CARDIAC ENZYMES IN ANAEMIA BEFORE AND AFTER TREATMENT

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BY

MAGDY HABIB AYAD

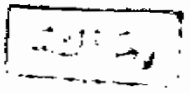
M B. B. Ch

SUPERVISED BY

Prof. Dr. AHMED GHAREEB
Chairman of Department of Medicine

Dr. SAYED RAAFAT
Ass. Prof. of Medicine

Dr. HUSSEIN EL DAMASY
Ass. Prof. of Medicine



Prof. Dr. FARID EL ASMAR
Prof. of Biochemistry

Dr. SOHEIR GAMAL EL-DIN
Lecturer of Medicine

FACULTY OF MEDICINE
EIN SHAMS UNIVERSITY

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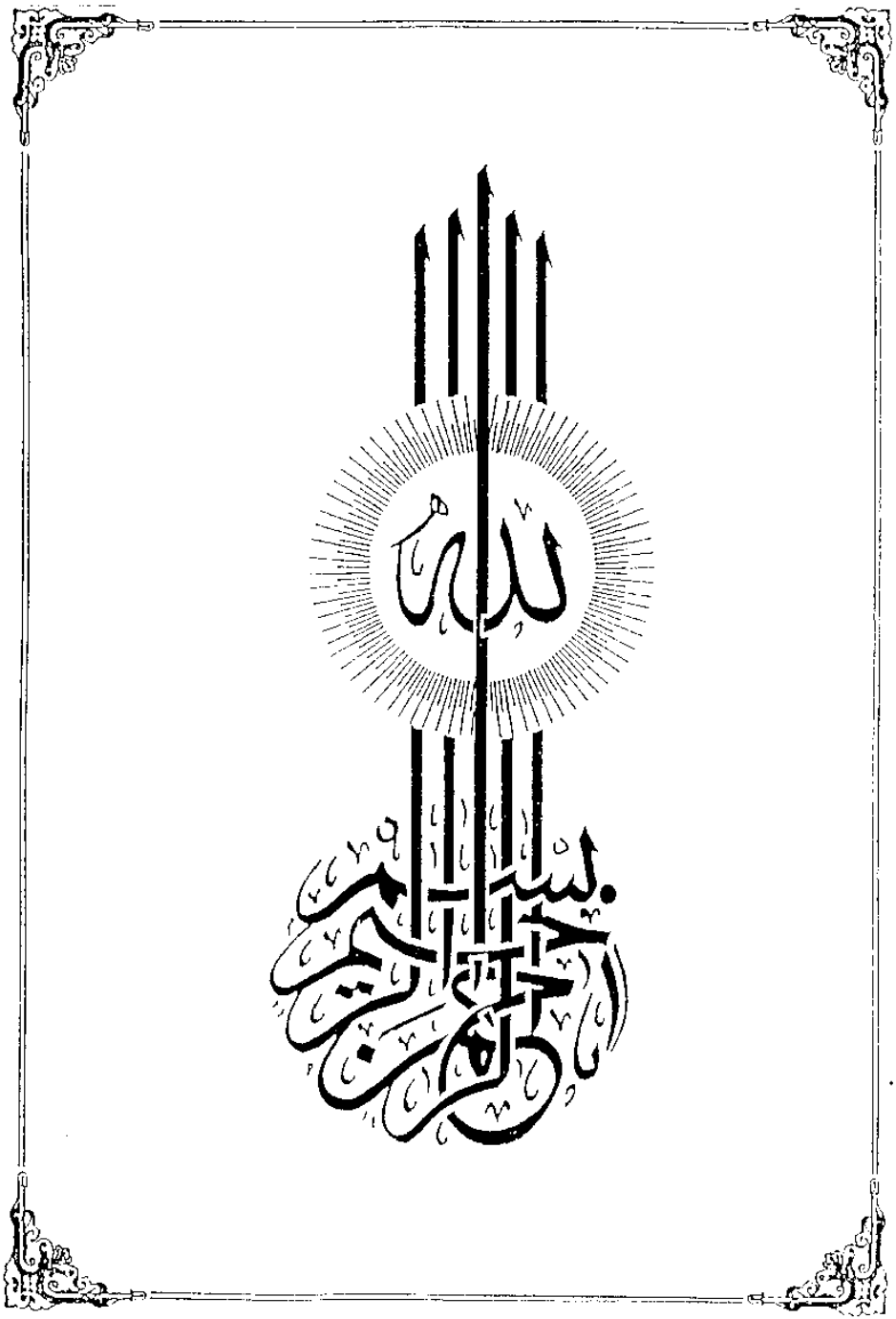

