DISCUSSION
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Hyperlipidaemia of pregnancy is now an established fact. Levels of hormones like oestrogen and progestrone significantly increase during pregnancy and falls with the expulsion of placenta so these hormone are indirectly responsible for altered lipid profile of pregnancy. So in cases of complicated pregnancy (Preeclampsia, Eclampsia & IUGR) there may be alteration in hormone levels which in turn will lead to alteration in lipid profile. So this study include changes in serum lipoproteins in cases of pre eclampsia, eclampsia and IUGR and comparison of these changes with each other.

The Basal level of plasma lipids in normal subjects are as follows:-

STC = < 200 mg%
STG = < 160 mg %
HDL = 30 - 90 mg %
LDL = 50 - 130 mg %
VLDL = < 32 mg %

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1. PRE ECLAMPTIC AND ECLAMPTIC Pts (GROUP A, GROUP B):

The observed mean STC during 2nd trimester was 178.33 ± 21.0, which increased to 196.77 ± 30 mg % at 3rd trimester, and reaching to 207.8 ± 28.86 mg% during labour. This rise in STC during pregnancy in cases of preeclampsia was statistically significant.

This level abruptly declined to 183.2 ± 25.36 on 24 hours P.P. and slowly reached to 172.5 ± 33.24 on 30th P.P. day. This fall on 1st P.P. day was also statistically significant.

Similarly in eclampsia mean STC level during 3rd trimester was 219.37 ± 36.3 mg % which touched to a peak of 234.41 ± 40.17 mg % during labour and declined to 209.45 ± 31.2 mg % on 24hrs P.P. These change were statistically significant. STC decreased to 180.83 ± 24.5 mg % on 30th P.P. day which was much less than the value at 3rd trimester. This rise in STC upto labour was in accordance with Nelson, 1966, Pontis and Purandare, 1972, Hyten and Lind, 1973, Chaturvedi, Tandon and Singh, 1978.

The rise in STC level from 3rd trimerter to I.P. was much less than fall with in 24 hrs. P.P. pt’s. with eclampsia, this may be due to the
fact that the values of third trimeter were unusually at the end of third trimeter and pt's usually delivered with in 2-5 days after admission.

Values of STC in pt's with eclampsia were much higher in comparison to patients with pre eclampsia in the corresponding period of gestation and these changes were statistically significant.

Rise in STC from 3rd trimester to labour was slightly more 6.8% in eclamptic pt's in comparison to pre eclampsia 5.5%. Fall in STC level with in 24 hrs P.P. was 10.6% in eclamptic pt's ,while in pt's with pre eclampsia it was 11%, it was nearly equal.

**SERUM LOW DENSITY LIPOPROTEIN - LDL-C:**

The observed mean LDL value during 2nd trimester in cases of pre eclampsia was 123.9 ± 14.94 mg %, it increased to 140.56 ± 22.48 at 3rd trimaner and touched to a peak of 152.98 ± 22.50 during labour. Rise from 2nd trimester to 3rd trimester and from 2nd trimester to labour was statistically significant.

However rise from 2nd to 3rd trimester was not significant statistically. These value declined to 127.90 ± 20.07 on 24 hrs P.P., 119.80 ± 21.01 on 7th day P.P. day 116.1 ± 24.49 on 30th day P.P which was little less than the value at 2nd trimester.

Observed mean LDL-c value in pt's with eclampsia was 156.88 ± 29.96 at 3rd trimester, during labour it was 178.82 ± 32.03 this rise in LDL was statistically significant these values declined to 157.37 ±20.87 on 1st P.P.day, it decreased to 131 ±16.27 on 30th P.P. day .It was much less than the value at 3rd trimester. The fall after labour was also statistically significant.

Values of LDL -C in pt's with Eclampsia were much higher in comparison to pre eclampsia during Pregnancy, labour and post partum period. Percentage rise of LDL -C was higher in pt's with eclampsia (14%) from 3rd trimester to labour, in comparison to 8% in pt's with pre eclampsia, the difference in LDL -C value at 3rd trimester between pt's with pre eclampsia and eclampsia was statistically not significant but it became statistically significant during labour due to more rise of LDL -C in eclamptic patients.

