PROFILE OF TRACE ELEMENTS IN PRE-TERM LABOUR

THESIS

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SUBMITTED BY

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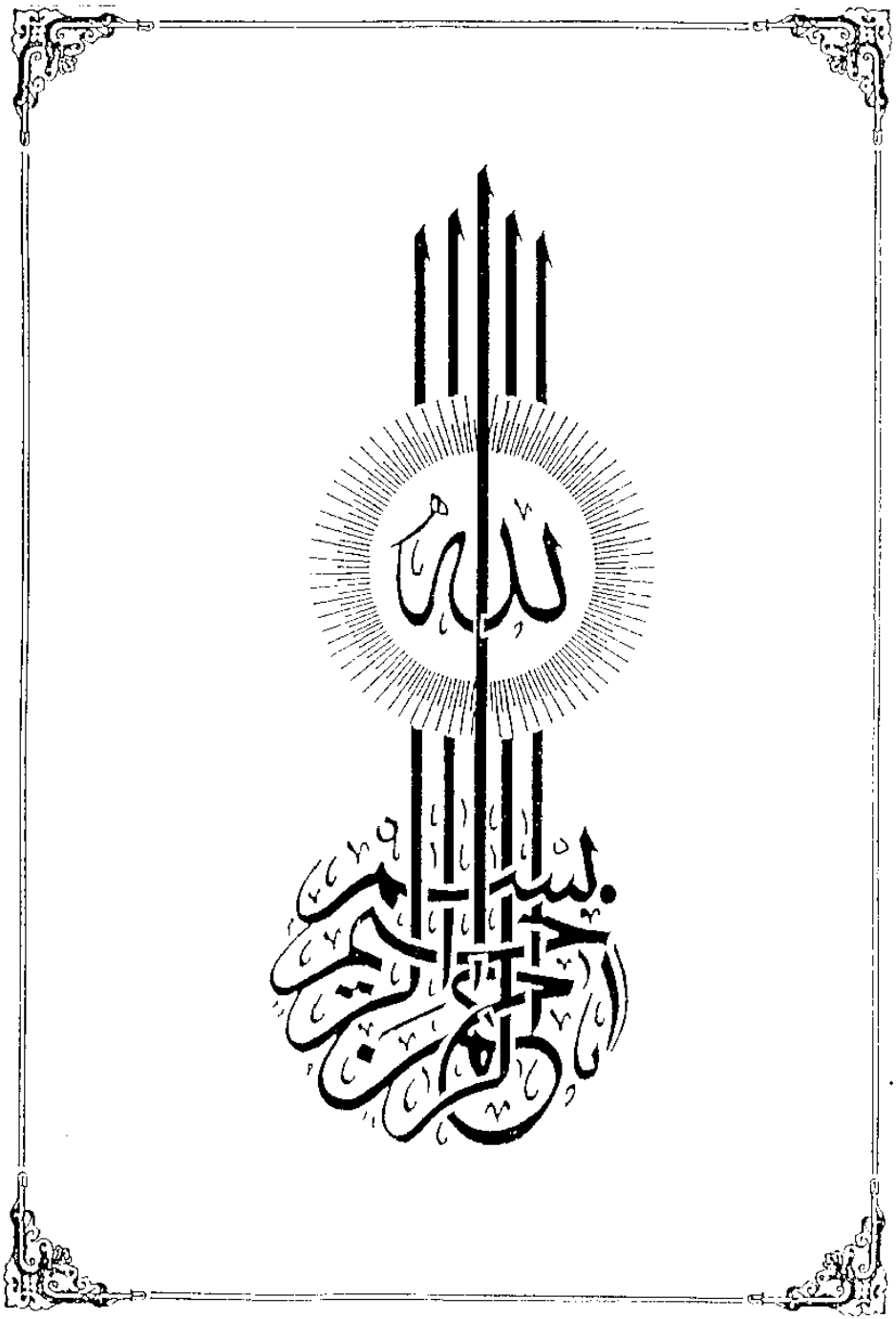
TO MY LOVELY WIFE

Dr. NEVEN BOLIS

&

TO MY WONDERFUL DAUGHTER

AMERA



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INTRODUCTION

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More than forty trace elements have been found in the human body, however, few of them are known to have vital roles in regulating body's metabolism and the maintainance of life. An element is termed essential if an animal species deprived of it develops reproducible features which can be reversed or prevented by physiological amounts of that element. At least nine trace elements (iron, zinc, copper, manganese, cobalt, chromium, selenium, molybdium, and iodime) are required for optimal human health. The term trace element is a relic of the time when the concentrations of these individual elements in tissues and the body fluids could not be determined accurately. This is no longer the case, but the term remains in the popular usage simply because nothing better has been found (Aggett,P.J. 1984).

Hormones can interrestingly affect trace element levels. Administration of estrogen has been known for many years to produce an increase in plasma concentration of copper. The mechanism by which this change occurs is mainly through the induction of copper carring protein, ceruloplasmin (Henkin et al, 1971).

