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MATERNAL AND NEWBORN PROTEIN STATUS AT DELIVERY IN A PUBLIC AND A PRIVATE MATERNITY HOSPITAL IN TEHRAN

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ABSTRACT

Protein status of 194 pregnant women and their newborn at a public and a private maternity hospital in Tehran was studied. Blood samples were taken from all women before delivery and from cords at delivery of the placenta. The following determinations were made: total serum protein, protein fractions, creatinine and urea. In the private group, significantly higher maternal mean values were found for serum urea ($P<0.01$), albumin ($P<0.05$) and ß -globulin ($P<0.01$) when compared to the public group. In cord blood, the mean serum creatinine ($P<0.01$) and urea ($P<0.02$) were significantly higher and ß -globulin ($P<0.05$) was lower in the private group when compared to the public group. It can be concluded that socio-economic status clearly affects maternal nutrition, thereby affecting to some extent the nutritional status of the fetus.

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INTRODUCTION

The notion that a pregnant woman and her fetus are in competition when the food supply is limited is quite compelling.[1] Protein is a diet constituent for which such competition probably exists; therefore it is likely to be insufficiently available for the fetus when food supplies are limited, causing difficulty for the fetus.

Plasma and serum protein pattern during pregnancy and also during the neonatal period have been studied by a number of investigators.[2-10] In the present investigation the effect of two different socio-economic classes on the protein status of the mothers and their newborn will be evaluated.

MATERIALS AND METHODS

194 pregnant women were randomly selected from among women hospitalized for delivery at Mottahedin (public) and Shahid Mostafa Khomeini (private) maternity hospitals. Each subject was examined by gynecologist. Women with clinical complications, unknown gestational age or unusual obstetrical procedures were excluded from the study.

In general, those subjects hospitalized at the public hospital were classified in a lower socio-economic group and those in the private hospital in a higher socio-economic group.

Blood samples were drawn from the mothers within 30 minutes of delivery and from the cord at delivery of the placenta. The serum was separated and frozen at 17°C until analyzed. Total protein level was measured by the Biuret method and protein fractions were measured by electrophoresis with cellulose acetate strips of Millipore apparatus. Creatinine level and blood urea measured according to the method of Toto and Ackermann[11] and Henry.[12] Evaluation of protein deficiency was performed in accordance with the method described by Sauberlick, et al.[13]

The neonates were weighed on a calibrated hospital baby scale according to the technique described by Jelliffe.[14]

The student «t» test and X^2 were used for statistical analysis of data.

RESULTS

The results of the study are summarized in Tables I to V. In mothers the serum urea ($P<0.05$), total protein ($P<0.01$), albumin ($P<0.05$) and ß-globulin ($P<0.01$) levels were significantly higher in the private group.

In cord blood, the serum creatinine ($P>0.01$) and urea ($P<0.02$) were significantly higher and ß-globulin was lower in the private group when compared to the public group. The birth weight was significantly lower in the public group.

No other significant differences were observed concerning other parameters in the mothers or in their newborn.

Table I. Serum protein values in pregnant women at delivery

Measurements	Public(111) (g/dl) X	S.D.	Private(80) (g/dl) X	S.D.	Level of Significance
Protein, total	6.72	0.81	7.05	0.53	P<0.01
Albumin	2.59	0.36	2.76	0.29	P<0.01
α_1 globulin	0.23	0.10	0.25	0.10	N.S.
α_2 globulin	1.05	0.27	1.04	0.27	N.S.
ß globulin	1.53	0.28	1.74	0.29	P<0.01
ɣ globulin	1.30	0.33	1.22	0.25	N.S.

Table II. Serum protein values in pregnant women at delivery

Measurements	Public(81) X	SD	Private(60) X	SD	Level of Significance
Birth wt.(kg.)	3.17	0.46	3.34	0.46	P<0.05
Protein, total(g/dL)	5.87	0.96	5.81	0.70	N.S.
Albumin (g/dL)	3.01	0.48	3.02	0.40	N.S.
$\alpha_1$globulin (g/dL)	0.14	0.05	0.14	0.07	N.S.
$\alpha_2$globulin (g/dL)	0.54	0.15	0.52	0.16	N.S.
ß globulin (g/dL)	0.72	0.21	0.78	0.19	N.S.
ɣ globulin (g/dL)	1.45	0.38	1.33	0.28	P<0.05

