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Evolution of Hypovitaminosis D among Libyan Blood Donors (18–55 Years Old) Attending Maternity Hospital for Donation

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Abstract: ***Deficiencies in both Vitamin D and iron are recognized as two major public health concerns in the globe, nearly, 30%–50% of all age groups are Vitamin D deficient worldwide , to define laboratory values that are related to the diagnosis of anemia and iron deficiency,it is impotant to analyses included Hb. Objectives: To investigate the prevalence of vitamin D deficiency among individuals attending attending maternity hospital for donation and to assess the association between vitamin D deficiency and haemoglobin. Method and materials: The study included 200 libyan healthy blood donors (18–55 years old) . Blood samples were collected & assessed by ELISA method for serum vitamin D and sysmex auto analyzer instrument for hemoglobin level. Results: The prevalence rate of vitamin D deficiency was 16 % among study participants with no history of vitamin D replacement therapy and that of vitamin D insufficiency was up to 48 %. Conclusion: This study is suggestive of a higher prevalence of vitamin D deficiency among young adults, Libya nationality and those with blood donation***

Keywords: vitamin D, hemoglobin, blood donors, prevalence, Libya

1. Introduction

Deficiencies in both Vitamin D and iron are recognized as two major public health concerns in the globe, nearly, 30%–50% of all age groups are Vitamin D deficient worldwide.[1]

Vitamin D deficiency is a major public health problem worldwide in all age groups, even in those residing in countries with low latitude, where it was generally assumed that UV radiation was adequate enough to prevent this deficiency, and in industrialized countries, where vitamin D fortification has been implemented now for years.

Sun exposure is the most important source of Vitamin D for most people.

The effect of sun exposure on Vitamin D synthesis depends on skin pigmentation, body size, and aging.[2]

Photosynthesized Vitamin D is transported to the liver by the Vitamin D binding protein to pass the first hydroxylation.

The second hydroxylation in kidneys converts it to its biologically active form, 1,25-hydroxy Vitamin D (1,25(OH)2D). [3]

Although the most popular role of Vitamin D in the body is bone health, it has a wide range of functions. Vitamin D deficiency (VDD) is related to infant mortality, cardiovascular diseases, cancer, total mortality, diabetes, mood disorders, and increased risk of infections like tuberculosis and AIDS.[4]

When the concentration of 25(OH)D3 is <20 ng/ml (50 nmol/L), VDD exists. A level of ≥30 ng/ml (≥75 nmol/L) is considered normal.

Vitamin D insufficiency has been defined as 25(OH)D between 21 and 29 ng/ml. Vitamin D is involved in the proliferation and differentiation of bone marrow stem cells and may play a role in red cell production Vitamin D can also potentially affect circulating iron status by promoting erythropoiesis and by suppressing hepcidin expression [5]

Anemia is a major global health concern due to its high prevalence and association with substantial morbidity and mortality.

The World Health Organization (WHO) estimates that about 2 billion people in the world are suffering from this disease, and that approximately 50% of all anemia cases are diagnosed as iron deficiency anemia (IDA), it is known that a variety of causes, such as inadequate iron intake, chronic blood loss, chronic disease, malabsorption, hemolysis or a combination of these, can induce anemia.

Consequently, efforts to identify less well-known, but potentially modifiable, factors associated with anemia will be required to reduce the large burden of anemia. .[6]

It has estimated that 2–3 billion individuals suffer from anemia worldwide.[7] IDA is the most prevalent type of anemia., have been used to estimate iron deficiency based on the prevalence of anemia in countries with a high prevalence of anemia and iron deficiency.

Accordingly, when anemia is prevalent in 20% of population, iron deficiency prevalence will be 50%, and when it is >40%, some degree of iron deficiency exists in whole population.[8,9]

Vitamin D has previously been found to be associated with anemia in various healthy and diseased populations.

Recent studies indicate that the association may differ between race and ethnic groups and is likely specific to anemia of inflammation.

