STUDY OF NEUTROPHIL FUNCTION AND MYELOPEROXIDASE ENZYME ACTIVITY IN PREGNANCY

Thesis Submitted

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in

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Presented by

Hoda Mohamed El-Gindi

SUPERVISED BY

Professor Fadila Hassan Sabry

Prof. of Clinical Pathology

Dr. Salwa Mohamed Youssef

Ass. Prof. of Clinical Pathology

Dr. *Mona Mohamed Rafik*

Lecturer of Clinical Pathology

FACULTY OF MEDICINE

AIN SHAMS UNIVERSITY

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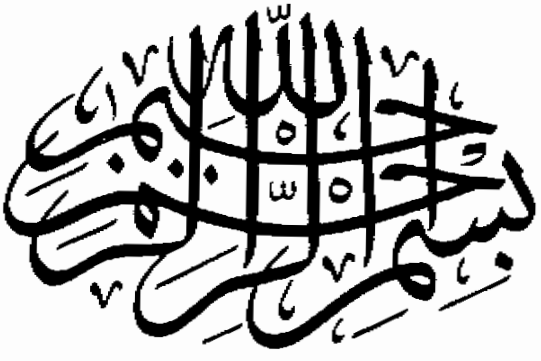

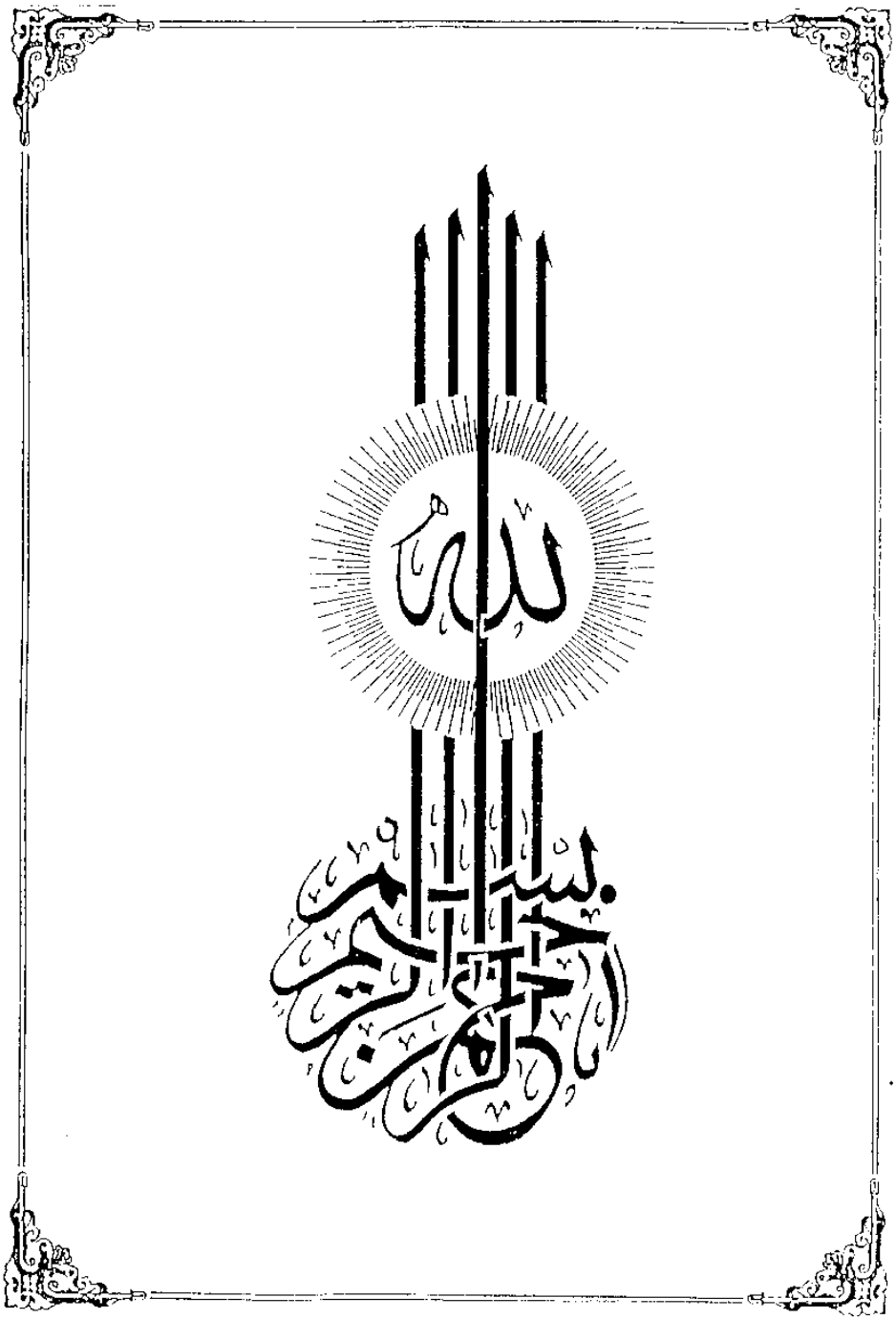

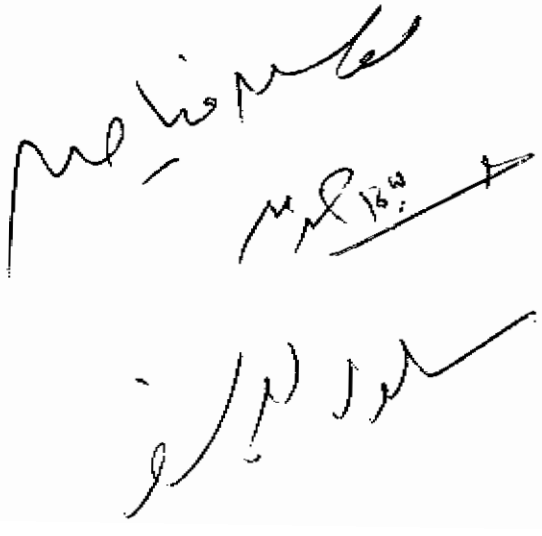

To My Parents

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INTRODUCTION AND AIM OF WORK

Normal pregnancy involves extensive adjustments in maternal physiology that are often reflected in characteristic alterations in a number of laboratory indices. Mitchell et al.,(1966) have shown that pregnant women have a mild neutrophil leucocytosis compared with non pregnant females. These neutrophils showed morphological abnormalities with larger and more pronounced granules. The significance of these changes is not understood and it is not clear whether they are accompanied by any changes in neutrophil function or not. At the same time it has been suggested that pregnant women are more susceptible to many infections namely viral and urinary tract infection (Mitchell and Sbarra, 1965) with an increased incidence of asymptomatic bacteruria. The exact factor or factors responsible for this is not known. Thus great attention is given by many scientists regarding the relation between pregnancy and neutrophil function and the results are conflicting. Mitchell and Sbarra (1965) and Persellin and Thoi, (1979) reported that there

