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A study of circulating sialic acid levels in pregnancy

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Abstract

Background: The sialic acid level is significantly higher in full term cord firbrinogen than in controls and higher in premature than term samples and degree of hypersialation of fetal fibrinogen is a function of gestational age,prenatal diagnosis and confirmation of infantile sialic acid storage disease have been carried out by amniocentesis. **Aims & Objectives**: To correlate the physiological stress occurring during different trimesters of pregnancy with circulating level of serum sialic acid. **Methodology:** In this study 30 blood samples were collected from healthy pregnant women in each trimester of pregnancy of age group between 18-35 years along with age and sex matched non pregnant control group. The blood samples was collected from all participants and analyzed for Serum sialic acid ,total protein, albumin and Blood sugar. **Results:** The mean concentration of serum sialic acid (Micmol/dl) in non pregnant control was estimated to be 119.1±4.68 as compared to 138.8± 4.57,155.76± 5.1, 171.18± 6.7 in first, second and third trimester of pregnancy respectively. **Conclusion:** The level of total sialic acid is found to be elevated as the pregnancy advances. This increase in maternal circulating serum TSA levels can be attributed to the immunological and metabolic adjustments that the pregnant women undergoes to bring about successful pregnancy.

Keywords: Sialic Acid, Pregnancy, Cancer, Biochemistry.

INTRODUCTION

Serum sialic acid has been used as a tumor marker for a number of different types of cancer: carcinoma of the bronchus, prostate, ovary, breast, colon, and malignant melanoma [1-4]. In addition, serum sialic acid has been found to be elevated in chronic liver diseases, pneumonia, rheumatoid arthritis, Behcet's disease, and Crohn's disease [5-8]. Patients with chronic glomerulonephritis [9] also have elevated serum sialic acid concentrations. Serum sialic acid has been recently shown to be a cardiovascular risk factor and elevated in patients with an acute myocardial infarction although the underlying mechanism is not known [9, 10]. This study tested the hypothesis that serum sialic acid may be altered in pregnancy. There are few data concerning serum sialic acid in pregnancy or post-partum and controversy exists regarding whether there is an elevation during and following pregnancy. Such a study has important implications for the interpretation of serum sialic acid status in females.

MATERIALS AND METHODS

The study was carried in the department of Biochemistry of B.J Medical College and New Civil Hospital, Ahmadabad, Gujarat, India.

Cases- 90 pregnant female of 25-35 year age group (30-First trimester,30-Second trimester,30-Third trimester)

Controls- 30 Non pregnant female of 25-35 year age group controls

The blood samples were drawn and collected in a clean, disposable plastic tube from anterior cubital vein under aseptic condition for estimation of total sialic acid (TSA), total protein, albumin and Blood sugar. The TSA content of serum was estimated according to periodate/thiobarbituric acid/diethyl sulphoxide method given by L.Skoza and S.Mohos [11] in semiauto analyser. Serum Total protein, albumin and Blood sugar was estimated by manual method in semi automated biochemistry analyzer.

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Statistical analysis

Comparison of various parameters was done between pregnant (case) and Non pregnant (Control) Female by calculating p-value by using Graphpad prism software. *P-value* <0.01 was consider as a significant

RESULT

Statistical evaluation of serum total sialic acid levels and other biochemical parameter in non pregnant and pregnant groups is shown below-

Among 120 women total participants 30 is of first trimester, 30 is of first trimester, 30 is of second trimester, 30 is of third trimester and 30 is of control(Non pregnant women). [Table 1].

Table 1: Distribution of participants according to trimester of pregnancy

Group	Number of participants(n)
Control (Non pregnant)	30
Cases (Pregnant)	
1 st Trimetser	30
2 nd Trimetser	30
3 rd Trimetser	30

The mean concentration of total sialic acid(TSA), total protein, albumin and Blood sugar of all participants (Both case and control group)is mentioned in tabulated form. [Table 2-5].

Table 2: Showing the mean concentration of TSA in pregnant and Non pregnant females

Group	Number of participants(n)	Total sialic acid (Micmol/dl) (Mean ± SD)
Control (Non pregnant)	30	119.1± 4.68
Cases (Pregnant)		
1 st Trimetser	30	138.8± 4.57
2 nd Trimetser	30	155.76± 5.1
3 rd Trimetser	30	171.18 ± 6.7

Table 3: Showing the mean concentration of Blood sugar level in pregnant and Non pregnant females

Group	Number of participants(n)	Blood sugar (mg/dl) (Mean ± SD)
Control (Non pregnant)	30	79.23±1.52
Cases (Pregnant)		
1 st Trimetser	30	79.4± 3.04
2 nd Trimetser	30	79.68±2.39
3 rd Trimetser	30	79.29 ± 1.88

Table 4: Showing the mean concentration of Total protein (gm/dl) in pregnant and Non pregnant females

Group	Number of participants(n)	Total protein (gm/dl) (Mean ± SD)
Control (Non pregnant)	30	7.29± 0.08
Cases (Pregnant)		
1 st Trimetser	30	7.23± 0.09
2 nd Trimetser	30	7.57± 0.13
3 rd Trimetser	30	6.95 ±0.17

Table 5: Showing the mean concentration of Serum albumin (gm/dl) in pregnant and Non pregnant females

