Plasma B-Carotene Concentrations in Pregnancies, Newborn Infants and Their Mothers

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Abstract

Concentrations of 3-carotene were determined in maternal and fetal blood. The samples were collected from 33 mothers, their 33 newborns and 50 pregnant and 29 non-pregnant women, B-carotene concentrations of the non-pregnant, pregnant, newborn infant and theirmothers were 140.31,171.54,63.57 and 175,74 ig/dl, respectively. There was a significant correlation (P<0.001) between 13-carotene values of the maternal plasma and cord plasma. Mean maternal plasma 13-carotene concentration was higher (P<0.0005) than that of the cord. These results suggest that plasma transport capacity of 13-carotene was low from mother to their fetus (JPMA 46:77, 1996).

Introduction

B-carotene, like other carotenoids (a-carotene. cryptoxantin, lutein and lycopene) is one of the essential antioxidants, responsible for the protection of cellular lipids, susceptible to peroxidation. Maternal concentration of this' substance is influenced by dietary intake[1-3] seasonal variations[4], age[5] abruptio placentae[6] and preeclampsia[7]. Fetal plasma concentration, its ranges and mechanism of placental transport of B-carotene are still being investigated. Plasma levels of carotene in adult men and women may reflect dietary intake in recent weeks or months[1]. In addition, the possible roles of B-carotene deficiency in the etiology of disorders in the newborn are not yet clear. It has been observed that fetal plasma levels of B-carotene are lower than those of their mothers[8]. Plasma B-carotene concentrations in the newborn are possibly related to their plasma binding capacity, thhickness of the placentae, placental transfer ratio, gestational age, growth of the fetus and maternal B-carotene status. The purpose of this study was to investigate the concentrations of B-carotene in plasma of newborn infants and their mothers and to determine relationships between maternal and fetal plasma concentrations of J3-carotenc.

Subjects and Methods

One hundred and twelve women during gestation (24 1st trimester, 26 2nd trimester), 33 at delivery and 33 cord blood of the term infants were studied, Blood samples were collected by venipuncture into heparizines glass tubes from all women and 33 cord bloods in the term infants delivered via vaginal route. Blood samples of newborn infants and their mothers were taken within 5-10 minutes of delivery. The birth weight was in the range of previously reported values for healthy newborn infants[9]. The non-pregnant women were normal, healthy and of child-bearing age. None of the women in the study received oral contraceptive. additional vitamin and B-carotene therapy (except for tene indict). investigation were unavailable for evaluation. Informed consent was obtained from all subjects.
All blood samples were promptly wrapped in aluminium foil to protect against photooxidation of The samples were centrifuged and plasma removed. Harvested plasma samples were frozen at -20°C and

