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STUDY OF SERUM CHOLESTEROL IN NORMAL PREGNANCY AND PREGNANCY INDUCED HYPERTENSION (PIH) AT TERM.

Physiology

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ABSTRACT

A cross sectional study was carried out in the dept of Obstetrics & Gynaecology, Guwahati Medical College, Guwahati and also the estimation was done in the Department of Physiology, G.M.C.H during the period commencing from Dec 2018 to Nov 2019. To determine the values of serum cholesterol in normal pregnancy and PIH at term we have applied student t test and p value . The two- tailed P value is <0.0001, considered extremely significant. t = 5.427 with 138 degrees of freedom. 95% confidence interval, Mean difference = 26.080 (Mean of PIH minus mean of Normal) The 95% confidence interval of the difference : 16.578 to 35.582. We have also found out the maximum number of cases are from the age group 28-30, which is a very potential reproductive age group. For pregnancy induced hypertension cases BP level and serum cholesterol level are compared in terms of mean BP and mean serum cholesterol level, according to maternal age- group and it showed that rising blood pressure level does not signify a high serum cholesterol level which was statistically proved, as P> 0.01. Summary- In this study, the relation of serum cholesterol in normal pregnancy at term and pregnancy induced hypertension (PIH) with the maternal age, have been reviewed. The level of serum cholesterol was found to increase gradually with the advancement of pregnancy at term, reaching a maximum during labor. This elevation of cholesterol may be due to physiological response to pregnancy or it may be indicative of pathology in some women.

KEYWORDS

Pregnancy, Serum cholesterol, PIH.

INTRODUCTION

Cholesterol is present in the diet in all persons, and it can be absorbed slowly, from the G.I.T. into the intestinal lymph. Cholesterol is fat soluble, but slightly soluble in water and it has the capacity to form esters with fatty acids. Cholesterol was first obtained from Gall stones in the year 1769. Normal serum cholesterol in both sexes varies with age. Normal serum cholesterol level in adult venous blood is around 145-170 mgm/dl [1]

The estimated cholesterol values vary from 110 to 296 mgm percent although in majority the range is from 130-240 mgm percent [2].

Relation of serum cholesterol with different trimesters of pregnancy

It has been observed by several workers that serum cholesterol level rises as pregnancy advances and it was seen that the highest level is in the third trimester of pregnancy.

All women in normal pregnancy displayed a significant elevation of serum total cholesterol and low density lipoprotein- cholesterol (LDL-C) during parturition [3]. The high cholesterol levels can cause some risks during pregnancy. Women who had high cholesterol during the gestation period have a heightened risk of preterm birth and may develop pregnancy induced hypertension [4].

Pregnancy is associated with hypercholesterolaemic state in some ladies with pregnancy-induced hypertension [5]. High levels of cholesterol in pregnancy enhance inflammatory responses and peroxynitrite generation in cerebral arteries [6].

Early pregnancy dyslipidemia is associated with an increased risk of preeclampsia. Preeclampsia shares some metabolic characteristics with coronary artery disease. In the pre-eclamptic women plasma low density lipoprotein cholesterol was increased. Pregnancy induced hypertension (P.I.H) continues to be a major obstetric problem in the present days healthcare practice.

Cholesterol is the source of most of the steroids found in increased amounts in the circulation of pregnant women, which has a significant role of lipid metabolism in pregnancy. The lipid change during pregnancy may be due to formation of zygote in the uterine wall in the first trimester in response to the maternal switch from carbohydrate to fat metabolism, which is an alternative pathway for energy generation due to high energy demand in second trimester and development of fetal organ in the third trimester. [7]

Pre-eclampsia and eclampsia are the most frequently encountered medical complications of pregnancy. It affects both the mother and the unborn infant. It occurs in approximately 4-8% of all pregnancies and it also leads to death up to 17% of pregnant women [8].

