Study Of Cord: Zinc Magnesium Calcium And Phosphorus In Neonates Of Diabetic Mothers

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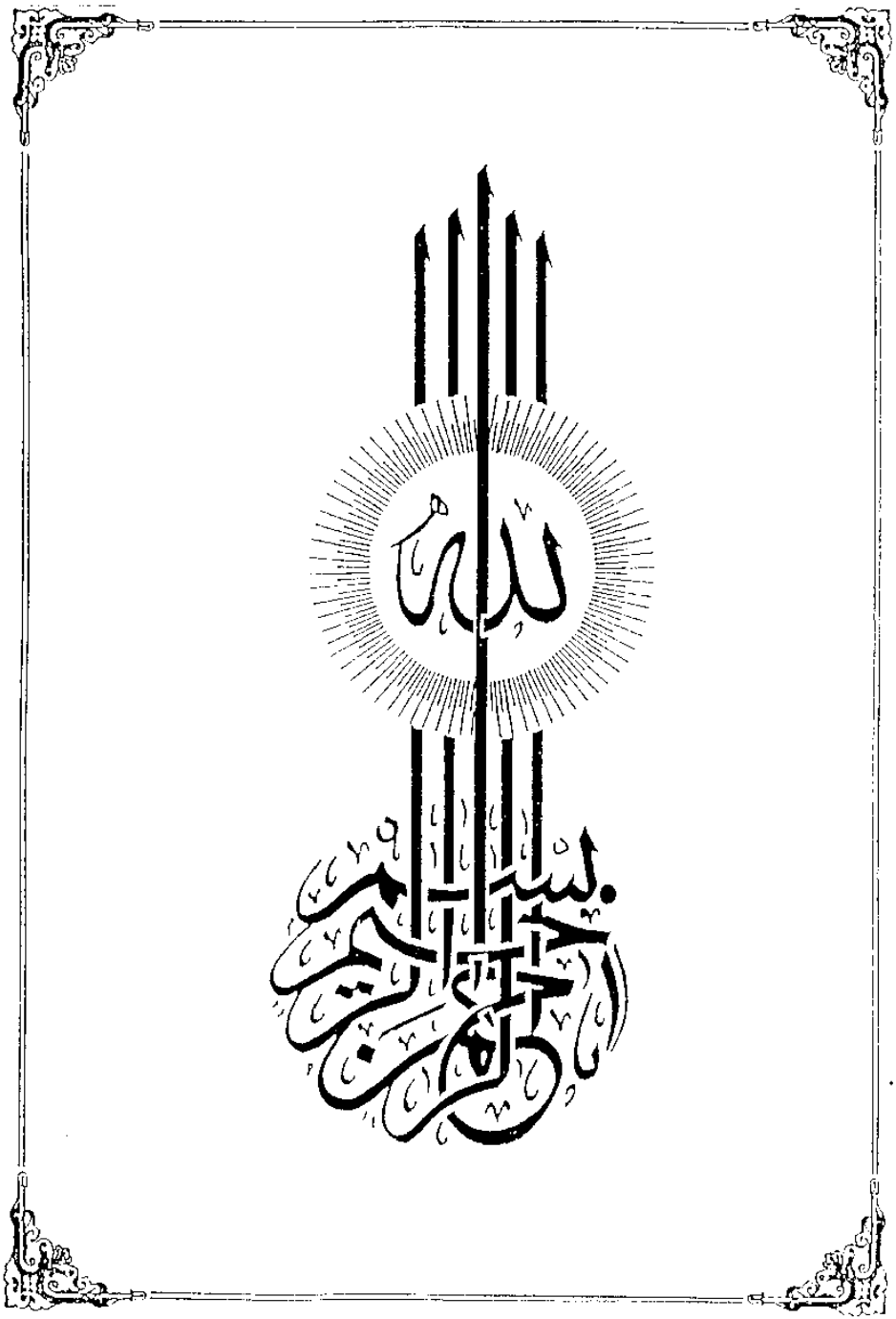

To My Parents, They Gave Me Life And Guidance That Paved The Way And The Existence Of This Work.

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AIM OF THE WORK

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Infants of diabetic mothers emerge from the fiery metabolic furnace of diabetes mellitus. They resemble one another so closely that they might well be related . They are plump, sleek, liberally coated with vernix caseosa, full-faced and plethoric (Farquhar J.W. 1959).

This classic picture, described more than 20 years ago, lost many of its features . Due to the better understanding of maternal metabolism and the need to regulate maternal glycemia carefully as well as through reliable techniques for the surveillance of fetal well being; many of the problems of these infants found a solution .

Still, we are faced by some problems as neonatal macrosomia, respiratory distress syndrome, congenital abnormalities and neuromuscular irritability. (Gabbe S.G. 1981).

Tsang R.C. et al (1972) reported hypocalcemia in infants of diabetic mothers .

Phosphorus is essential for the metabolism of carbohydrate, lipids, and protein. Also contributing to the metabolic potential in the form of high energy phosphate compounds . (Avioli L.V. 1979).

Khalil T.E. (1981) reported hypomagnesemia and hypozincemia in diabetic patients compared with normal control .

The aim of this work is :

To study the levels of the serum calcium, phosphorus, magnesium and zinc in the diabetic mothers and their infants during labour .

