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FREE FATTY ACIDS IN SERUM OF CORD BLOOD OF NORMAL EGYPTIAN NEW BORN BABIES

By

Mahmoud Abou-El-Makarem, Osama Abul Shohoud, Sami Abd-El-Aziz, Ahmed Abbas Raof, Farouk Hussein Saber and Moussa Madany

Department of Biochemistry, Faculty of Medicine, Al-Azhar University.

Abstract : In this study free fatty acids (FFA) in cord blood of 70 new borns (35 males and 35 females) were determined.

The results showed that the sex of the foetus does not affect FFA level in cord blood.

FAA, are transported with albumin in cord blood, when they exceed the albumin capacity to carry them, they become attached to all membranes and produce dangerous effects.

In this study two of the new borns were dead without any known cause, their FFA content was high, as well as the FFA/albumin ratio was increased.

So, high concentrations of FFA could result in deleterious effects, especially if the amount of albumin is decreased. Therefore, the FFA level in cord blood should be determined routinely which could protect against these fatalities.

Also, it is advisable to administer human albumin to new borns with high level of blood FFA to retain the fatty acids-albumin molar ratio at its normal level.

الاحماض الدهنية الحرة فى دم الحبل السرى للاطفال حديثى الولادة المصريين .

تناول البحث تعيين كمية الاحماض الدهنية فى دم الحبل السرى للاطفال الحديثى الولادة فى مستشفى بولاق الدكرور العام ولقد وجد ان كمية الأحماض الدهنيه فى الاطفال الذكور ٠,٦٦١ ، . ميلليمول / اللتر وفى الاطفال الاناث ٠,٦٤٥ ميلليمول / اللتر ولايوجد اختلاف احصائى بين الجنسين . ولقد وجدت حالتين زادت فيهما الاحماض الدهنيه عن ١,٧ ميلليمول / اللتر ولقد ماتا وهما الحالتين التى تجاوزت فيهما نسبة الاحماض الدهنيه الحرة الى الالبيومين المعدل الطبيعى لها وهو ٣,١ وينصح فى هذه الحالات باعطاء المولود البيومين .

Introduction :

Churchill, et al., 1967, noted lower intelligence quotients in children whose mothers had biliary tract disease during gestation and speculated that this could be related to decreased availability of linoleic acid for foetal brain development.

The nature of fatty acids in cord blood may play an important role in production of atherosclerosis later in life, especially if there are any traces of trans-unsaturated fatty acids, (Allard, et al., 1973).

The binding of free fatty acids to membranes in the blood cellular elements produces

some of the toxic manifestations due to the free fatty acids (FAA).

The toxic effects that FFA produce in biological systems are due to the presence of excessive free fatty acids which will be associated with cell membranes.

The FFA may either alter the fluidity of the lipid bilayer, or influence the action of vital enzymes, receptors, or transport systems located in the membranes.

Fatty acid synthesis in the foetus comes from glucose, pyruvate, acetate, and citrate, (Fain and Scow, 1966).

Acetate seems to be the major substrate for human foetal fatty acids, especially for brain lipids and myelin sheeths, (Roux, et al., 1967).

The sources of acetate for foetal brain could be aceto-acetate which is produced during the stress of labour, (Anesley-Green, et al., 1977).

Human full term placenta can transfer fatty acids from the maternal to the foetal circulation, and to a lesser extent in the opposite direction, (Dancis, et al., 1973).

FFA are transported mainly in association with plasma albumin in a molar ratio not exceeding 3/1, as well as with plasma lipoproteins to a minor extent, (Goodman and Shafrir, 1959), also platelets and leukocytes, (Burns, et al., 1976).

The normal level of FFA in human serum is 0.3 — 1.10 mmol/L, when the concentration reaches 4 — 5 mmol/L, ventricular extrasystoles and myocardial infarction will occur, (Kurien, et al., 1969).

Material and Methods

Determination of FFA in cord serum :

Cord blood from 35 male and 35 female new borns were collected taking care to be from the foetal side, birth weight was 2.8 kg, ranged from 2.6 to 3.3 kg.