Effect of serum cholesterol level during pregnancy and PIH

Pregnancy induced hypertension (PIH) which includes both gestational hypertension and pre- eclampsia is a common and morbid pregnancy complication for which the pathogenesis remains unclear. Emerging evidence suggests that insulin resistance, which has been linked to essential hypertension, may play a role in P.I.H. Conditions associated with increased insulin resistance, including gestational diabetes, polycystic ovary syndrome, and obesity may predispose to hypertensive pregnancy. Furthermore, metabolic abnormalities linked to insulin resistance syndrome are also observed in women with P.I.H to a greater degree than in normotensive pregnant women. These include glucose intolerance, hyperinsulinemia, hyperlipidemia, and high levels of plasminogen activator inhibitor-1, leptin and tumour necrosis factor. These observations suggest that possibility of insulin resistance may be involved in the pathogenesis of P.I.H and that approaches that improve insulin sensitivity might have benefit in the prevention of treatment of this syndrome, although it requires further study [9].

Pregnancy induced hypertension (P.I.H) is known as toxemia or pre eclampsia is a form of high blood pressure in pregnancy. PIH is the second most common medical disorder seen during pregnancy. Hypertensive disorders of pregnancy affects 6-8 % of all pregnancies, with wide variation as per geographical areas [10].

Materials and methods

After taking permission from Obstetrics & Gynaecology (O&G) dept of guwahati medical college a cross sectional study was carried out in the dept of Physiology from Dec 2018 to Oct 2019.

Serum cholesterol level was estimated in 70 cases of normal pregnancy at term and 70 cases of pregnant women complicated with pregnancy induced hypertension (toxaemia of pregnancy) at term.

The cases were selected at random from those attending regular clinic and also after they were admitted in the ward.

Inclusion criteria for selecting a case in normal pregnancy at term includes:

(i) The age range from 21-38
(ii) Normal blood pressure of 120-80 and the

Exclusion criteria includes :

(i) Pre-existing hypertension
(ii) Treatment with drugs that may influence lipid profile.

Pregnancy induced hypertension (Pre- eclamptic toxaemia) was labeled when the cases showed at least any two of the following signs.
1. Resting blood pressure 140/90 mm. Hg or above.
2. Development of leg oedema and
3. Albuminuria without the evidence of urinary tract infection.

Methods
After taking informed consent data were taken from the patients that include their personal details, menstrual history, history of past illness, family history. Previous obstetric history, dietary habits and history of present pregnancy.

Laboratory Investigations

Estimation of serum cholesterol
2ml of venous blood was collected by a dry and sterile syringe. The blood was kept at room temperature and allowed to clot.

Separation of serum
The serum was separated by centrifuging the whole blood in a centrifuge machine at 3000 rpm for 10 minutes.

Method:CHOD- POD ENZYMATIC, COLORIMETRIC, END POINT TEST.

Reagents
1. Enzme reagent- 5vials
2. Buffer solution- 50 ml
3. Precipating reagent- 5ml
4. Standard- 3ml.

Reagent preparation
Reconstitute 1 vial of reagent with 10ml of buffer solution reagent. All other reagents are ready to use.

Procedure
Mode – Endpoint
Wavelength – 505 n.m.
Incubating temp – 37 degree C
Incubation time – 10 mins.
Optical path length – 1 cm.
Reaction slope – Increasing.
Reaction Volume – 1ml
Sample volume – 0.01 ml.
Concentration of standard- 200 mg/dl.
Linearity – 500 mg/dl.
Units – mg/dl.

Manual Assay: Pipetted into the test tubes labeled

	Blank	Standard	Test
Cholesterol Reagent	1.0 ml	1.0 ml	1.0 ml
Standard	-	0.01 ml	-
Sample	-	-	0.01ml

The reagents are mixed well and incubated at 37 degree c for 10 mins and measured the absorbance of standard and test at 505 n.m against Reagent Blank.

Calculations
Total cholesterol in mg/dl = $\frac{\text{ABS. of Test X 200}}{\text{ABS. of standard}}$

Reference Values
Total cholesterol – 150- 250 mg %

Statistical analysis of data
To determine the value of serum cholesterol in third trimester of normal pregnancy and PIH at term, we have applied student t test and p value to test whether the difference of serum cholesterol in third trimester for normal pregnancy and PIH at term are statistically significant or not.

Table : Comparison between the levels of serum cholesterol in cases of normal pregnancy, and pre- eclamptic toxaemia.

	Serum Cholesterol level (mg%)		
	No. of cases	Mean	S.D
Normal pregnancy(Third Trimester)	70	270.67	33.15
Mild pre-eclamptic toxaemia	70	296.75	22.75

The above table shows that the cases of pregnancy complicated with pre- eclamptic toxaemis show the serum cholesterol levels higher when compared with the levels of normal pregnancy.