Group	Number of participants(n)	Albumin (gm/dl) (Mean ± SD)
Control (Non pregnant)	30	4.0± 0.09
Cases (Pregnant)		
1 st Trimetser	30	3.63± 0.07
2 nd Trimetser	30	3.42± 0.06
3 rd Trimetser	30	3.37 ±0.05

Comparisons of all parameters between pregnant and non pregnant females was done according to trimester by calculating p-value. [Table 6]

Table 6: Showing the Comparison of mean concentration of various parameter between pregnant (Case)and Non pregnant(Control) females

Parameter	Group	Number(n)	Mean SD	p-value
S.TSA (Micmol/dl)	Control	30	119.1± 4.68	**<0.01 (Significant)**
	1 st trimester	30	138.8 4.57	
	Control	30	119.1± 4.68	**<0.01 (Significant)**
	2 nd trimester	30	155.76 5.1	
	Control	30	119.1± 4.68	**<0.01 (Significant)**
	3 rd trimester	30	171.18± 6.7	
Blood Sugar (mg/dl)	Control	30	79.23±1.52	>0.01 (Non significant)
	1 st trimester	30	79.4 ± 3.04	
	Control	30	79.23±1.52	>0.01 (Non significant)
	2 nd trimester	30	79.68± 2.39	
	Control	30	79.23±1.52	>0.01 (Non significant)
	3 rd trimester	30	79.29 ± 1.88	
Total protein (gm/dl)	Control	30	7.29± 0.08	>0.01 (Non significant)
	1 st trimester	30	7.23 ± 0.09	
	Control	30	7.29± 0.08	>0.01 (Non significant)
	2 nd trimester	30	7.57 ± 0.13	
	Control	30	7.29± 0.08	>0.01 (Non significant)
	3 rd trimester	30	6.95 ± 0.17	
Albumin (gm/dl)	Control	30	4.0± 0.09	>0.01 (Non significant)
	1 st trimester	30	3.63 ± 0.07	
	Control	30	4.0± 0.09	>0.01 (Non significant)
	2 nd trimester	30	3.42 ± 0.06	
	Control	30	4.0± 0.09	>0.01 (Non significant)
	3 rd trimester	30	3.37 ± 0.05	

Among them we find only significant difference in total sialic acid level. Sialic acid levels found to be high pregnant women of all trimester as compared to control. Among all pregnant womens, it is very high in third trimester as compared to first and second trimester.

DISCUSSION

The serum sialic acid concentrations (Micrmol/dl) obtained by us in this study in pregnant women's are 119.1±4.68, 119.1±4.68 and 119.1±4.68 in first, second and third trimester respectively as compared to 138.8 ±4.57, 155.76±5.1 and 171.18±6.7 in control group respectively. Sialic acid levels found to be high pregnant women of all trimester as compared to control. Among all pregnant women's, it is very high in third trimester as compared to first and second trimester that is similar to those reported by Hangloo *et al* [12] and Lindberg *et al* [13] who reported serum sialic acid values in non-pregnant females.

We were able to show that there were highly significant elevations in serum sialic acid during pregnancy which persisted 12 weeks post-partum, albeit to a lesser degree in comparison to non-pregnant females. There is controversy in the literature of whether serum sialic acid increases in pregnancy. Sydow *et al* [14] reported that serum sialic acid was not significantly increased in pregnancy, whereas Alvi and colleagues [15] did show significant elevation during pregnancy that was in keeping with ear- lier data from Goni and co-workers [16].There could be many reasons for these discrepancies including varying populations of women studied and assay differences. We used a specific enzymatic assay to measure serum sialic acid and not the thiobarbituric acid or resorcinol assays that are colorimetric and can interfere with other carbohydrate moieties.

The mechanism of alterations in sialic acid concentrations is unclear and merits further research as to its cause. A number of alterations in sialic acid metabolism have been described during pregnancy. Szeverenyi *et al* [17] showed that the binding of sialic acid targeting lectins (Limulus polyphemus and Triticum vulgaris) towards uterine cervical tissue is increased during pregnancy. Nemansky *et al* [18] demon- strated that human placenta has sialytrans- ferase activity that is capable of transferring sialic acid residues to oligosaccharide chains of glycoproteins. Furthermore, Arkwright *et al* [19] described fetally derived syntiotrophoblast tissue in the placenta as being richly sialylated. Interestingly, bovine pregnancy associated glycoprotein also contains sialic acid residues, although whether the same applies to humans needs clarification. Furthermore, salivary sialic acid is decreased during pregnancy, which the authors concluded may be because of the hormonal changes associated with pregnancy [20]. The elevation of serum sialic acid during pregnancy is of note and we believe our data adds to the literature showing changes in sialic acid status in pregnancy. The mechanisms are unclear and we can only speculate as to the reason. Particularly, intriguing is the question of whether pregnancy imposes an increased risk of cardiovascular disease [21,22].

CONCLUSION

The level of total sialic acid is found to be elevated as the pregnancy advances. This increase in maternal circulating serum TSA levels can be attributed to the immunological and metabolic adjustments that the pregnant women undergoes to bring about successful pregnancy. Increase in pregnancy specific protein containg sialic acid would be reflected in serum TSA levels.

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