

SERUM CHOLESTEROL IN PREGNANCY

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In addition to the features relating to circulatory and blood pressure changes during pregnancy, it is known that high concentration of many of the steroids occur as normal pregnancy advances and since cholesterol is the source of most of the steroids found in increased amounts in circulation of normal pregnant women the part played by lipid metabolism in pregnancy, both normal and abnormal, becomes all the more intriguing.

It has been known for years that an increase in circulatory lipids occurs during pregnancy. Becquereau and Redier in 1845 suggested that hyperlipimia occurred during pregnancy and they hypothesized that this change represented an increase in blood cholesterol as well as increase in lipid phosphorous during pregnancy. Two years later Virchow (1847) showed that the milky appearance of the sera of some pregnant women was due to the presence of fat as demonstrated by shaking the sera with ether, so that the fat could be extracted. The first chemical study was undertaken in 1911 when Chauffard and associates demonstrated an increase of blood cholesterol during pregnancy. In the same year Neuman

and Herrmann studied the lipid particles in whole blood and reported increase in cholesterol and in neutral fat during pregnancy.

Material and Methods

One hundred and Seventy cases were taken from Upper India Sugar Exchange Maternity Hospital, Department of Obstetrics and Gynaecology, G.S.V.M. Medical College, Kanpur during the period from February 1975 to May 1976 for the study of total serum cholesterol in pregnancy.

The patients studied were divided into the following groups:

CONTROL GROUP

Consists of 30 normal healthy non-pregnant women.

STUDY GROUP

Consists of:

(A) Normal	58
(B) Abnormal pregnancy	82
(a) Pre-eclampsia	32
(b) Eclampsia	12
(c) Essential hypertension	7
(d) Diabetes mellitus	4
(e) Hydramnios	4
(f) Jaundice	4
(g) Hyperemesis gravidarum	5
(h) Postmaturity	6
(i) Prematurity	7
(j) Thyroid goitre	1

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Cases were studied to find out the value of serum total cholesterol in mg% in normal non-pregnant women and the changes which follow as pregnancy advances and any change in abnormal pregnancy. General, systemic and local abdominal examinations were done; urine was tested for albumin and sugar and blood for Hb%. Other special investigations were done according to the need of the case. Serum cholesterol was analysed by MacIntyre and Rolston (1954) method.

Observations

TABLE I
Range of Serum Cholesterol in Non-pregnant Women

Total serum cholesterol in mg%	
Range	170 to 210
Mean	184.04
S.D.	12.52

TABLE II
Total Serum Cholesterol in Normal Pregnancy

Period	Range	Mean	S.D.
First trimester	200-277	235.0	28.84
Second trimester	210-255	243.8	19.03
Third trimester	220-287	257.54	21.24

TABLE III
Total Serum Cholesterol in Toxaemia of Pregnancy (mg%)

Toxaemia	Range	Mean	S.D.
1. Mild pre-eclampsia	243-378	280.83	34.93
2. Severe pre-eclampsia	291-327	300.00	18.04
3. Eclampsia	268-343	313.18	23.20
4. Essential hypertension	156-302	243.86	50.66
5. Hyperemesis gravidarum	150-293	247.75	60.10

The maximum level of total serum cholesterol was found in eclampsia. No significant rise was obtained in essential hypertension and hyperemesis gravidarum.

As evident from Table IV 29.8% cases of mild pre-eclampsia, 9% cases of severe pre-eclampsia and 14.29% cases of eclampsia showed serum cholesterol higher than 230 mg%. It indicates that total serum cholesterol increases maximum with toxaemia of pregnancy.

Discussion

Non-Pregnant Group

Total serum cholesterol level ranged from 170-210 mg% with a mean value of 180.04 ± 12.52 . Tyler and Underhill (1925) reported a figure of 206.9 ± 24.5 , while Green (1956) found it in a range of 180-230 mg%. Potnis and Purandare (1972) reported the mean value of 136.1 ± 14.60 . The lower value of total serum cholesterol may be due to different dietary habits in different parts of the country. Our findings are in agreement with the findings of Tyler and Underhill (1925) and Green (1966).