is evidence that serum of pregnant females depresses some of the neutrophil function. On the contrary Mitchell et al., (1966) said that neutrophils show a hyperphagocytic and bactericidal activity during pregnancy which is normal or slightly reduced in cases showing asymptomatic bacteruria. They suggested that the function is enhanced by humoral factors Recently, El-Maallem and Fletcher (1980) claimed that neutrophils of pregnant women can phagocytose and kill candida normally.

This study is carried out to assess the function of neutrophils as regards phagocytosis, intracellular killing and myeloperoxidase enzyme activity in order to:

- Find out the effect of pregnancy as a physiological condition on neutrophil function.
- Find any relation between any infection particularly urinary tract infection in pregnant females and neutrophil function.
- Assess the effect of cyclic hormonal changes of menstruation on the neutrophil function.

Review of Literature

PHYSIOLOGICAL CHANGES DURING PREGNANCY

Many important physiological changes are reported in pregnancy, these include haematological and biochemical ones.

The biochemical changes are:

* Reduction of total plasma proteins by about 1 gm/dl which is mostly due to a fall in plasma albumin.
* changes in lipid metabolism with accumulation of fat stores and an increase in blood concentration of most circulating lipids from 700 mg/dl to over 1000 mg/dl.
* Fall in the level of fasting blood glucose to about 90% of the normal non pregnant level.
* Liver functions are unaffected except the serum level of alkaline phosphatase which rises in the last 10 weeks due to production of this enzyme by the placenta.
* Decrease in level of blood urea and creatinine due to increase in glomerular filtration rate.