Table III. Serum creatinine and urea values in pregnant women at delivery and their newborns

Measurements	Public(100) (g/dl) X	S.D	Private (80) (g/dl) X	S.D	Level of Significance
Maternal					
Creatinine	0.74	0.11	0.74	0.16	N.S.
urea	15.89	1.23	16.33	1.51	P<0.05
Newborn					
Creatinine	0.79	0.13	0.92	0.19	P<0.01
Urea	15.90	2.39	16.77	2.02	P<0.02

DISCUSSION

In the present study the maternal total serum protein and also serum albumin and ß-globulin were significantly lower in the public group. The differences between socioeconomic groups in all the serum protein fractions (except α_2-globulin) have previously been reported.[15] Another study also reported that total serum protein and protein fractions (except α_2-globulin) were higher in upper-income groups.[7]

In malnutrition, the breakdown of plasma albumin is reduced and its half life is significantly increased. The size of the extravascular pool is reduced before there is a reduction in the total circulating albumin.[16] Considering these homeostatic mechanisms, the lower serum albumin found in our pregnant groups compared to the acceptable level (Table V), is an indication of protein deficiency in these pregnant groups.[17] Protein intake from meat, eggs, milk, yogurt and legumes were 46.5, 44, 270, 149 and 24 grams respectively in the private group, and 24, 27, 48, 115 and 43 grams in the public group (unpublished data).

Furthermore, as shown in Table IV, the percentage of pregnant women who had a low and deficient status of serum albumin was very high with the public group, with a higher percentage (87%) of women in a deficient state when compared to the private group (75%).

For the evaluation of protein status of a group, the low level of serum albumin can be considered as an indication of deficient protein status. Therefore, in this regard, both pregnant groups, especially the public group with lower serum albumin, can be considered as a group with protein deficiency.

The ß-globulin fraction (Table I) was also significantly lower ($P<0.01$) in the public group. The significant decrease in ß-globulin in the public group represents a decrease in circulating transferrin and hence a reduction in iron absorption and transportation. The iron deficiency in the public group (that has been determined in our laboratory) might also be due, in part, to a decrease in ß-globulin fraction.

In the present study, as reported by others,[8] the cord blood total protein values were less than the corresponding maternal values.

Despite the above findings in maternal serum protein, in the newborn, (except for the ɣ-globulin fraction that was significantly higher in the public group), no differences in serum protein were found between the two groups. This is probably due to much less metabolic stress of pregnancy imposed on the private mothers with a single fetus and its long gestation.[17]

ɣ-globulin is responsible for antibody activity, and the fact that ɣ-globulin was higher in the public group indicated a high degree of infective assault in this group. In Nigeria a study was conducted on African and European neonates and it was found that at birth, the African neonate has a higher concentration of serum ɣ-globulin than the European.[18] The result of another study also shows that at birth the African had a higher concentration of serum ɣ-globulin than the Caucasian.[9]

Table IV. Serum total protein and albumin status of mothers.

measurements	Public No.of subjects	%	Private No.of subjects	%	Statistical Significance
Serum total protein					
Acceptable≥6	95	86	79	96	X^2=9.02 P<0.01
Lowor deficient<6	6	14	3	4	
Serum albumin					
Acceptable≥3.5	3	3	2	3	X^2=6.23
Low 3-3.4	11	10	18	22	P<0.05
Def. <3	97	87	61	75	

Table V. Serum total protein and albumin status of newborns.

Measurements	Public(18) No of subjects	%	Private(60) No of subjects	%	Statistical Significance
Serum total protein					
Acceptable≥5	69	85	53	88	X^2=2.8 N.S
Low or deficient>5	12	15	7	12	
Serum albumin					X^2=0.89 N.S
Lowor deficient<2.5	10	12	4	7	
acceptable ≥2.5	71	88	56	93	

Also, it was indicated that the cord non-protein nitrogen concentration rose with increasing birth weight.[19] In the present study, serum creatinine and urea concentrations of newborns in the private group were significantly higher with a higher birth weight. The higher concentration of creatinine in these babies can be explained by increased fetal production of creatinine because of the higher birth weight and hence increase of muscle mass.

From the present study, it can be concluded that maternal nutrition, as a result of a particular socio-economicstatusclearly affects the mothers and to some extent their newborns' nutritional status.

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