Serum Cholesterol in Normal Pregnancy

As evident from Table II serum cholesterol showed progressive rise as pregnancy advances. Oliver and Boyd (1955) noted low levels of serum cholesterol

TABLE IV
Total Serum Cholesterol in Abnormal Pregnancy (mg%)

Disease	150-190	190-230	Above 230
Pre-eclampsia			
Mild	—	—	23 (29.8%)
Severe	—	—	7 (9.09%)
Eclampsia	—	—	11 (14.29%)
Essential hypertension	1 (1.3%)	1 (1.30%)	5 (6.40%)
Diabetes Mellitus	—	—	3 (3.90%)
Hydramnios	—	2 (2.60%)	2 (2.60%)
Jaundice	—	—	4 (5.20%)
Hyperemesis gravidarum	1 (1.30%)	—	3 (3.90%)
Postmaturity	—	—	6 (7.79%)
Prematurity	—	2 (2.60%)	5 (6.49%)
Thyroid goitre	—	—	1 (1.30%)
TOTAL	2 (2.60%)	5 (6.50%)	70 (90.90%)

during 9th week of pregnancy, a peak rise at 33rd week. Rise in serum cholesterol as pregnancy advances was reported by Gupta *et al* (1967); Mullick *et al* (1969) and Potnis and Purandare (1972). Our data is in agreement with those of Mullick *et al* (1964), Russell *et al* (1964) and Potnis and Purandare (1972).

It is evident from our findings that total serum cholesterol starts rising after 12 weeks of pregnancy. It is well known that 73% of healthy women during pregnancy excrete lactose and glucose. It is evident that lactose is formed during pregnancy. Lactose is made up of glucose and galactose and the effect of glucose on serum cholesterol is less. All attention should be focussed on lactose only, as one of the aetiological factors for cholesterol increase in pregnancy. Exact mechanism still remain obscure.

The incidence of atherosclerosis is less in Indian women even in repeated pregnancies where the cholesterol level is elevated. This is probably because the elevated estrogens might be preventing the deposition of cholesterol in the intima of arteries and veins. Another possibility may be attributed to the

absence of testosterone in women even though the activity of this hormone may be seen. The rise of cholesterol is attributed to the new hypothetical concept of intramolecular conversion to cholesterol.

Toxaemia Group

It is evident from Table III that in mild pre-eclampsia the mean value of total serum cholesterol is 288.83 ± 34.93 . It is slightly higher than normal in pregnancy and definitely much higher than in normal non-pregnant group.

In severe pre-eclampsia the mean value for total serum cholesterol is 200 ± 18.04 when compared with the mean value of non-pregnant and pregnant groups it is much higher. In eclampsia the mean value for total serum cholesterol is 313.18 ± 13.20 , higher than in pre-eclampsia and much higher than in normal pregnant and non-pregnant groups. In cases of essential hypertension and hyperemesis gravidarum total serum cholesterol showed, significant rise, mean values being 243.50 ± 50.66 and 247.7 ± 66.10 respectively.

Konttinen *et al* (1964) also reported

increased serum cholesterol in late pregnancy (345.4 in normal pregnancy and 412.6 mg% in pre-eclampsia groups). The highest values were encountered at delivery—357.1 mg% for normal mothers and 447.6 mg% for pre-eclamptic mothers.

Scandrett *et al* (1959) found no significant change in total serum cholesterol of normal and pre-eclamptic mothers, his figures for total serum cholesterol for normal pregnancy were 277 mg% and for pre-eclamptic mothers 282 mg%. He also reported no significant change in essential hypertension.

Potnis and Purandare (1972) also found no significant change. They obtained a mean value for normal pregnant women in third trimester of 275.4 ± 23.58 and for eclamptics of 278.6 ± 78.21 mg%. Our findings are nearly in agreement with those of Kontinen *et al* (1964).

In our study there were only 5 cases of diabetes mellitus complicating pregnancy in which total serum cholesterol was significantly higher. Scandrett *et al* (1959) also reported elevated values in diabetes mellitus.

There was no change in total serum cholesterol in pregnancies associated with hydramnios, jaundice, prematurity and postmaturity.

Summary

1. Serum cholesterol studies were carried out in normal gravidas and in pre-eclamptic conditions. The results were compared with normal non-pregnant control groups. The results of pre-eclamptic group were compared with the results obtained in third trimester of normal gravidas.

2. A progressive rise was observed in serum cholesterol level as pregnancy advances.

3. In toxæmia of pregnancy there was significant rise in the total serum cholesterol as compared to third trimester in normal gravidas.

4. There was no significant change in levels of total serum cholesterol in essential hypertension and hyperemesis gravidarum as compared to normal pregnancy.

5. Cases of diabetes mellitus complicating pregnancy showed very high values of total serum cholesterol as compared to normal gravidas.

6. The values of total serum cholesterol in cases of hydramnios, jaundice, post maturity and pre-maturity were significantly changed besides the cases were few, so a definite conclusion can not be drawn.

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