screening for Iron stores in healthy primigravid women

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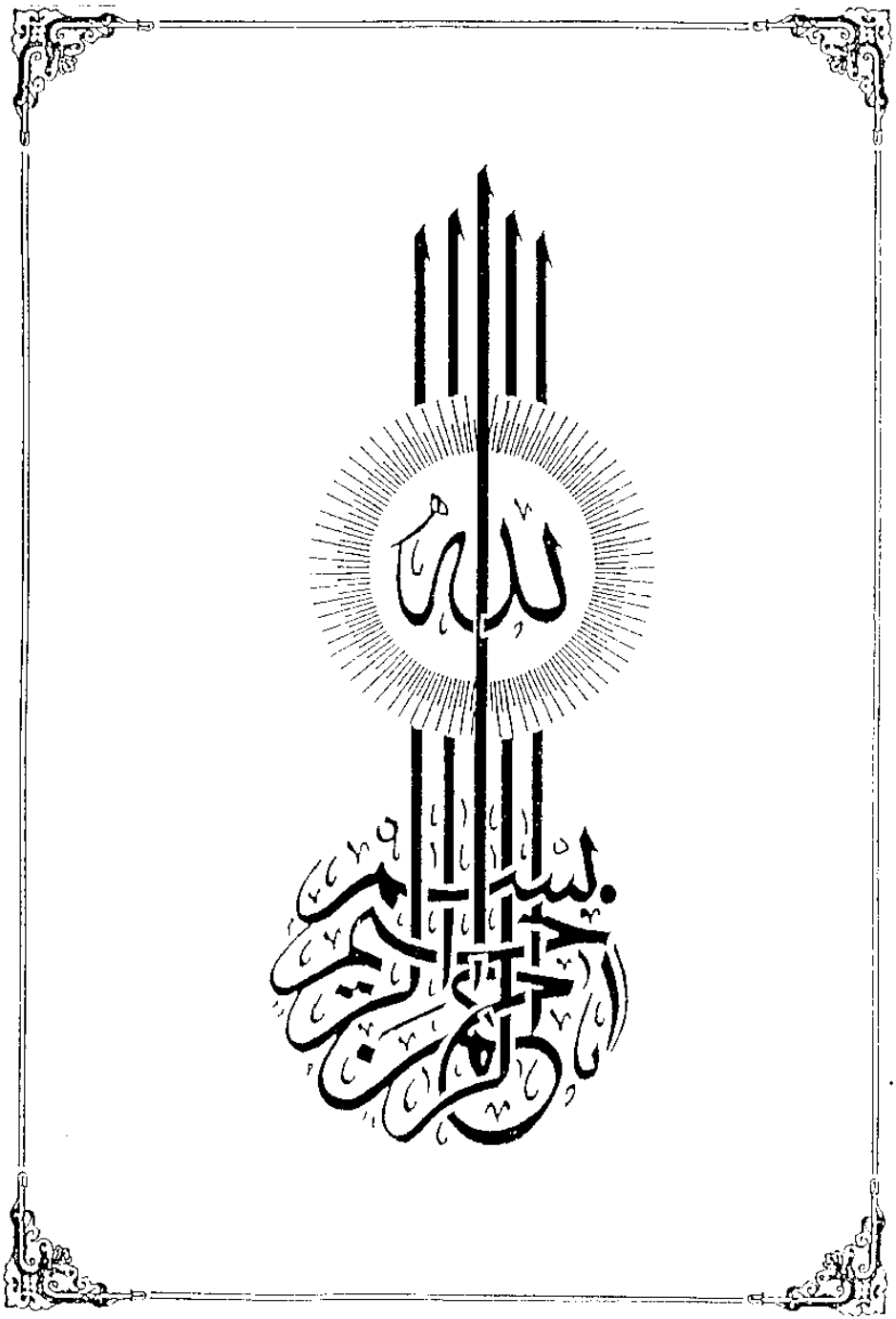

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CONTENTS

INTRODUCTION

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Anaemia can be defined as a state of chronic oxygen lack i.e a decreased capacity of blood due to defect in the number or function of circulating red cells. (the latter is termed). The number of RBCS could be expressed as hematocrit of packed cell volume (P.C.V.) or as the total haemoglobin content in a sample of peripheral venous blood. It's important to know that anaemia is not a disease but it is a manifestation of some underlying disorder *(Cecil, 1988)*.

The total body iron content of a healthy young woman of average size is probably in the range of 2.0 to 2.5 grams, which enters in the formation of haem iron , enzymes, myoglobin and in transferrin bound circulating iron. The rest of this amount constitutes the iron stores which are only about 300 mg *(Pritchard and Mason, 1964)*.

The iron requirement during normal pregnancy is about 1000 mg. About 300 mg are actively transferred to the foetus and placenta *(Widdowson and Spray, 1951)*. and about 200 mg are lost through various normal routes of excretion on the other hand, the increase in the

total volume of circulating erythrocytes needs about 500 mg iron.