CONTENTS

INTRODUCTION

AIM OF THE WORK

INTRODUCTION AND AIM OF THE WORK

The heart muscle is rich in enzymes that catalyze a variety of biochemical reactions. The serum activity of many of these enzymes may be greatly increased by various diseases. Studies during the past 20 years have established that measurement of the blood levels of certain enzymes is a valuable laboratory aid in the diagnosis of myocardial injury. While the increase in levels of serum activity of these enzymes are more sensitive indicators of tissue damage than are such phase reactants as sedimentation rate and C-reactive protein, the wide spread tissue distributior of the clinically significant enzymes precludes the desired specificity of a laboratory test. Hamolsky(1967) .

Critical integration of the results of these tests with all other elements of the clinical picture is essential to their meaningful use diagnostically. When used in this manner, determinations of serum levels of enzyme activity are corner stones in the laboratory diagnosis of myocardial necrosis and ischaemia .

Anaemia may affect the heart by direct impairment of its oxygen supply or by increasing its mechanical load through the alteration of its circulatory dynamics. When severe anaemia develops acutely from rapid and profuse blood loss,

symptoms of shock may dominate the picture , not because of anaemia but because of an insufficient cardiac output due to a deficient blood volume. As a rule manifestation of circulatory disturbances appear in chronic anaemias only when the anaemia is very severe . Friedberg(1969) .

According to Brannon et al (1945) , serious disturbances did not usually occur in their patients untill the haemoglobin fell below 7 gm per 100 c.c., but moderate circulatory abnormalities appeared when the haemoglobin level was between 8 and 9 gm % .

Aim of work :

Anaemia is prevalent in Egypt because of Ankylostoma infestation , malnutrition, Mediterenean Cooly's anaemia and chronic infections. Heart diseases are also prevalent in our country. Our aim is to study the effect of different types and degrees of anaemia on the cardiovascular system.

REVIEW OF LITERATURE

ANAEMIA

ANAEMIA

DEFINITION :

Anaemia means a reduction in the concentration of haemoglobin in the peripheral blood below the normal for the age and sex of the patient .

Determination	Males	Females	Children (3months -13Y.
Haemoglobin(gm%)	14.0-17.0	12.0-15.0	10.0-14.5
Haematocrit(per/cent)	42-53	38-46	31-43
Erythrocytes(millions/mm^3)	4.6- 6.2	4.2-5.4	3.8-5.2

Table : Normal ranges of peripheral erythroid values Linman (1975) .

PATHOLOGICAL PHYSIOLOGY :

In anaemia , because of the reduced oxygen carrying capacity of the blood, reduction of the amount of oxygen available to the tissues will occur . This results in tissue hypoxia with subsequent impairment of function of the body tissues. The symptoms and signs of anaemia are thus referred to many systems, the deterioration in the functions of the individual tissues will depend on their normal

oxygen requirements, so the tissues with higher oxygen requirements e.g., the cardiovascular system, central nervous system and skeletal musculature, will be affected more than those with little oxygen requirements ,
De Gruchy (1978).

Physiological Compensatory Adjustments In Anaemia : -

The aim of these adjustments is to achieve the most effective use of available haemoglobin. These occur first in the red blood cell itself and secondary in the circulation.

