STUDY OF PREVALENCE AND EPIDEMIOLOGY OF IRON DEFICIENCY ANAEMIA AMONG PREGNANT WOMEN AT TAHTA TOWN.

THESIS

Submitted in Partial Fulfilment of the

Master Degree in Public Health .

By

RIZK HANNA RIZK

M.B.B.Ch.

Under Supervision of

Prof.Dr.ALY MASSOUD

Professor and

Chairman of Community

Environmental and

Occupational Medicine.

Assist.Prof.Dr.AHMED H.

ABD ELKAREEM

Industrial Medicine Unit,

Natural Research Center.

Dr. AHMED SHAREEF HAFEZ

Lecturer of Community, Environmental and

Occupational Medicine

Faculty of Medicine

Ain Shams University

1981

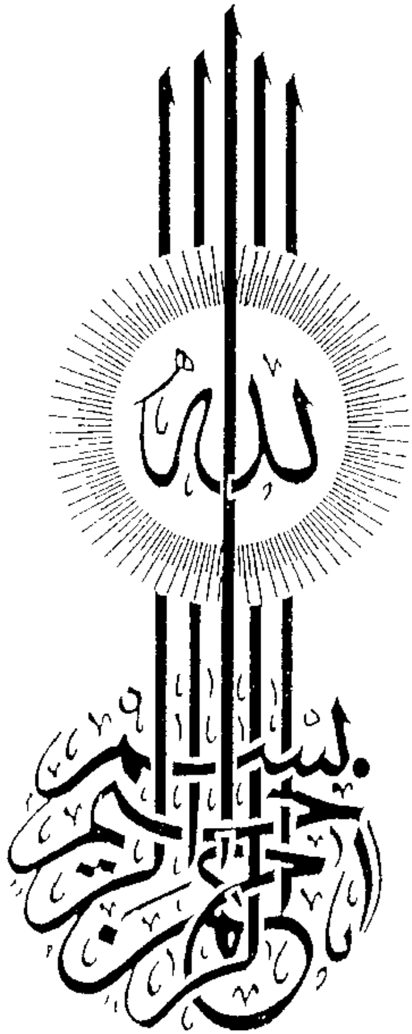
A C K N O W L E D G M E N T

It is advantageous to work under the supervision of Professor Dr. ALI MASSOUD, to whom I wish to express my deep gratitude and thanks for his kind supervision, encouragement and energetic help in following the details of this work with constructive criticism.

I am highly indebted to my supervisor assistant Professor Dr. AHMED H. ABD ELKAREEM. His inspiring ideas were of utmost value to elucidate this work and I would like to take this occasion to thank him for his kind help and continuous advice to ensure that this work would reach an updated level.

I wish to acknowledge my thanks to Dr. AHMED SHAREEF HAFEZ for his kind attention and his cardinal help presented to me throughout this work and supervision.

My great thanks are also to our patients who had tolerated my investigations and without help this work would have not seen the light.


بسم الله الرحمن الرحيم

C O N T E N T S

INTRODUCTION

Anaemia is a health problem in the most of the developing countries of the tropics and subtropics (W.H.O. 1959, W.H.O. 1975). It occurs more frequently among vulnerable groups of the low socio-economic societies.

Anaemia has been attributed to many aetiological factors, either acting alone or in combination with each other. Of these factors are the following :

1) Dietary iron deficiency (Foy & Kondi, 1957).
2) Protein deficiency (Sandozai et al., 1963).
3) Parasitic infestation due to hookworm or plasmodium malaria (Rhods et al., 1934).
4) Vitamin B_{12} or folic acid deficiency (Rajusuriya et al., 1960).
5) Metabolic disorders involving riboflavinosis (Foy et al., 1961) or liver function (Lareson, 1948).

The institution of adequate measures for control and prevention of such anaemia depends on the availability of knowledge on their character, aetiology and pathogenesis. Such knowledge is to some extent inadequate.

Although much studies concerned with iron metabolism including its absorption, transport, storage and excretion in normal and iron deficient individuals have been done, yet few investigations have been carried out on protein-calori deficiency anaemia.

Iron deficiency anaemia is characterised by a low haemoglobin giving less colour than normal to the red blood cells.

Severe anaemia in pregnant women increases the maternal morbidity and mortality and involves a higher risk for the fetus (Liewellyn-Jones, 1965).

Many reports have disclosed a very high prevalence of nutritional anaemia and deficiency of haematopoietic nutrients in people of all age groups but especially among pregnant women. Although nutritional anaemia is a worldwide problem, its prevalence is highest in developing countries (Chopra et al., 1967; Sood & Ramulingaswani, 1968; Rachmilewitz, 1966).

The present work has been designed to entail investigation on anaemia due to iron deficiency through the following lines :

Clinical examination of pregnant women in Tahta town and biochemical analysis of blood for the haemoglobin, haematocrit, serum iron, serum iron binding capacity and percent of transferrin as well as routine urine and stool analysis have been done for every woman for parasitic infestation.

IRON METABOLISM

1- Distribution of Iron in the Body :

Although iron is present in the body in relatively small amounts, it is of great importance to the life and function of all cells and of the organism as a whole.