So, there is a high incidence of iron deficiency anaemia in pregnancy because many women of child bearing age are in precarious iron balance and because the foetal iron requirements are satisfied before maternal iron needs *(Pritchard Jk, MacDonald JS, 1985)*.

AIM OF THE WORK

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The aim of this study is to demonstrate the incidence of iron deficiency anaemia and to demonstrate that serum Ferritin level is the most accurate test for diagnosis of iron deficiency and iron stores in pregnancy.

REVIEW OF LITERATURE

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Erythrocytes :

Cells of the erythroid series have the same mechanism for synthesis as any cell, but with the unique capacity for haemoglobin synthesis. The earlist morphologically distinct erythroid precursor is the proerythroblast (or pro-normoblast). ***Izak G. (1977).***

It can synthesize D.N.A, R.N.A and protein together with carbohydrate and enzymes. It is characterized by a large nucleus with clear and delicate chromatin pattern nucleoli. The cytoplasm contains abundant R.N.A, ribosomes mainly in the form of polyribosomes, endoplasmic reticulum, together with few microtubules and fibrils, a large number of mitochondria and a centrosome composed of centrioles and well - formed Golgi body. ***(Lewis S.M., Bayly R.J. 1985).***

There may be ferritin molecules scattered throughout the cytoplasm.; To this ferritin comes iron which has been brought to the cell membrane bound to transferrin and then passes across the membrane into the cell. Some of iron is taken up in the mitochondria, where protoporphyrin rings are synthesized from succinate and glycine, into which the iron is incorporated to from the haem which will be used subsequently

to produce haemoglobin *(Ricketts C., Cavill J., Napier J.A.F., Jacobs A. (1977))*.

The erythroid cell is unique in that it loses its nucleus at mature stage whilst retaining its functional capacity. *(Izak G. 1977)*. As the cell matures, its D.N.A activity becomes suppressed. This leads to chromosome condensation with cessation of differentiation. After the erythrocytes have matured they survive in circulation for about 120 days (S.D.$\pm$ 15 days) *(Giblett E.R., Coleman D.H., Pirzio Biroli G., Matulsky A.G., Finch C.A. (1956))*.

There are 2 methods for measuring the life span and rate of destruction of red cells using radionucleotide markers, namely cohort and randum labelling. In Cohort labelling a population of red cells is labelled during the production in the bone marrow. Peripheral blood radioactivity is then monitored over a period of time to detect the release of these cells into the circulation and their subsequent removal. Labelled amino acids such as glycine and radioactive iron (^{59}Fe) are generally used for Cohort labelling.

Randum labelling, in which a sample of circulating blood is labelled with radioactive sodium chromate (^{51}Cr) is simpler and is the method of choice in most clinical situations *(Dacie and Lewis, 1984)*. The

destruction of red cells at the end of their life span is by phagocytosis in the reticuloendothelial-system. (RES) This occurs partly in the spleen, *(Ferrant A., Cauwe F., Michaux J.L., Beckers C., Verwilghen R.L. 1982).* But RES cells throughout the body, notably in the bone marrow, also take part in the process. With phagocytosis the constituents of the erythrocytes are disassembled : amino acids are returned to the body protein pool; iron is freed from haem and is transported, bound to transferrin, back to the marrow for re-use in a new cycle of erythropoiesis *(Cazzola M., Huebers H.A., Sayers M.H., Mac Phail P., Finch C.A. (1985)).*

The breakdown of protoporphyrin ring releases carbon which escapes through the lungs as carbon monoxide, whilst the remaining pyrol ring is carried as bilirubin to the liver where it is conjugated to glucuronoide and excreted. During the phase of excretion in the gut, bacterial action converts the conjugated bilirubin to urobilinogen it is in this form that it appears in the stool, whilst a small proportion is reabsorbed and excreted in urine. *(Berlin N.I., Berk P.D. (1981)).*

ERYTHROPOIESIS

The essential purpose of erythropoiesis is to provide a vehicle for the transport of haemoglobin. Normal erythropoiesis requires the production of an adequate number of erythrocytes at a rate determined by the body's demand.

The origin and sites of erythropoiesis :- **(Fig.1)**

In common with granulocytes and megakaryocytes, erythroid cells are derived from a mesenchymal stem cells which appears in the yolksac in two - week old embryos. At the sixth week, the liver becomes a haemopoietic organ and the mesenchymal cells differentiate into reticulum cells and colony forming cells. The liver becomes the main site of haemopoiesis by the 12 th to 16 th week and remain active until few weeks before birth. The spleen, is a relatively minor organ of erythropoisis, beginning to function in this role at about the same time as the liver and continuing until gestation. The bone marrow becomes a site of erythropoiesis from about 20 weeks, increasing rapidly in its activity during the last trimester of pregnancy. Meanwhile, during the developmental process, the cells have further differentiated into primitive erythroblasts and then into definitive pronormoblast and normoblast which