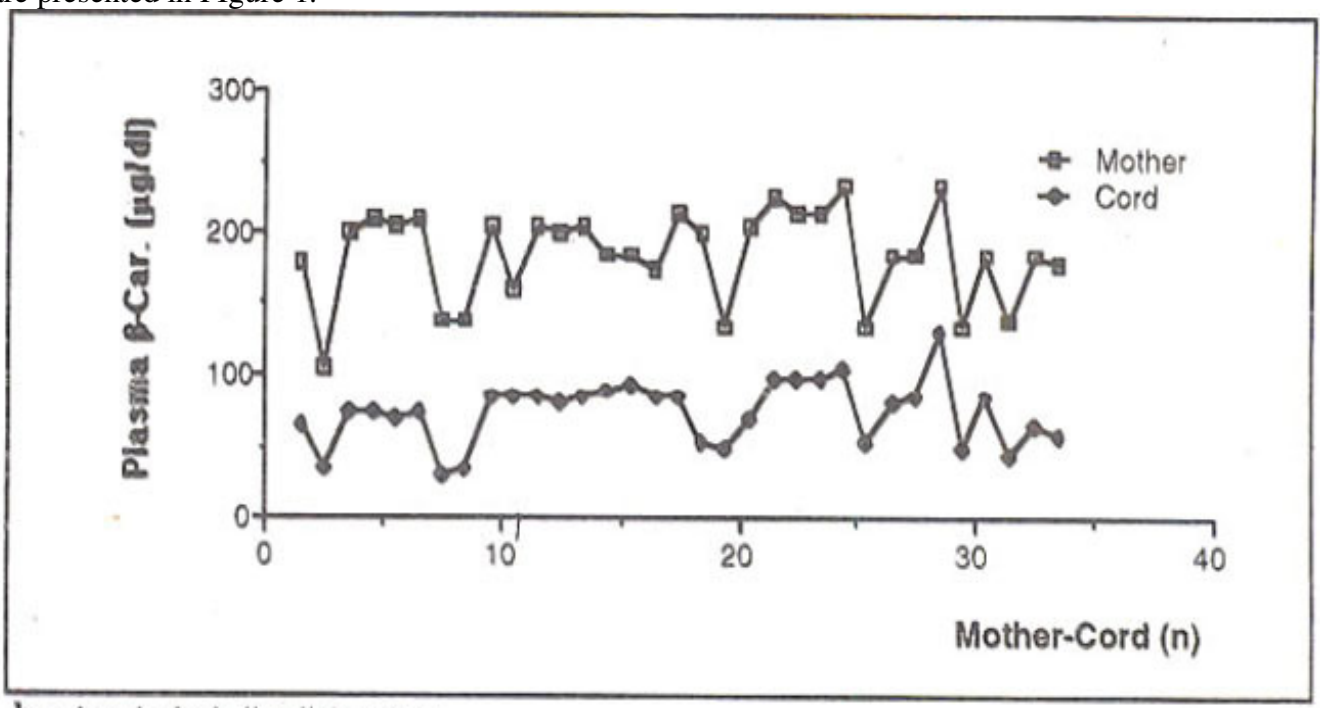
were analyzed on the 6th and 7th day after collection. Analysis of samples under golden-fluoroscency light to protect against photooxidation of

B-Carotene Analysis

B-carotence concentration of all the samples was determined spectrophotometrically (In the laboratory of Medicine Faculty, Firat University 23119, Elazig) by the methods of Martinek[10] and Tsen[11], modified as follows: Into a small centrifuge, add 1 ml of absolute ethanol (Merk Chem. Co.). Whirl into a vortex for one minute. Add 1 ml n-hexane (analytical grade) and centrifuge at 2000 rpm for 5 minutes. With a micropipette, transfer 500 ul of the upper n-hexane layer to a microcuvette. Add 200 ul of bathophenanthroline reagent in absolute ethanol. Cover and shake. In a spectrophotometer (Spectronic-1000), read absorbance of B- carotene at 460 rim, using n-hexane as a blank. Calculate the concentration of b-carotene from standard curve constructed from pure Bcarotene, no interference was noted from bilirubin, Means, correlation coefficients, paired student's 't' test and regression analysis were performed on computer using Macintosh Performa-450 by Statistical Software Programme of Feldmann and Gagnon, Brain Power Inc., Calabasas Ca and figures were lined by Cricket Graph Programme of Rafferty and Norling, Cricket Software Inc., Philadelphia PA[12], on same computer at Harran University.