The mechanism underlying this association involves the reduction of proinflammatory cytokines by vitamin D and the direct suppression of hepcidin mRNA transcription. There is also evidence that vitamin D may be protective against anemia by supporting erythropoiesis.

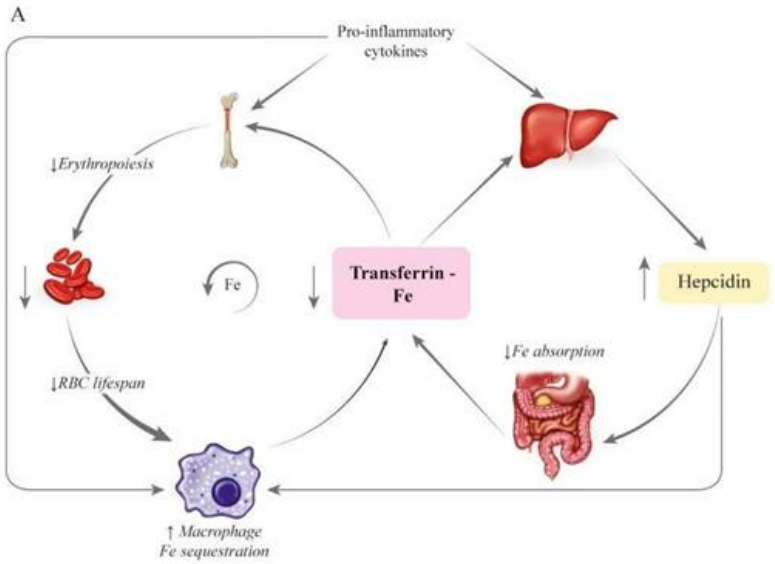
Anemia and VDD have been observed simultaneously.[10] Some recent studies blame IDA for VDD because of their linked metabolism.[11,12,13]

There are also several trials evaluating the effect of iron intake on Vitamin D concentration as their primary or secondary outcomes,[14,15,16,17,18,19,20]

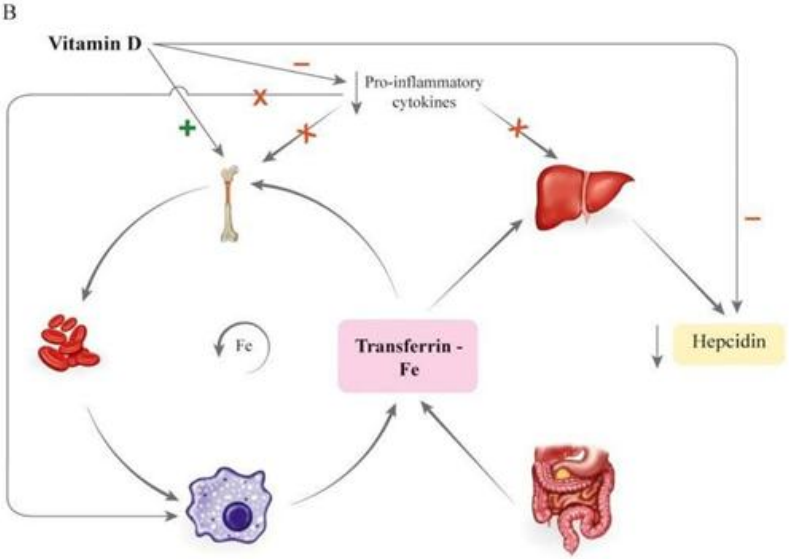
Alterations in Iron Recycling in Anemia of Inflammation and Proposed Role of Vitamin D

a) Iron recycling, under non-pathologic conditions, involves transferrin-bound iron in circulation traveling to the bone marrow to support erythropoiesis. Upon senescence, red blood cells (RBCs) are engulfed by macrophages and iron is recycled back into circulation to support further erythropoiesis. Dietary iron may also enter the circulating pool from absorption in the duodenum based on the body's needs. In anemia of inflammation, elevations in pro-inflammatory cytokines suppress erythropoiesis in the bone marrow and shorten RBC lifespan due to increased macrophage activation and erythrophagocytosis.

