Changes In Plasma Proteins And Fibrinolytic Activity In Pregnant Women In Calabar, Nigeria

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Citation

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Abstract

Haemodilution and changes in various protein levels have been associated with pregnancy and in order to assess the fibrinolytic activity and changes in plasma proteins during pregnancy, 100 pregnant and 100 non – pregnant subjects (controls) of age range 18 - 40 years were studied. Standard manual techniques were used to estimate plasma fibrinogen concentration (PFC), euglobulin lysis time (ELT), total proteins and albumin. The values of PFC and ELT were 3.2±0.8g/l and 358.3±84.7 minutes respectively for pregnant women as against 2.3±1.2g/l and 270.5±170.6 minutes respectively for non-pregnant women and the differences were statistically significant at p<.001 and p<.001 respectively while concentrations of total proteins, albumin and globulin were 61.3±10.3g/l, 38.1±7.4g/l and 19.9±9.1g/l respectively for pregnant women and 62.0±10.1g/l, 38.3±8.0g/l and 21.2±8.1g/l respectively for non-pregnant women and these differences were not statistically significant (P>0.05) . The differences in the values of PFC, ELT, total proteins, albumin and globulin in pregnancy with regard to the three age groups (19 – 25 years, 26 – 32 years and 33 – 39 years) were not statistically significant (P> 0.05). In conclusion, fibrinolytic activity in pregnant women differ from non – pregnant subjects due to significant increase in PFC and prolonged ELT which confirms hyperfibrinogenaemia and reduced fibrinolytic activity in this condition which therefore makes it necessary to monitor PFC and ELT in pregnancy since they are prone to thrombosis and haemorrhage.

INTRODUCTION

Fibrinolysis is a normal body process where fibrin clot, the product of coagulation is broken down by plasmin at various sites leading to the production of circulating fragments that are cleared by other proteinases or by the kidney and liver [1-3].

Coagulation and fibrinolytic systems undergo major alteration during pregnancy and the knowledge of these physiological changes characterized by haemodilution, changes in the concentration of one or more plasma proteins fractions and reduced fibrinolytic activity is necessary to manage two of the more serious problems of pregnancy, haemorrhage and thrombo–embolic disease, which are caused by disorders in the mechanism of haemostasis [4,5]. However, the most striking maternal physiological alteration occurring during pregnancy is the increase in blood volume and this increase is needed for extra blood flow to the uterus, extra metabolic needs of the fetus and increased perfusion of other organs especially the kidneys [5] .

Increased levels of plasma proteins and reduced fibrinolytic activity have been reported in pregnancy [6,7] while prolonged euglobulin lysis time and increased level of fibrinogen have been observed by earlier authors [8,9] .

Since geographic and ethnic differences could influence health indices, this study was carried out in Calabar, South Eastern Nigeria to determine baseline values for plasma proteins fractions and ELT in pregnant women.

MATERIALS AND METHODS

The study was carried out between January and June, 2007 after the Ethical Committee of the University of Calabar Teaching Hospital, Calabar had approved of the study. Informed consent of each of the one–hundred (100) apparently healthy pregnant subjects who attended the antenatal clinic at the University of Calabar Teaching Hospital, Calabar and that of one hundred (100) non–pregnant subjects (controls) of similar age of 18 – 40 years drawn from Calabar metropolis was sought.

Six (6.0) ml of venous blood was withdrawn asceptically into a disposable plastic syringe from each subject and 4.5 ml of it was mixed with 0.5 ml of 31.3 g/l sodium citrate solution while the remaining 1.5ml of the blood was put in a plain bottle. Blood samples in citrated bottle were centrifuged at 2,500g for 10 minutes to separate the plasma

for the determination of plasma fibrinogen concentration by dry clot weight method of Ingram[10] and euglobulin lysis time by Haugie method [11]. The serum from the plain container was used for the determination of total proteins and albumin.

Total proteins determination using Biuret method was done by adding 1ml colour reagent to 20µl of serum sample or standard in a test tube and the contents were mixed and incubated for 5 minutes at room temperature. The absorbance of the sample and the standard were measured against the reagent blank within 30 minutes at 540 nm while albumin concentration was determined using Randox kit by adding 3.0ml of BCG reagent (R1) to 0.01 ml distilled water, standard and serum sample respectively in three different test–tubes. The contents were mixed and colorimetric measurement of the absorbance of the sample and the standard against the reagent blank at 620nm determined.

DATA ANALYSIS

Data were expressed as mean ± standard deviation. Students't–test and one-way analysis of variance (ANOVA) were employed and the differences of $P \leq 0.05$ were considered significant while correlations were determined by linear regression analysis.

RESULTS

Table 1 shows the result of plasma proteins and fibrinolytic activity in pregnant women. Significant increase in the values of PFC and ELT of 3.2 ± 0.8 g/l and 358.3 ± 84.7 minutes for pregnant women were observed when compared to 2.3 ± 1.2 g/l and 270.5 ± 170.6 minutes for non-pregnant women at P< 0.001 and P< 0.001 respectively. There were no statistically significant differences in the values of total proteins, albumin and globulin of pregnant women as compared to non-pregnant women (P> 0.05).

Table 2 shows changes in plasma proteins and fibrinolytic parameters with age during pregnancy. The differences in the values of PFC, ELT, total proteins, albumin and globulin in the three age groups (19-25 years, 26-32 years and 33-39 years) were not statistically significant (P>0.05).