Results

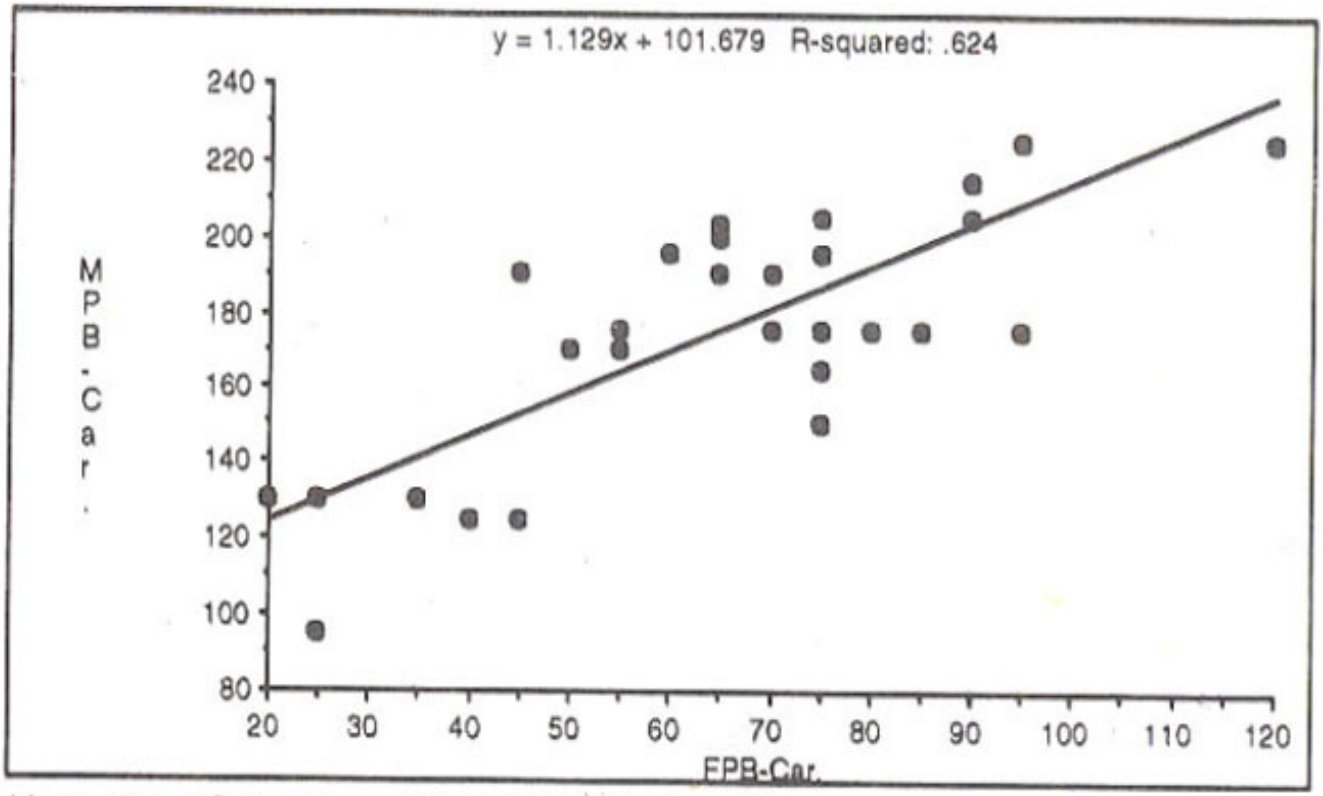
The mean ages of the non-pregnant, pregnant and mothers were 24.30±3.19, 24,46±2.97 and 25.85±2.31 years respectively. The plasma concentrations and variation ranges of tion of born infants are presented in FIgure 1.



b-values is the indivudials values.

Figure 1. Individual distribution of b-carotene concentrations in plasma of mother and cord[b].

The relationships between maternal plasma values of cord plasma was statistically significant (r=0.79, P<0.001) (Figure, 2).



Maternal Plasma β-Carotene FPB-Car : Fetal (Cord) Plasma β-Carotene

r = 0.79 , P< 0.001

Figure 2. Correlation between maternal plasma b-carotene levels and cord values.

b-carotene level (159.35±5.75 ug/dl) of pregnant women in the first trimester was lower (P<0.025) than that (177.27±7.54 ug/dl) in the second trimester. The differences among the (Figure 1) might be due to the different tions in dietary intake.

(P<0.025) than that of non-pregnant women. of cord blood plasma was significantly lower than the values of lion-pregnant women and pregnant and mothers (P<0.0005).