Fall in LDL value was 11.8% in pt's with eclampsia, while it was 16% in pt's with pre eclampsia. Similar findings were reported by Konttinen et al, 1964 Mullick and Bagga 1964, Barclay et al, Worth et al 1975, Pontis et al and Knopp et al 1981.
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**HDL-C:**

The observed mean HDL level during 2nd trimester was 34.8 ± 4.58 in pre eclamptic pt's, it declined to 32 ± 4.12 during labour. This fall was statistically just significant. The level of HDL started rising again soon after labour and it reached to 35.0 ± 3.36 at 30th P.P. day. In pt's with eclampsia the mean level of HDL during 3rd trimester was 32.4 ± 3.96 mg% which decreased to 29± 4.47 during labour and gradually raised to 30.1± 5.40 on 24 hrs P.P.and further decreased to 29.6 on 30th P.P.day. The fall in HDL from 3rd trimester to labour was statistically highly significant.

When we compared HDL level in both groups we found that mean value of HDL was much lower in pt's with eclampsia than in pre-eclampsia in the corresponding period of gestation, labour and after delivery. The difference in the values during labour and in the post partum period was statistically significant the HDL level started rising early in pts with pre-eclampsia while in pts. with eclampsia value remained on lower side even upto 30th P.P. day. Total decrease of HDL-C from 3rd trimester to labour was only 8.04% in pts. with pre-eclampsia while it was 11.7% in pt's with eclampsia.

As level of HDL-C is influenced by the level of Oestrogen and Oestrogen during pregnancy are mainly synthesized by placenta. HDL-C reflects placental function. Toxaemia of pregnancy is associated with chronic placental insufficiency leading to decreased production of Oestrogen. In our study we also found the same type of change that is fall of HDL level in Pts of eclampsia and pre-eclampsia during pregnancy. HDL-C in pre-eclampsia has also been reported previously (Scandrett, 1959).

**Serum Triglycerids (STG)**

In patients with pre-eclampsia the observed mean STG value was 97.2 ± 16 during 2nd trimester, it raised to 110 ± 20.33 during labour after labour it declined to 99.9 ± 19.2 on 1st P.P. day and further decreased to 89.5 ± 22.52 on 30th P.P. day. The rise in STG in pts with pre-eclampsia from 2nd trimester to labour was 13.4% and it was statistically significant. STG in pre-eclamptic pts showed a decreasing trend during post partum period.
In pts with eclampsia mean STG values were $111.75 \pm 24.79$ during 3\textsuperscript{rd} trimester, $114.82 \pm 26.42$ during labour and it decreased thereafter to $85.5 \pm 18.02$ on 30\textsuperscript{th} P.P. day. Rise from 3\textsuperscript{rd} trimester to labour was only 2.6% and it was statistically not significant. These findings are in accordance with previous observations (Kontinen et al 1979, Kalkhott et al 1978, Knopp et al, 1981, Dermandy et al, 1989). While comparing the values in the same period in both group of patients values were higher among patients with eclampsia except on 30\textsuperscript{th} P.P. day. Slow rise in STG during pregnancy in both group of patients may be due to the fact that toxaemia of pregnancy is associated with chronic placental insufficiency leading to decreased production of Oestrogens.

**Very Low Density lipoproteins - VLDL**

In pt's with pre-eclampsia, VLDL values were $19.28 \pm 3.3$ during 2\textsuperscript{nd} trimester, $22.1 \pm 3.81$ during labour and thereafter it gradually decreased to $18.5 \pm 4.11$ on 7\textsuperscript{th} P.P. day and $17.9 \pm 4.5$ on 30\textsuperscript{th} P.P. day. Rise in VLDL was 14.5% upto labour and it was statistically significant.

In pts with eclampsia VLDL values were $22.35 \pm 5.12$ during 3\textsuperscript{rd} trimester; $23 \pm 5.38$ during labour and $17 \pm 3.94$ on 30\textsuperscript{th} P.P. day. there was very slight rise (3%) from 3\textsuperscript{rd} trimester to labour in pts with eclampsia.

We divided the pts of pre-eclampsia broadly into twogroups depending on it's severity.

- patients with mild pre-eclampsia
  - BP < 160/110 mm Hg
  - Proteinuria absent
- patients with severe pre-eclampsia
  - BP > 160/110 mm Hg
  - Proteinuria present

Though values of STC, LDL during 2\textsuperscript{nd} trimester were less in patients with severe pre-eclampsia but rise was more in comparison to patients with mild IUGR. Percentage rise in STC and LDL was 13.8% and 20% respectively in pts with mild pre-eclampsia while it was 21% and 26% in pts with severe pre-eclampsia. Values of HDL were lower in patients with severe pre-eclampsia and this difference was statistically significant.

We also studied the serum lipoprotein profile in cases of pre-eclampsia who delivered low birth weight babies (weight < 2.5 kg). There
was not much difference in levels of STC and LDL in pts who delivered LBW babies from the mean value for the whole group as such. However decrease in HDL level from 2nd trimester to labour was more (13%) in this group in comparison to whole group where it was 8%.