* Proteinuria is not uncommon and is considered abnormal if it exceeds 300 mg/24 hours. Intermittent glucosuria which is not related to the level of blood glucose (Smith, 1984).
* Increase in plasma chloride and cholesterol with decrease in plasma sodium, bicarbonate and uric acid (Agobe et al., 1979).

The Haematological Changes:

Many haematological changes are induced with pregnancy, these changes last 6-8 weeks after labour (Taylor and Lind, 1979).

Plasma Volume:

The plasma volume rises steadily during pregnancy starting from the 10th week of gestation and reaches its peak at 34 weeks. Such an increase correlates with the size of the foetus, number of pregnancies and whether the mother is primi or multiparous. In normal healthy primigravida, the plasma volume expands by about 1250 ml, while in subsequent pregnancies it expands by about 1500 ml (Hytten and Leitch, 1971; Pirani et al., 1973). In one woman with a quadruplet pregnancy, her plasma volume was raised by 2400 ml at 34 weeks (Fullerton et al.,1965).

Red Blood Cell Volume:

There is a general agreement that the red cell mass increaes during the second and third trimesters of pregnancy, and the degree of elevation depends on the presence or absence of iron supplementation. Hytten and Leitch, (1971) suggested a rise of 400-450 ml in pregnants receiving iron and of about 250 ml in absence of iron supplementation, while Taylor and Lind, (1979) suggested an increase of 349 ml and 180 ml in both cases respectively.

On the other hand, data concerning first trimester changes in red cell mass are conflicting. Caton et al., (1951) reported reduction of 300 ml, while Blekta et al., (1970) reported an increase of approximately 100 ml, but Lund and Donovan (1967) mentioned no change in red cell mass when corrected for body weight. Later, Taylor and Lind, (1979) reported a reduction of red cell mass by about 97 ml among pregnants receiving iron therapy and 102 ml among ones without iron supplementation. They assumed that, this reduction by 12 weeks gestation could be due to an increase in destruction of red cells, a decrease in their production or a combination of both processes.

As regards the concentration of 2,3 diphosphoglycerate (2,3 DPG), McCullogh and Kelly, (1979) reported that at 21-24 weeks, there is no significant elevation in level of 2,3 DPG which is followed by a significant fall at 25-28 weeks, while at term there is a significant increase. These changes were suggested to be due to fall of haemoglobin concentration, respiratory alkalosis and increaed demand for oxygen. The increaed 2,3 DPG concentration moves the oxygen dissociation curve to the right by stabilising deoxyhaemoglobin, thus releasing more oxygen to the tissues at any given oxygen tension.

Haemoglobin concentration:

In pregnancy, haemoglobin level decreases due to disproportionate increase in plasma volume and the red cell mass i.e. dilutional or physiological anaemia of pregnancy (peck and Arias, 1979). The fall of haemoglobin level starts from the 8th week and progresses slowly till the 32 week, where it becomes stable. This decrease is proved to be statistically significant when compared to nonpregnant females (Shukla et al., 1982), and it is usually moderate and rarely below 11 gm/dl (Low et al., 1965).

The haemoglobin level is higher in obese pregnants than lean ones by 0.2 gm/dl (Gran and Petzold, 1982).

When the haemoglobin concentration is less than 10.4 gm/dl, a true reduction in red cell mass is likely to be present. However, because of variation in the degree of hydraemia, a fixed line of demarcation between the normal and abnormal is very difficult to place in pregnancy (Deleeuw et al., 1966).

RBCs* remain normocytic normochromic in pregnancy unless the picture is complicated with iron or folate deficiency (Wintrobe et al., 1981). Iron deficiency is not uncommon, it occurs due to limited iron stores before pregnancy and additional iron requirements of pregnancy in the expansion of red cell mass, increased tissue requirements by foetus and placenta for production of haemoglobin, myoglobin, and some enzymes (Smith, 1984). In such case the red blood cells become hypochromic, microcytic. There is decrease in serum iron, increase in total iron binding capacity and the saturation index is less than 16%. However even in apparently healthy women, during pregnancy there is progressive decline in serum iron, increase in

* RBCs = red blood cells.