INTRODUCTION

CALCIUM

Calcium, the fifth most abundant element in the human body, serves a variety of vital functions . In addition to providing skeletal strength, it plays essential roles in such widespread physiologic activities as muscle contraction, neural transmission, blood coagulation, membrane transport and enzyme activity .

Normal Distribution :

Calcium constitutes about 2 per cent of the weight of the adult body, and about 99 per cent of the total quantity is contained in the skeleton (Keynes W.M. (1966).

The muscles contain about 8 mg per 100 grams net weight, plasma or serum from 9 to 10.5 mg per 100 ml. The red corpuscles contain only minute amounts, so that the content of whole blood is between 4.5 and 6 mg. per 100 ml. The other body fluids e.g. lymph, aqueous humer, ascitic and edema fluids, etc. contain it in somewhat lower concentrations, whereas the concentration in the the cerebrospinal

fluid is only about 5 mg per 100 ml. Negligible amounts of calcium are deposited in the skeleton before the fifth month of intrauterine life, and nearly 70 per cent of the skeletal calcium of the new-born is the result of deposition during the last 2 months of pre-natal life . The mother suffers a much greater loss of calcium to the suckling child. Whereas only about 20 grams of the element are lost during pregnancy, over 80 grams are secreted in the milk during a normal lactation period .

Calcium is present in the plasma in three states : ionized, complexed and protein-bound . The protein bound form is non diffusable and attached to both the albumin and globulin fractions of the plasma proteins (but chiefly to the albumin) in the proportion of about 0.84 mg per gram of protein . (Potts and Defots 1974).

The ionized and complexed calcium in plasma are diffusable and can be estimated by measurment of the total calcium in an ultrafiltrate .

Although the three fractions of calcium in the plasma are believed to be in equilibrium with one another, the level of the ionized calcium is regarded as most

immediately related to the activity of the parathyroid glands . The ionized calcium in plasma is raised in hyperparathyroidism, and it has been found that, in this condition, but not with other causes of hypercalcemia, there is reduced ability for plasma proteins to bind calcium (Latner A.L. 1975).

Intake and Sources :

In Europe and the U.S.A. the average daily calcium intake in adults is 800 to 1000 mg. In developing countries the intake is often considerably less (200 to 400 mg/day) (Bell G.H. et al 1976).

The growing fetus requires 80 mg of calcium per day; infants require 45 mg per kilogram body weight per day, children and adolescents 1 gram daily. (Belton N.R. 1978).

Milk is the best dietery source of calcium. Eggs, certain green vegetables, cabbage, lettuce, cauliflower, beans, nut and figs are rich sources. Meat, fruits and cereals are poor sources of calcium.

Spinach and other plant foods containing oxalic or benzoic acid, which form relatively insoluble compounds with calcium, reduce calcium absorption .

Absorption of calcium :

Calcium absorption occurs in the small intestine, maximally in the duodenum. Absorption of calcium needs an active transport process but a small amount can pass passively. It is absorbed if present in a water-soluble form such as calcium chloride, citrate, lactate, acid phosphate and gluconate (Katz L. 1972).

The process is regulated by 1.25 - dihydroxy-cholecalciferol, a metabolite of vitamin D that is produced in the kidney in response to low plasma calcium concentrations (Tyler D.D. 1977).

The 1,25 dihydroxy cholecalciferol, which is a vitamin D metabolite penetrates into the nuclei of the mucosal cells where it interacts with deoxyribonucleic acid to induce formation of messanger ribonucleic acid . This latter promotes synthesis of a specific calcium binding protein in the cytoplasm which acts as a carrier for calcium transport . (Lather A.L. 1975).

Other factors which influence calcium absorption are :-

- Calcitonin :

It inhibits calcium uptake from the intestine as it inhibits the formation of 1,25 dihydroxycholecalciferol.

- Parathyroid hormone :

It stimulates and regulate the formation of active metabolite 1,25 dihydroxycholecalciferol in the kidney.By this action parathyroid hormone promotes intestinal absorption of calcium. (Ganong W.F. 1979).

- Intestinal pH :

An increase in acidophilic flora (e.g. the lactobacilli) is recommended to lower the pH, which favors calcium absorption (Tyler D.D. 1977).

- Requirements of the body :

The amount of calcium absorbed depends upon the requirement of the body, it is increased in cases of hypocalcemia .

- Phosphate levels :

Phosphates inhibit hepatic hydroxylase enzyme

Somatotropin : enhances calcium absorption from the intestine .

Estrogens : inhibit the hepatic 25-hydroxylase enzyme, so interfere with the formation of 1,25 dihydroxycholecalciferol and decrease calcium absorption .

Thyroid hormone : excessive doses of thyroxine inhibit calcium absorption from the intestine . (Martin C.R. 1976).

Excretion :

Calcium is excreted in urine, bile and in digestive secretions . Latner A.L. (1975). The major source of urinary calcium is bone resorption rather than dietary intake .

Under normal conditions, and despite wide variation in calcium intake, the amount excreted in the urine remains constant . (Ganong W.F. 1979).

Since approximately 9 grams of calcium is filtered daily in the glomeruli, about 90 to 95 percent is reabsorbed from proximal and distal tubules . Reabsorption