Collectively, depressed erythropoiesis, shortened RBC lifespan, iron sequestration in the macrophage, and reduced iron absorption impairs iron recycling and results in insufficient iron available for erythropoiesis and hemoglobin synthesis, ultimately leading to anemia.



b) Proposed Role of Vitamin D in Counteracting Anemia of Inflammation: Vitamin D has been shown to promote erythropoiesis by increasing erythroid progenitor proliferation and decreasing pro-inflammatory cytokines. Additionally, by decreasing hepcidin-stimulatory pro-inflammatory cytokines, and through direct transcriptional regulation of the HAMP gene, vitamin D may suppress hepcidin expression. Decreases in pro-inflammatory cytokines and hepcidin may increase iron bioavailability for erythropoiesis and hemoglobin synthesis by restoring iron recycling, preventing iron sequestration in macrophages, and removing impairments on iron absorption, thus protecting against anemia.



2. Materials and Methods

2.1 Design and study population

This study, a cross-sectional conducted to evolution of Hypovitaminosis D among libyan blood donors (18–55 years old) attending maternity hospital for donation 200 donor, the survey was approved by the maternity hospital blood bank. (2018)

2.2 Laboratory measurements and definition

Blood samples were obtained from an antecubital vein after obtaining informed consent and collected in BD Vacutainer tubes containing EDTA, hemoglobin levels were measured using a XE-2100D hematology analyzer (Sysmex, Tokyo, Japan). and serum 25 (OH) vitamin D levels The study included 200 libyan healthy blood donors (18–55 years old), samples were measured using a competitive enzyme-linked immunosorbent assay for serum vitamin D and sysmex auto analyzer instrument for hemoglobin

3. Results

The prevalence of anemia was 6.0 % in Table 3. The prevalence was greatest in both groups ,those aged 18-25-yrs oldold (13.0%) and aged 46- 55 yrs

The prevalence of anemia in the other age groups was; 0 % ,and the prevalence of vitamin D deficiency was 16 % among study participants with no history of Vit D replacement therapy and that of vitamin D insufficiency was up to 48 %. in Table2

Table 1: Frequency distribution of the total study samples for serum vitamin D

Age group in years	Total No = 200 cases	100 %
18–25	46	23 %
26–35	60	30 %
36–45	48	24 %
46–55	46	23 %

Table 2: The prevalence of selected outcomes based on different serum vitamin D values for study 200 participants

Age group in years	Total	Severe vitamin D deficiency		Vitamin D deficiency		Vitamin D insufficiency	
	N	N	%	N	%	N	%
18–25	46	0	0	6	13	6	13
26–35	60	0	0	6	10	10	16.0
36–45	48	0	0	10	20.8	16	33.2
46–55	46	0	0	12	26	16	34.7

Table 3: Hemoglobin values for study 200 participants

Age group in years	Total	Hb less than 12 g%		Normal Hb%		Hb more than 16 g%	
	N	N	%	N	%	N	%
18–25	46	6	13	38	82	2	5
26–35	60	0	0	58	96	2	4
36–45	48	0	0	46	96	2	4
46–55	46	6	13	36	78	4	9

Table 4: The prevalence of selected outcomes based on different Hb% and serum vitamin D values for study 200 participants

Age group in years	Total	Hb less than 12 g%		Vitamin D deficiency		Vitamin D insufficiency	
	N	N	%	N	%	N	%
18–25	46	6	13	6	13	6	13
26–35	60	0	0	6	10	10	16
36–45	48	0	0	10	20.8	16	33.2
46–55	46	6	13	12	26	16	34.7

4. Conclusion

This study is suggestive of a higher prevalence of vitamin D deficiency among young adults, Libya nationality and those with blood donation

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