Iron is a component of haemoglobin, myoglobin, the cytochromes, catalase, peroxidase and certain other enzyme systems. As a part of these heme complex and metalloenzymes, it serves important functions in oxygen transport and cellular respiration. The body of a normal adult contains approximately 2 to 6 gm of iron, depending largely on the body weight and the circulating mass of haemoglobin. One half to two thirds of this total is found in haemoglobin, 0.5 - 1.5 gm. stored chiefly in organs rich in reticuloendothelial cells (liver, spleen, bone marrow). All the rest-plasma, myoglobin and cellular or parenchymal iron-amounts to only several hundred milligrams.

Deficiency of iron leads to the development of hypochromic microcytic anaemia, probably the commonest of all deficiency diseases and certainly one of the two or three most common anaemias in the world today. Iron excess or overload is of increasing clinical importance, it occurs in haemochromatosis, transfusion hemosiderosis or as a consequence of prolonged excessive oral intake (Moore, 1962).

2- Irom Requirements :

The daily requirements of iron differ according to the age and physiological needs of the body. A child under 12 years of age needs from 7-12 mg, a pregnant woman in the second half period of pregnancy requires not less than 15 mg, while the requirements of an adult male ranges from 3 - 15 mg daily.

3- Iron Absorption :

Between 1930 and 1940 many clinical studies on iron retention were done by means of balance studies, most of which were well carried out. After 1940, with the introduction of methods based on the utilization of radioactive, iron balance studies were largely abondoned.

Turntrull (1974) stated that absorption of iron is influencedby a variety of factors some operative in the lumen of the gut, some in mucosal cells and some in the blood. The site of action of others is undetermined.

Factors Affecting Absorption of Iron :

A- Luminal Factors :

1- Quantity :

The amount of iron absorbed increases with increasing quantity presented to the intestinal mucosa. In rats and mice the relation between dose and amount absorbed appears to the linear above a threshold dose which is higher in iron deficient animals, below this amount the relationship is non linear, the percentage absorbed decreases with increasing dose (Gitlin and Cruchaud, 1962; Wheby et al., 1964). In man, there is a loglinear relationship between the dose and the amount absorbed at all dose levels (Bothwell and Finch, 1962).

This appears to hold both for ionisable iron and for iron bound in heme. (Bannerman, 1965, Conard et al., 1966).

2- Chemical Form :

a) Inorganic Iron :

Simple ferrous salts are better absorbed than more complex salts and ferric salts (Brise and Hallberg, 1960). To a large extent the superior absorbability of ferrous iron can be attributed to its greater solubility of the pH of the intestinal contents, since ferric iron is barely soluble at pH greater than 2.5. If iron solution is presented at pH 2, isolated rat jejunal mucosa takes up iron equally well from ferric chlorides as from ferrous salts (Rummel, 1965).

Thus does not prove that the iron is absorbed in the ferric state since in such an experiment about one third of the ferric iron becomes reduced to the ferrous state within 15 minutes of contact with the mucosa (Forth and Rummel, 1973). The production of iron deficiency in growing rats by the administration of oral dipyridyl, which binds only ferrous iron (Lintzel, 1933) and the blocking effect of dipyridyl on absorption of ferric and ferrous iron (Venkatachalam et al.,1956) could be explained by the tendency for iron to be reduced in the lumen of the gut do not necessarily indicate that iron must be reduced before it is absorbed. Further studies are needed on uptake by isolated mucosa,but seems probable that the effects of gastric acidity and of reducing agents are due to their capacity to maintain iron in the soluble ferrous state.

b) Food Iron :

Early rather limited studies indicated that food iron is less well absorbed than inorganic iron and that with the exception of iron in egg, iron in animal food is better absorbed than iron of vegetable origin (Moore, 1961). Comparative studies in a large number of subjects (Layrisse and Martinez, 1971) have shown mean absorption of vegetable iron in normal and iron deficient subjects to range from 1% for rice and spinach to 7% in soybean. Higher absorption of iron in wheat and beans has been found in iron depleted blood donors, but the amounts absorbed were much less than that of ferrous salt (Mameesh et al., 1970). Iron in bread is poorly absorbed (Callender and Warner, 1968;Elwood et al., 1968). These vegetable foods form the staple diet of much of the world's population and the poor absorption from this source is a factor in the aetiology of iron deficiency in many countries.

3) <u>Dietary Factors</u> :

The differences in absorption from individual foods may be due not only to the chemical nature of the iron in each food but also to its interaction with other food compounds.

a- <u>Iron content</u> :

In rats, a change in the iron content of the diet leads to a change in absorption of a test dose of inorganic iron within five days. A diet of high iron content reducing absorption and a diet of low iron content increasing absorption (Bannerman et al., 1962; Charlton et al., 1965).

Attempts to demonstrate the phenominon in man have largely been unsuccessful (Kaufman et al., 1966, Rush et al., 1966).

b- <u>Blocking factors</u> :

Poor absorption of iron of vegetable origin can be attributed to the presence of oxalate, phosphate and particularly phytate which bind a unique iron and reduce its solubility (Sharpe et al., 1950; Forth and Rummel, 1966; Peters et al., 1971).