Mothers in this study were those who had a normal pregnancy, not diabetic, and received no drugs during the period of pregnancy.

Delivery was normal as regards no anaesthesia or other sedations or drugs were administrated, and the 3rd stage of labour was 6 min., ranged from 4 — 9 min.

New borns had no evidence of congenital malformations, and the determination of FFA in cord serum was according to the method of (Falholt, et al., 1973).

The FFA were extracted in an organic solvent (Chloroform) containing copper salt. Copper salts form copper soaps with the FFA. After carefull separation from the aqueous reagent, the copper soaps in the organic phase were determined colorimetrically using the cuprizone reagent.

Standard palmitic, oleic and linoleic acids were used with reproducible results. Recovery, as well, was done and was above 90%.

Nature of FFA :

Lipids of cord blood serum were extracted by ether. Different aliquots of the extracted lipids (10 µl,220 µ 1,30 µl,and 40 µ 1) were subjected to thin layer chromatography on silica gel plates, type SA, (Gelman).

Equal aliquots (10 µl) of lipid standards (oleic acid in ether, hydrolysed linseed oil, and olive oil in ether) were simultaneously used.

The chromatogram was carried out according to (Smith and Stevens, 1969), using chloroform : acetic acid : liquid paraffin (130 : 60 : 20 ; v/v) and RF values were compared with the standards. The separated fatty acids were detected using the iodine vapour.

Results :

The mean values (mmol/L) and standard deviations (S.D. ±) of FFA level in cord blood were 0.661 ± 0.34, ranged from 0.38 to 1.90 in males, and 0.645 ± 0.3, ranged from 0.35 to 1.78 mmol/L in females, $p > 0.05$.

The results showed that the sex of the foetus does not affect FFA level in cord blood, Fig. (1).

Thin layer chromatography showed that cord blood does not contain a detectable amount of triglycerides, but oleic acid could be detected. Thin layer chromatography is not

efficient for separation of fatty acids with the same number of carbon atoms. Gas liquid chromatography will be needed to detect other unsaturated fatty acids in cord blood.