Table. Mean β- carotene concentrations and variation ranges.

Groups	Plasma β-carotene (µg/dl) Mean±SE[a]	Ranges
Non-pregnant	140.31±8.42	90-230
Pregnant	171.54±8.60*	95-245
Mother	175.74±9.14*	95-225
Cord	63.57±3.97**	20-120

[a]SE Standard errors. Significantly different than the non- pregnant (*) and all of the other samples (**) concentrations, *P<0.025, **P<0.0005.

Discussion

Antioxidant functions of B-carotene, like other antioxidants[13-15] are dependen to ntheirconcentrations inbody fluids and tissues[7-8]. Free radicals (oxidants) are produced during normal oxidative metabolism and the self-catalyzing autooxidative reactions of lipid peroxidation. B-carotene is one of an important natural antioxidants and it quenches oxidants and so, prevents formation of the free radicals[1,14,28]. The presence of bile and pancreatic secretions are essential for an efficient absorption of gastrointestinal tract[6]. The mucosal cells of the gastrointestinal tract may play an essential role in the transport of nutrients from the gastrointestinal lumen to the blood circulation. B-carotene transfered within blood plasma is transported by low and high lipoproteins1. Plasma reflect only intake of recent weeks or months, while its liver and adipose tissue concentrations arc likely to reflect the longer period of ingestion of carotenoid-rich dicts[1,3]. In addition, there is significant interindividual variability of B-carotene in plasma of humans[1]. Physiologic ranges of this substance in plasma and other tissues arc still being investigated[1,3]. In the present study, mean plasma (3-carotene concentrations (140.31 ug/dl) in non-pregnant women was higher than that reported by Stiykes et al[16] who found the ranges from 17.3 to 26.3 ug/dl. The differences between the results of different studies may be attributed to the differences in dietary patterns in various populations and methods employed to measure B-carotene[1]. Mean plasma b-carotene level (171.54 pg/dl) in pregnancy was higher than those reported by Sharma et al[6] who found the ranges between 120 to 140 mg/L. The reason for increased B-carotene levels during pregnancy are not known. But, its concentrations may increase as a physiologic response to pregnancy. The increasing of vasodilatation in pregnancy may increase absorption of enhance the transport or binding capacity by lipoproteins in blood plasma.

In our study, maternal plasma B-carotene levies were approximately three times, greater ($P<0.0005$) than the values of fetal samples. The reason for this difference is unclear. Vitamins are transported by the placenta through the mechanism of a simile or facilitated diffusion, active transport or pinocytosis[8,17,18]. Many factors, such as lipid solubility of substrate placental age, abmptio placentae, thickness and surface area may modify the rate of transfer of this substance.

Still other factors may influence the fetal plasma concentration such as levels of carrier protein in the fetus, occurrence of reverse transport, placental and fetal metabolism of vitamins and tissue storage in the fetus. These considerations were also confirmed by some other investigators[8]. In the present study, plasma concentrationof B-carotene in cord and maternal blood was higher than that reported by Ostrea et al[8] who found a mean level of 17.9 ug/dl in cord and 131.00 ug/dl in maternal blood. The differences between the result of the different studies may be due to variable dietaiy intake of determined that the correlation between maternal plasma B-carotene concentration and cord plasma was statistically significant ($r=0.79$, $P<0.001$). Maternal plasma possibly responsible for placental transport of fetal plasma B-carotene. Therefore, if maternal plasma tration is determined during late pregnancy, the fetal plasma status of this substance might be approximately predicted. If this is so, it should be possible to identify the offspring that may be at risk from a low plasma B-carotene level by measuring the plasma in last months of pregnancy. And so, corrective treatment could be taken by receiving this essential nutrient to the mother in the last month of pregnancy.

In conclusion, these results might be considered as a potential model to predict fetal plasma (3-carotene status from maternal plasma concentration in the last month of pregnancy. However, there is still a need to determine a definitely potential model.

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