Table 3 shows comparison of fibrinolytic parameters for pregnant and non-pregnant women with regard to age. Higher values of plasma fibrinogen concentration (PFC) of 3.22 ± 0.73 g/l, 3.18 ± 0.89 g/l and 3.44 ± 0.63 g/l in pregnancy were observed for the age groups 19-25 years, 26-32 years 33-39 years respectively as compared to 2.48 ± 0.67 g/l, 2.41 ± 0.5 gll and 2.5 ± 0.45 g/l for non-pregnant subjects and these differences were statistically significant at P< 0.001, P< 0.001 and P< 0.005 respectively. ELT values increased with age in pregnancy as follows: - 351.9 ± 99.6 minutes, 358.3 ± 81.7 minutes and 369.2 ± 57.0 minutes were observed for age groups 19-25 years, 26-33 years and 33-39 years respectively as compared to 261.5 ± 92.6 minutes, 290.8 ± 108.2 minutes and 245 ± 76.6 minutes for the same age groups of non-pregnant subjects. These differences were statistically significant (P< 0.001, P< 0.001 and P< 0.001 respectively).

Plasma levels of total proteins, albumin and globulin between pregnant and non-pregnant subjects with respect to age groups 19-25 years, 26-32 years and 33-39 years were not statistically significant (P> 0.05).

Figure 1

Table 1:CHANGES IN PLASMA PROTEINS AND FIBRINOLYTIC ACTIVITY IN PREGNANT WOMEN

Parameter	Pregnant Women (n = 100)	Non-pregnant Women (n = 100)	P-value
PFC (g/l)	3.2 ± 0.8	2.3 ± 1.2	<0.001
ELT (mins)	358.3 ± 84.7	270.5 ± 170.6	<0.001
Total proteins (g/l)	61.3 ± 10.3	62.0 ± 10.1	>0.05
Albumin (g/l)	38.1 ± 7.4	38.3 ± 8.0	>0.05
Globulin (g/l)	19.9 ± 9.1	21.2 ± 8.1	>0.05

Figure 2

Table 2: CHANGES IN PLASMA PROTEINS AND FIBRINOLYTIC PARAMETERS IN PREGNANT WOMEN IN RELATION TO AGE

Parameter	19-25 years (n = 27)	26-32 years (n = 57)	33-39 years (n =16)	P-value
PFC (g/l)	3.22 ± 0.73	3.18 ± 0.89	3.44 ± 0.63	>0.05
ELT (mins)	351.9 ± 99.6	358.3 ± 81.7	369.2 ± 57.0	>0.05
Total proteins (g/l)	61.2 ± 10.9	61.6 ± 8.9	60.3 ± 14.4	>0.05
Albumin (g/l)	37.6 ± 6.9	38.1 ± 7.4	39.2 ± 8.8	>0.05
Globulin (g/l)	20.4 ± 8.4	20.3 ± 9.1	17.7 ± 10.1	>0.05

Figure 3

Table 3: PLASMA PROTEINS AND FIBRINOLYTIC PARAMETERS OF PREGNANT AND NON-PREGNANT WOMEN WITH REGARD TO AGE

Parameter	19-25 years		26-32 years		33-39 years	
	Pregnant	Non- pregnant	Pregnant	Non- pregnant	Pregnant	Non- pregnant
Number	27	60	57	34	16	6
PFC (g/l)	3.22 ± 0.75	2.48 ± 0.67*	3.18 ± 0.89	2.41± 0.5*	3.44 ± 0.63	2.5 ± 0.45**
ELT (mins)	351.9 ± 99.6	261.5 ± 92.6*	358.3 ± 81.7	290.8 ± 108.2*	369.2 ± 57.0	245 ± 76.6*
Total proteins (g/l)	61.2 ± 10.9	61.7 ± 11.9 ns	61.6 ± 8.9	62.1± 6.4 ns	60.3 ± 14.4	63.7 ± 8.2 ns
Albumin (g/l)	37.6 ± 6.9	37.5 ± 9.0 ns	38.1 ± 7.4	39.4 ± 6.6 ns	39.2 ± 8.8	40.1 ± 3.3 ns
Globulin (g/l)	20.4 ± 8.4	21.8 ± 8.8 ns	20.3 ± 9.1	20.2 ± 6.1 ns	17.7 ± 10.1	21.1 ± 6.7 ns

Values are expressed in mean ± SD

ns = not significant (P> 0.05)

* = significant (P< 0.001) compared to non pregnant subjects with age

** = significant (P< 0.005) compared to non-pregnant subjects with age

DISCUSSION

Haemodilution and changes in various protein levels have been observed during pregnancy and the knowledge of these physiological changes is necessary to manage problems of haemorrhage and thrombo-embolism associated with the condition.

Reports from different parts of the world showed that there is hyperfibrinogenaemia in pregnant women [12-14] and this common finding from different authors has been confirmed in this study. The increased concentration of fibrinogen could be due to enhanced synthesis and utilization in the utero-placental circulation or hormonal changes, particularly high levels of estrogen [5].

The present study further showed that there was prolonged ELT during pregnancy which is associated with reduced fibrinolytic activity. Suppression of fibrinolytic activity has been found to play an important role in the prevention of haemorrhage during pregnancy [15].

Total proteins, albumin and globulin concentrations in pregnancy showed no significant differences when compared to non-pregnant subjects . These findings are comparable to earlier authors [13,16,17], however, changes in the concentration one or more of the plasma proteins could lead to change in plasma viscosity which plays role in haemorheology [18].

The study showed that age had no significant effect on PFC, ELT, total proteins, albumin and globulin in pregnant women. However, pregnancy significantly increased the values of PFC and ELT while the concentrations of total proteins, albumin and globulin showed no significant differences irrespective of age.

In conclusion, this study has shown that fibrinolytic activity in pregnant women differ from non-pregnant subjects due to significant increase in PFC and prolonged ELT which confirms hyperfibrinogenaemia and reduced fibrinolytic activity in pregnancy.

It is recommended that PFC and ELT should be monitored in pregnancy especially when there is risk of thrombotic crisis.

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