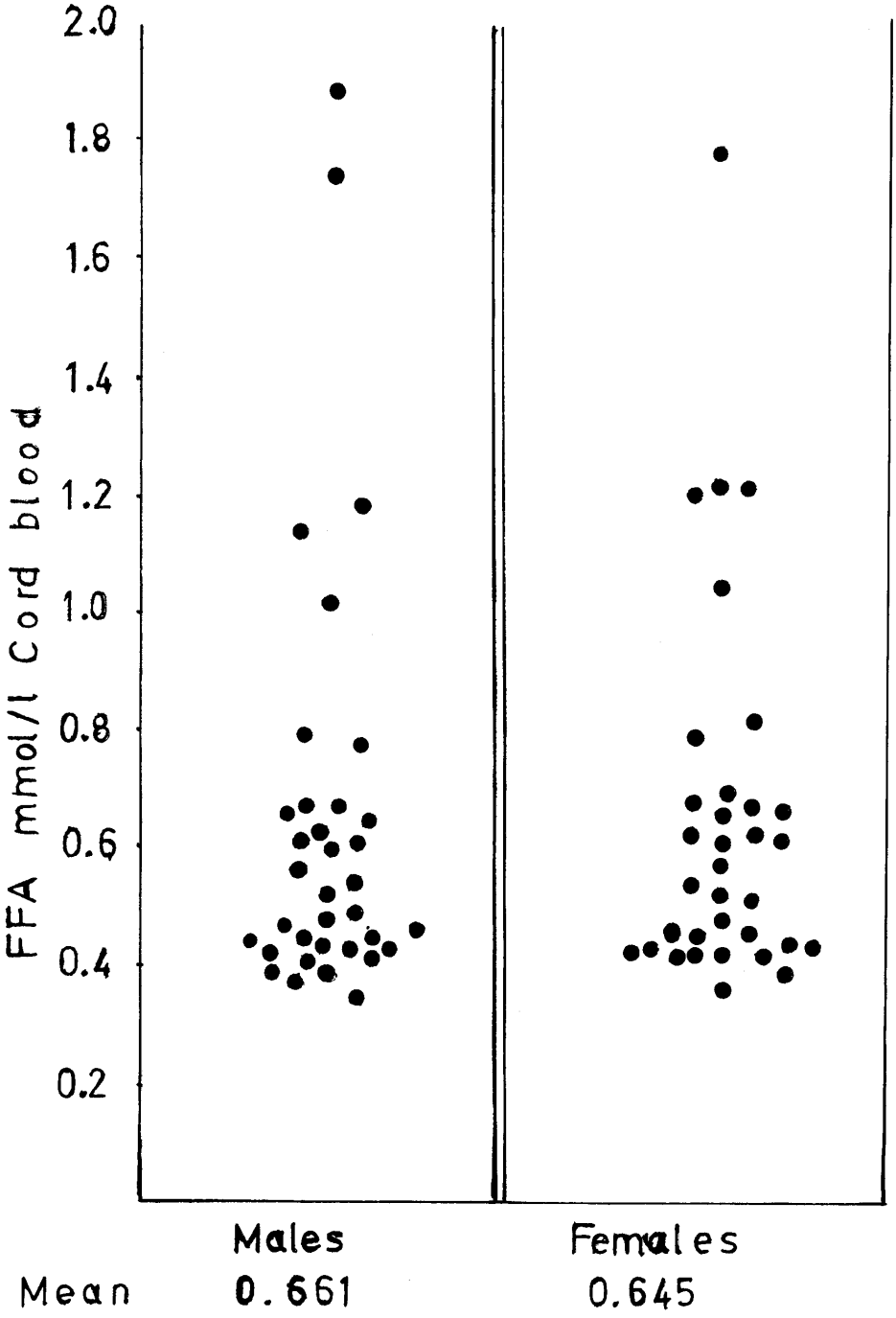

Fig. (1) : Free Fatty acids in cord blood in male and female Egyptian newborns.

Discussion :

FFA in cord blood represent the stress conditions at which the foetus is delivered. Also as they pass through the placenta from the mother, they are affected by the degree of lipolysis which occurs in the mother.

The mean value of FFA in Cord blood in both males and females were respectively 0.661 ± 0.34 and 0.645 ± 0.3, no significant difference was shown.

This may be explained due to the origin of these fatty acids ; the depot fat in the foetus is small which could not account for the FFA level in cord blood.

The origin of these FFA is maternal, and is affected by the stress at labour, FFA can pass easily across the placenta, (Van Dyne, et al., 1962) and (Szabo, et al., 1969).

The mean value in this work is similar to that reported in U.S.A. (Johan, et al., 1966).

This value is much lower in another study in Sweden (0.38 mmol/L), (Persson and Gentz, 1966).

This difference could be explained by the great care to mothers and babies in Scandinavian counteries avoiding all risk factors. Also, death rate during delivery in Sweden is much lower than in U.S.A.

FFA, are transported with albumin in cord blood. When they exceed the albumin capacity to carry them ; which is reported to be 3/1 as a molar ratio, they become attached to all membranes and produce dangerous effects.

Albumin level in Egyptian new borns is low as compared to other counteries, (Metawei, 1984), due to the general nutritional state of mothers which reflects itself on the state of the foetus.

In this study two of the new borns were dead without any cause, their value of FFA were higher than 1.7 mmol/L, and FFA/albumin ratio was 2 — 1.

The attachment of FFA with albumin is affected by many drugs as well as bilirubin level, and sulphonamides.

So administration of compounds which can pass placenta and are carried by albulin may increase the toxicity of FFA, due to lowering the capacity of the albumin to carry the FFA.

So, high FFA level in new borns serum whatever their birthweight should be regarded as a risk state and treated immediately, so the FFA level in cord blood should be determined routinely which could protect against these fatalities.

Also, it is advisable to administrate human albumin to those new borns with high level of blood FFA to retain the fatty acids-albumin molar ratio at its normal level.

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