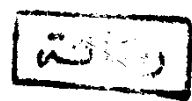# ANEMIAS ASSOCIATED WITH

NEOPLASTIC DISORDERS

Thesis

Submitted for partial fulfillment

of the degree of M.S. in

Medicine

By

EMAN AHMED HAFEZ

M.B.B.Ch.

Supervised by

Prof. Dr.MOHAMED SADEK SABBOUR

Professor of Medicine

Ain Shams University

Prof. Dr.TARIF HAMZA SALLAM

Professor of Clinical Pathology

Ain Shams University

Prof. Dr. LAILA FARIS

professor of radiotherapy.

Ain Shams University.

Co-Supervisor

Dr. INAS ASSFOUR

Lecturer of Medicine

Ain Shams University

1990

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INTRODUCTION

AND

AIM OF THE WORK

INTRODUCTION

Anemia is commonly encountered in neoplastic disorders, including Hodgkin's disease and a variety of solid tumours such as carcinoma of lung and breast. Other factors may contribute to the development of more severe anemia in cancer patients. In those with gastrointestinal cancer, blood loss can be the predominant factor. Chronic gastrointestinal bleeding will lead to iron deficiency. Furthermore, cancer patients are often malnourished and may develop folate deficiency. Rarely, patients with disseminated malignancy develop severe hemolytic anemia.

Finally, suppression of hematopoiesis by chemotherapeutic agents or radiation therapy may aggravate anemia.

AIM OF THIS WORK

To delineate the prevailing pathogenetic mechanism of anemia in cancer patients with solid tumours.

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REVIEW OF LITERATURE

DEFINITION OF ANEMIA

Statistical consideration:

Anemia is defined as a reduction in either the volume of red blood cells termed the hematocrit or packed cell volume (PCV), or the concentration of hemoglobin in a sample of peripheral venous blood when compared with similar values obtained from a reference population.

Normal values for red blood cell measurements are given in the following table:

Age	Haemoglobin(gm/dl)	Haematocrit(%)	MCV(U^3)
1-3 days	18.5 (14.5)	56 (45)	108(95)
0.5-2 yrs.	12 (10.5)	36 (33)	78 (70)
12-18 yrs.			
Male	14.5 (13)	43(37)	88 (78)
Female	14 (12)	41 (36)	90 (78)
16-40 yrs.			
Male	15.5 (13.5)	47(41)	90 (80)
Female	14 (12.0)	41 (36)	90 (80)

Selected haematologic values in normal individuals of various ages (Keitt,1988).

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By convention the normal range is defined to include 95 per cent of a reference population that is assumed to have a normal distribution.

In this definition 2.5 per cent of "normal individuals" will fall below this arbitrary statistical limit and be classified as anemic.

Some of these individuals in the general population will be truly anemic while others are statistical outliers. Unfortunately this statistical definition of anemia may fall to detect truly anemic patients whose hematocrits have decreased significantly without leaving the defined normal range. Here the only valid reference figure is a previous hematocrit in that individual.

II-Red cell mass:

Anemia can be more defined as a reduction in red cell mass (a misnomer for the total volume of circulatory erythroid cells in the body).

Red cell mass can be accurately measured by isotope dilution using ^{51}Cr-labeled red cells, a procedure usually employed to establish increased red cell mass, i.e. erythrocytosis, rather than anemia. This measurement is occasionally useful for assessing anemia in patients with marked splenomegaly in whom the peripheral hematocrit underestimates the true red cell mass.

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Compensation for Anemia:

I)Increased Plasma Volume:

Initial symptoms of patients with anemia are related to efforts by the body to compensate for the dimininshed oxygen. Lattre symptoms of progressive anemia reflect failure of these compensatory mechanisms.

The symptoms and signs differ markedly depending on the acuteness of onset of the anemia. The abrupt loss of 30 per cent of the circulating blood volume in a patient with gastrointestinal hemorrhage will result in a marked postural hypotension, a fall in cardiac output, shunting of blood from skin to central organ, thirst and air hunger.

In contrast, the gradual loss of 30 per cent of the circulating red cell mass in a patient with iron deficiency may occur without any symptom at all. The major difference lies .in the blood volume, which is maintained by a proportionate increase in plasma volume as a compensatory response in most chronic anemias but is compromised in acute hemorrhage.

Because the central blood volume is maintained until very late in the course of a progressive chronic anemia, such patients are susceptible to volume overload by transfusions. The injudicious administration of whole blood and even packed red cell may precipitate acute congestive

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heart failure in a previously well compensated individual.

II) <u>Increased cardiac output</u>:

In chronic anemia cardiac output increases to circulate fewer red cells through the tissues more frequently. This process is abetted by the diminished viscosity of blood or low hematocrits but is ultimately limited by the capacity of the heart to respond to the increased work. An early sign of failing compensation in gradual-onset anemia is postural hypotension, which may be associated with palpitations, dizziness, throbbing headaches, and dyspnea on exertion.

III) <u>Reduced Affinity of Haemoglobin for O2 in anemia</u> :

In anemia the oxyhemoglobin dissociation curve usually shifts in a manner to increase the quantity of oxygen released in tissues without appreciable altering the quantity of oxygen bound in the lung.

Red cell 2,3-diphosphoglycerate (2,3-DPG) regularly increases in anemic patients to mediate this effect. Maximum elevation of RBCs 2,3DPG increases oxygen delivery only about 30 per cent, but this is a highly efficient form of compensation requiring no significant expenditure of energy.

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ASSESSMENT OF SYMPTOMS IN ANEMIA

Anemia is usually insidious in its onset and has no specific symptoms to alert the physician to its presence.

Usual fatigue is the earliest and most complaint, but other more subtle changes such as loss of libido or alternation in mood or sleep patterns may be elicited prior to the awareness of the more typical cardiovascular symptoms mentioned above.

The level of anemia at which symptoms occur is highly variable among individuals as would be expected from the widely differing degrees of physical activity, physical conditioning, circulatory adequacy, and sensitivity or stoicism of the population.

In other wise healthy individuals symptoms are usually present when the hemoglobin falls below 7 or 8 grams per deciliter.

Exceptions to this general rule are not infrequent. An occasional patient with a gradual-onset anemia, may deny all symptoms despite a hemoglobin of 5 grams per deciliter.

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Conversely, and more commonly, patients with mild anemia of 9 or 10 grams of hemoglobin per deciliter may complain bitterly of fatigue and lassitude. A careful search for underlying systemic disease or depression is warranted in these patients. Finally, because oxygen transport is much more compromised by impaired circulation than by diminished oxygen-carrying capacity per se, patients with vascular or cardiac disease may become symptomatic with milder degrees of anemia.

For example, angina, claudication, transient ischemic attacks, and cardiac failure can occur or be exacerbated with relatively mild anemia. In essence, each organ within each patient sets its own functional definition of anemia (Keitt, 1988).