(1) Increased oxygen delivery to the tissues by the red cell:

By increasing extraction of oxygen haemoglobin i.e., each unit of Hb release more oxygen to the tissues .

The mechanism is by increase of the red cell 2,3 diphosphoglycerate(2,3 DPG) which combines with the red cell haemoglobin and decreases its affinity for oxygen .

(2) Increase in cardiac output and in the rate of circulation of the blood : -

The increase in cardiac output (C.O.) is mainly due to increase in the stroke volume of the heart and to a less extent due to increase in the heart rate .

(3) Maintenance of total blood volume : -

This occurs by expansion of plasma volume to maintain an adequate circulation .

(4) Redistribution of blood flow : -

The blood is deviated from the tissues with low oxygen requirements to tissues with higher requirements.(Huehns (1971)

CLASSIFICATION OF ANAEMEA : -

Anaemia may be classified either on a pathological or morphological bases .

(A) PATHOLOGICAL CLASSIFICATION

I - Blood loss .

Acute Post-haemorrhagic anaemia .

Chronic post-haemorrhagic anaemia .

II - Excessive destruction of erythrocytes (haemolytic diseases) .

a - Extra corpuscular factors .

1. Antibodies .
2. Infection (e.g., malaria , etc..)
3. Splenic sequestration and destruction .
4. Associated disease states e.g. lymphoma .
5. Drugs, chemical and physical agents .
6. Trauma to RBC .

b - Intracorpuscular defects .

Congenital :

1. RBC enzyme deficiency .
2. Thalassemias .
3. Abnormal haemoglobins .
4. Red cell membrane defects (e.g. heriditary spherocytosis) .

Aquired

Paroxysmal nocturnal haemoglobinuria .

Combined

G-6-PD deficiency of mature erythrocytes .
El-Tahtouy (1978).

III- Inadequate production of mature erythrocytes

a - Deficiency of essential substances .

1. Iron, folic acid, vit. B_{12} .
2. Protein .
3. Possibly ascorbic acid .

(plus rarely other vitamins, hormones or mineral deficiencies)

b - Primary bone marrow failure .

1. Generalized : aplastic anaemia .
2. Selective : red cell aplasia .

c - Bone marrow infiltration : -

1. Leukaemias, lymphoma .
2. Myelofibrosis .
3. Carcinoma, sarcoma .
4. Reticulo-endothelial storaga diseases (e.g., Gaucher disease) .

d. Anaemia of chronic disorders .

1. Inflammatory disorders .
2. Renal diseases (erythropoietin deficiency).
3. Liver diseases .
4. Endocrine diseases (as myxoedema,addison disease , adrenal insufficiency, pituitary insufficiency) and sometimes hyperthyroidism . Rivilin and Wagner (1969) .

e . Sideroblastic anaemia . Hardisty and Weatherall (1974).

(B) Morphological Classification : -

The morphological classification depends on the characterist changes in the size and haemoglobin content of the red corpuscles that occur in various types of anaemia .

In the morphological classification of anaemia we depend on two features, namely the average cell volume (MCV) and the average cell haemoglobin concentration (MCHC) .

(1) Normochromic normocytic Anaemia .

(MCV = 82-92 μ^3),(MCHC= 30-36%) .

(2) Hypochromic microcytic Anaemia

(MCV < 80 μ^3),(MCHC < 31%) .

(3) Macrocytic anaemia .

(MCV > 94 μ^3),(MCHC > 36%).

Wintrobe (1974) .

CLINICAL EFFECTS OF ANAEMIA :

Before we discuss the different clincial manifestations in different organs in anaemia, it must be noted that these manifestations are due to first to the anaemia itself and secondly to the disorder causing the anaemia. Also these manifestations depend on the degree of anaemia and the nature and severity of the causative disorder, so the haemoglobin level at which symptoms of anaemia develop depend on two factors .

(1) The rate of development of anaemia .

(2) The age of the patient .

The rapid the rate of development of the anaemia the higher the level of haemoglobin at which symptoms will be