NUTRITIONAL ANEMIA IN PREGNANCY

by

MEI-LING WOO

B.S., Fu-Jen University, 1973

A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Foods and Nutrition

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1976

Approved by:

Beatrice Finkelstein

Major Professor

LD
2665
R4
1976
W66
c.2
Document

to my Parents

TABLE OF CONTENTS

INTRODUCTION

Anemia is the most common single objective finding in medical practice. It is indicated by a lower than normal level of hemoglobin in the circulating blood. It may be caused by a reduced number of red blood cells or by a lowered quantity of hemoglobin in the cells or both. Normal hemoglobin levels vary with age, sex, weight, physiological status, and altitude (1). During growth as well as pregnancy, blood volume is increased. During these growth periods a need occurs for an increased iron intake as well as several other nutrients required for synthesis of hemoglobin. When nutrient needs do not meet these requirements, anemia occurs.

Diagnosis of anemia is usually based on some measure of hemoglobin or red cell mass per unit volume of peripheral blood. It is necessary therefore to have an understanding of the physiologic changes that occur in blood during pregnancy.

Physiologic changes in plasma, red cells, and total blood volume occur during pregnancy. Determination of a precise hemoglobin level during pregnancy that can be called "anemia" is often difficult to assess. The WHO (World Health Organization), however, has established normal blood values for pregnant women. For persons with values below these, a diagnosis of anemia is made (2,3). Blood values indicative of anemia are contained in Table 1.

Nutritional anemia is the result of a deficiency of iron and folic acid (4,5,6). Deficiency of vitamin B-12 also produces anemia. This deficiency may be secondary to the lack of an intrinsic factor, a substance essential for the absorption of vitamin B-12 (7). Most of this paper deals with the former type of anemia, i.e., resulting from an iron and folic acid deficiency.

Table 1: Blood values indicative of anemia during pregnancy

Hemoglobin	11 g per 100 ml of blood
Red Blood Cell	3.3 million per cu mm of blood
Packed Cell Volume	29 mg per 100 ml of blood
Mean Capsular Hemoglobin	87 mg per 100 ml of blood
Mean Cell Hemoglobin Concentrate	34 mg per 100 ml of blood

World Health Organization Scientific Group: Nutritional Anemia, World Health Organization Techn. Rep. Ser., 1959 & 1968.

Persistent anemia in pregnancy is associated with increased infant morbidity and mortality. Severe anemia often causes maternal complications, and in some instances is the cause of death (8,9,10). Prevention of anemia is an essential part of prenatal care.

CLASSIFICATION

(A) Hypochromic Anemia is caused by an iron deficiency. As a result of this anemia, blood cells are pale. In the normal red blood cell, iron is a structural component of the hemoglobin molecule. During a 24 hour period as much as 6.3 g of hemoglobin, containing 21 mg of iron, can be synthesized and degraded (7). An inadequate supply of iron for the developing erythroid cells becomes apparent in a short time. Erythropoiesis is diminished and small erythrocytes having decreased hemoglobin concentration are formed. The erythrocyte is pale, misshaped, and has a shortened survival time (11).

(B) Megaloblastic Anemia is caused by a folic acid deficiency. The erythrocytes are larger than normal, have an excessive amount of

cytoplasm and a disproportionate aging of the nucleus (11). Folic acid is necessary for erythrocyte maturation which occurs in the bone marrow. Lack of this vitamin interferes with the synthesis of both nucleic acids and nucleo-proteins. Hence, large nucleated red cells (megaloblasts) are formed and are discharged into the blood. Usually these cells contain normal or increased amounts of hemoglobin. However, the number of cells produced is sharply reduced so that total hemoglobin is less than normal. The survival time of these cells is decreased (11).

(C) Pernicious Anemia is caused by a vitamin B-12 deficiency. It is a megaloblastic type of anemia. It produces many of the same symptoms which occur in a folic acid deficiency, such as fatigue, pallor, shortness of breath and gastrointestinal discomfort (11). Deficiency of vitamin B-12 is associated with abnormalities in nucleic acid metabolism (12). Erythrocyte precursors, normoblasts and reticulotytes, are larger than normal. Mature red cells also are large (macrocytes) but contain normal or even higher concentrations of hemoglobin. The total red cell count however is decreased (11).

INCIDENCE

Numerous investigations of nutritional anemia of pregnancy have been conducted around the world. These studies conclude: all types of nutritional anemia are prevalent in (1) low-income, low socioeconomic groups; (2) women who have had successive pregnancies; (3) women giving birth to twins; (4) women engaged in prolonged breast feeding prior to their pregnancy; and (5) adolescent mothers with inadequate dietary patterns (6,8,13).