P value

The two- tailed P value is <0.0001, considered extremely significant.
t = 5.427 with 138 degrees of freedom.

95% confidence interval
Mean difference = 26.080 (Mean of PIH minus mean of Normal)
The 95% confidence interval of the difference : 16.578 to 35.582

Assumption test : Are the standard deviation equal ?
The t test assumes that the columns come from populations with equal SDs, the following calculations test that assumption.

F = 2.123

P value is 0.0010.

This test suggests that the difference between the two SDs is very significant.

Assumption test: Are the data sampled fro Gaussian distribution ?

The t test assumes that the data are sampled from populations that follow Gaussian distributions. This assumption is tested using the method Kolmogorov and Smirnov.

Distribution of cases according to maternal age group

Age in years	Number of cases
16-18	3
19-21	10
22-24	5
25-27	15
28-30	20
31-33	10
34-36	7
	70

From the above table it is found that the maximum number of cases are from the age group 28-30, which is a very potential reproductive age group.

For 70 cases of pregnancy induced hypertension cases BP level and serum cholesterol level can be compared in terms of mean BP and mean serum cholesterol level, according to maternal age- group.

These are shown in the following table.

Table : Distribution of mean BP and mean serum cholesterol level according to different maternal age group.

Maternal age (years)	No. of cases	Mean B.P (m.m Hg)	Mean serum cholesterol (mg%)
16-18	3	163/97	283.0
19-21	10	162/94	298.8
22-24	5	158/96	312.8
25-27	15	162/94	289.4
28-30	20	164/97	295.2
31-33	10	151/91	302.2
34-36	7	155/93	300.0
	70		

The above table shows the different BP levels of the cases, which were studied, and it showed that rising blood pressure level does not signify a high serum cholesterol level which was statistically proved, as P> 0.01.

Discussion

Pregnancy is a physiological state, not a disease. Various anatomical, physiological and biochemical changes occur throughout the whole period of pregnancy. Most changes that occur associated with pregnancy are usually normal. In some it may be difficult to demarcate the zone between normality and alenormality. One of the important biochemical changes, amongst many others that occur during normal pregnancy is hypercholesterolemia. A gradual rise in serum cholesterol level in normal pregnancy reaching its peak at labour has been regarded as a normal change. Like most changes in normal pregnancy, the cause of hypercholesterolemia is also definitely not known.

In the present study the serum cholesterol estimation was done to determine the level in three different trimesters of pregnancy and also in 70 cases of pregnancy induced hypertension.

Table 1: Showing the relation of serum cholesterol with different trimesters of normal pregnancy.

Observer	Serum cholesterol mg% Duration of pregnancy		
	1st Trimester	2nd Trimester	3rd Trimester
1 . E. M. Boyd (1935)	183.20	220.13	254.73
2. Oliver and Boyd (1955)	187	201	283
3. Wastone et.al (1958)	134-238	158-284	214-555
4. Russel and Bratvold (1959)	152	211	257
5. Potnis et.al (1972)	170.5	210.6	275.4
6. Chaturvedi et.al (1978)	200-277	210-255	220-287
7. Sarin et.al (1982)	150-230	164-240	190-276
8. Present study	171.24	221.46	270-67

The present study shows that the serum cholesterol rises gradually with the advancement of pregnancy, reaching a maximum during third trimester. This is in coherence with the studies done by the past investigators.

Table 2:

Age (in years)	No.of cases	Cholesterol level
16-18	3	280
19-21	10	292
22-24	5	268
25-27	15	278
28-30	20	300
31-33	10	310
34-36	7	350

Age distribution of 70 cases of pregnancy induced hypertension shows that maximum numbers of cases (50%) were between the age of 25-27 & 28-30 years, which is the very potential reproductive age group.

Results

The present study was carried out in the dept of Physiology after taking permission from Obstetrics & Gynaecology (O& G) dept of guwahati medical college, guwahati and during the period commencing from Dec 2018 to Nov, 2019.The relation of serum cholesterol in normal pregnancy at term and pregnancy induced hypertension (PIH) with the maternal age, have been reviewed. The level of serum cholesterol was found to increase gradually with the advancement of pregnancy at term, reaching a maximum during labor.

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