Increased concentrations of circulating growth hormone, as occurs in patients with untreated acromegally have been associated with an increase in serum copper, decrease in serum zinc and increase in urinary zinc excretion (Henkin et al,1974). Adrenalectomy or adrenal cortical insufficiency from several causes including idiopathic Addison's disease and hypopituitarism, have been associated with increased serum copper and zinc concentrations, decreased urinary copper and zinc excretion, and increased retention of copper and zinc in several tissues. Exogenous replacement of adrenal corticosteroids in both man and animals corrects these changes. Conversily, elevated indogemous secretion of adrenal corticosteroids as in Cushing's syndrome or in patients with adrenal cortical carcinoma, has been associated with decreased plasma copper and zinc concentrations, increased urinary excretion of both elements and decrease in tissue retention of zinc (Henkin et al, 1974).

Parathyroid hormone controls the concentration of serum magnesium through a negative feedback mechanism (Heaton, 1965). Magnesium depletion in man may result in impaired synthesis or release of parathyroid hormone or both (Suh et al,1973). Lewis

and Slatoposky (1974), showed that hypocalcemia may occur with sever hypomagnesemia in both man and experimental animal as a result of magnesium deficiency per se, the mechanism of this hypocalcalcemia has been attributed to hypoparathyroidism due to decreased secretion of parathyroid hormone or unresponsiveness to the hormone.

A relationship between trace elements and prenatal and perinatal developmemt has been suspected for sometime, but extensive investigations of the effect of trace elements deficiences during the prenatal and perinatal period has occured only recently. The earliest recognized example of such a relationship is probably that of iodine deficiency and the thyroid gland which is associated in the adult with myxoedema and in the fetus with cretinism (Underwood, 1971).

Studies concerning copper in perinatal development have been made and suggest existance of an interaction between copper metabolism and a certain mutant gene in mice called Crinkled which has a high neonatal mortality rate and abnormalities in hair and skin (Hurley and Bell, 1975).

As regard the studies in human during the prenatal and perinatal period, a very high level of maternal serum copper has been reported in association

with hydatidiform mole (Heijkenskjold and Hedenstedt, 1962). A slight decrease of serum copper levels were observed in cases with pre-eclampsia (Friedman et al, 1969). These reports were in accord with the reports of decreased levels of mono and diaminooxidase and other copper containing enzymes im the blood and placenta of toxemic patients (De Maria 1964). Artal et al (1979) found a significantly lower levels of maternal and fetal serum copper at term in cases with premature rupture of membranes. Kiilholma et al (1984) found a significant low copper level in maternal serum in patients with preterm delivery than those at term.

The importance of zinc for the embryonic development was first demonstrated in chicks, growth malformations in embryos from zinc deficient hens included skeletal defects, brain abnormalities microphthalmia, and visceral herniation has been reported by Turk et al (1959). As regard studies in human during prenatal or perinatal period, Rosner and Gorfien (1968) demonstrated progressive decline of zinc concentration in plasma during pregnancy. Prema et al (1980) found that mean zinc levels were higher in mothers who gave birth to babies weighing below 2 Kg. However, they reported that serum zinc levels were not useful in the early detection of

toxemia or in the prediction of fetal or maternal wellbeing. Kiilholma et al (1984) suggest that zinc deficiency may play a role in the initiation of preterm labour. However, their results indicate that zinc is not involved in the etiology of rupture of membranes either before or at term.

The most striking effect of a deficiency of manganese during the prenatal period is ataxia in the offspring, characterized by incoordination, lack of equilibrium, and retraction of the head. This ataxic condition has been reported in a number of species, including the chick (Norris, 1939), guinea pig (Everson, 1959), rat (Shils, 1943), and mouse (Erway et al, 1971). As regard the studies in human during the prenatal or prinatal period, Hambidge et al (1974) found that mean plasma manganese concentrations at 38 weeks gestation were not different from those at 16 weeks gestation or from normal control non-pregnant females.

Doisy (1972) found that there may be coincedent deficiencies of vitamin K and manganese in man, the patient exhibited an inability to elevate clotting proteins in response to vitamin K deficiency, hypocholesterolemia was also observed with this patient.

Little has been known about changes in the serum level of nickel in the prenatal and postnatal periods.

McNeely et al (1971) reported that the concentration of serum nickel in post-partum mothers and their newborns did not differ significantly from the concentration in healthy adults, while Gabor et al (1982) measure the concentration of nickel by atomic absorption spectrophotometry, they found that the serum nickel level was lower by 60% than that in either the control non-pregnant group or the parturient group, also they found a significant 20 fold elevtion in the concentration of serum nickel immediatly after delivery of the infant but before delivery of the placenta.

Trace elements are having an increasing impact on clinical and community medicine. Much remains to be discovered about their roles, their metabolism and how they interact with other major and minor nutrients. Such studies will form an important component of further research in clinical nutrition.

Aim Of The Work

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The objective of this study is to determine the changes in maternal and fetal serum concentrations of Copper, Zinc, Manganese, and Nickel in premature labour, in cases gave birth to small-for-date babies, and also among cases with premature rupture of membranes and comparing their levels with those of term labour.