSSION

In anaemic patients, MA significantly increases morbidity. There is a paucity of information on the severity of the issue in different regions of India and the variables that could affect its occurrence. MA has a well-established cause: dietary vitamin insufficiency. There is a significantly wider variety of pathological diseases linked to MA. In our study, research has identified a wide range of possible reasons for MA, including malnutrition, alcoholism and alcoholic liver disease, malaria, kalazar, tropical sprue, hypothyroidism, hepatitis, drugs, HIV, tuberculosis, celiac disease and chronic pancreatitis.[16] Multiple illnesses are brought on by vitamin B12 deficiency, which affects people of all ages. The neurological, gastrointestinal, and hematologic systems are the main ones impacted by vitamin B12 insufficiency. [12] Heart and circulatory systems, the skeleton, and changes in the skin and hair are among the additional symptoms. [15] As it was a fairly consistent finding, this study paid particular attention to the cutaneous changes above other profiles.

In current study 210 patients of macrocystic anemia of both genders were presented. Among 210 cases, 130 (61.9%) were males and 80 (38.1%) females in this study. 70 (33.3%) cases had age 18-35 years, 90 (42.9%) had age 36-50 years and 50 (23.9%) had age >50 years. Mean BMI of the presented cases was 24.66±14.49 kg/m^2. These findings were comparable to the previous some studies.[17,18] Most common symptoms were loss of weight, brittle nails, fast heartbeat, shortness of breath, fatigue and pale skin among all 210 patients. In the current study, the MCV for men was 97.6±5.32 fl vs. 107.5±11.08 fl for women (P=0.0001), indicating higher values. Because vitamin cobalamin is required for the nucleotide (DNA) production, elevated RBC - MCV is a sign that nuclear maturation was delayed as a result of

cobalamin deficit. Mean corpuscular volume is increased as a result of late nuclear maturation (MCV).

We found that 180 (85.7%) patients had deficiency of cobalamin and 30 (14.3%) cases had normal cobalamin. These results were comparable to the previous studies.[19-21] Inconsistent results were found in a prior study[22], which revealed a 72.6% cobalamin deficit. The rationale is that the prior study's sample size was small and that its study populations were different. A reliable clinic-hematological sign of cobalamin insufficiency, according to other earlier investigations [23], is highly segmented neutrophils. Both vegans and non-vegans have been found to have cobalamin deficiencies of 85% and 78.5%, respectively. [24] It is consistent with the 84.7% cobalamin deficit found in the current investigation. Cobalamin insufficiency was observed infrequently, according to several earlier investigations [25], which contradicts the results.

Due to logistical issues, it was not able to identify the cause of vitamin B12 insufficiency. Vegetarians frequently have vitamin B12 shortage because animal products are the main source of this vitamin. [26] We were intrigued to learn more about the possible causes of vitamin B12 insufficiency in this region of the country because it was unexpected that 85.7% of the affected patients had a non-vegetarian diet. However, the authors acknowledge that the dietary evaluation was insufficient given the challenges of determining the nutritional content of the Indian food and the diversity of the population. The increased frequency of vitamin B12 deficiency in this area has to be confirmed by more, larger, well-designed epidemiologic research. Given the paucity of research on vitamin B12 deficiency in this region of the country and the significance of skin symptoms as a clinical pointer to symptomatic vitamin B12 deficiency, it may only be regarded as a pilot study. A recent study from southern India found that hyperpigmentation is a recurring and early sign of vitamin B12 insufficiency. [27]

CONCLUSION

We concluded in this study that patients with macrocystic anemia had higher number of vitamin cobalamin deficiency found in 85.7% cases. Majority of the patients were deficient and had severe deficiency of cobalamin.

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