Serum lipoprotein in pt’s with unfavourable outcome -

In our study incidence of prematurity was 20% in patients with pre-eclampsia while incidence LBW babies was 30%.

In contrast to pts. with pre-eclampsia, patients of eclampsia who delivered still births (5 out of 18) child showed marked deviation of serum lipoproteins from other patients of similar groups. Mean value of STC in patients who delivered still birth child during 3nd trimester was 251.3 ± 42.78 while the mean value of whole group was 219.37 ± 36.3, it raised to 278.0 ± 39.2 during labour it decreased to 236.8 ± 34.45 on 24 hrs P.P. and came to 205 ± 7 on 30th P.P. day. Similarly LDL value during 3rd trimester was 192.8 ± 58.72, it touched to a peak of 220 ± 31.72 during labour, then it declined to 183 ± 29.51 on 24 hrs. P.P. and decreased to 150 ± 10 on 30th P.P. day. Differences in the values of STC & LDL during 3rd trimester labour and in the post partum period was statistically significant with the mean values of these parameter for the group as such, however there was not much difference in the level of HDL as such. Rise in STC and LDL in pts. with still birth was 10.7% and 14.5% respectively, while it was 6% and 14.5 for the group as such. Similarly fall in the HDL was 14% and 10% respectively.

Effect of parity -

We studied the relation of parity with pre-eclampsia and eclampsia. pre-eclampsia was found to be more common (6 out of 10) in primiGravida. Similarly eclampsia was also found to be more common (11 out of 17) in PrimiGravida. Similar observation was made by Colvin et al (1939) who noted high percentage of cases of Toxaemia among Young primiGravida. Earlier workers also noted similar observations (Acosta - Sisson and bains, 1930 : Upshaw et al, 1932 ). Colvin also concluded that Toxaemia is more concerned with age rather than parity. We also studied the differences in serum lipoproteins in relation to parity. In pt’s with pre-eclampsia mean value of STC and LDL was little higher in PrimiGravidae in comparison to multi Gravidae but this was statistically not significant. There was no constant difference in the level of HDL in both group of patients.

In patients with eclampsia levels of STC and LDL was higher during third trimester and on 30th P.P. day in Primi Gravidae in
comparison to multi Gravidae. Like pt’s of pre-eclampsia, there was no constant difference in the level of HDL in both groups.

In the present study most of the Toxaemic mothers belonged to low and middle socio-economic status. Similar observations was made by De alvarez and Bratvold (1961). Most of the Toxaemic mothers were vegetarian. 70% of the pre-eclamptic and eclamptic patients were vegetarian. The dietary content of protein and fat plays a part in the production of toxaemia of pregnancy. Majority of earlier Hinselmann (1923), Groene (1923), and Bublitz Chenko (1925) concluded that lesser intake of protein and fat attributed to the production of Toxaemia.

40% of the pts. presented with unconsciousness in eclampsia group. On observing the lipoprotein profile it was found that mean STC & mean LDL was much higher in these patient in comparison to other patients without unconsciousness and this difference in STC & LDL level was Statistically significant during pregnancy, labour and post partum period. So it can be concluded that severity of eclampsia affects lipoprotein profile directly.

One pt. of pre-eclampsia group developed renal failure but there was no significant changes in the serum lipoproteins from other pts. 4 out of 17 pts. of eclampsia group developed renal failure and two patients showed impaired liver function but there was no significant changes in serum lipoproteins from other pts. though values were little higher specially in patients with renal failure.

II Patients with Intrauterine growth retardation - (Group - C)

The observed mean STC value in this group during 2nd trimester was 168.44 ± 7.95, it raised minimally to 171.5 ± 9.0 during 3rd trimester and touched to a peak of 176.9 ± 9.59 mg % during labour. This declined to 172.3 ± 9.2 on 24 hrs P.P. and reached to 165.83 ± 10.83 on the 30th P.P. day. Rise in STC upto labour and fall on 24 hrs P.P., 7th P.P. day and 30th day was statistically not significant. Total rise in STC was only 4.7% while it was 16% in pts. with pre-eclampsia.

When we compared the STC level in the three groups, they were lowest in pts. with IUGR during antepartum period, labour and post partum period and this difference was statistically highly significant.

Mean LDL value was 113.53 ± 8.0 during 2nd trimester, 119 ± 8.67 at 3rd trimester and 125.4 ± 8.77 during labour. It raised only 10% from 2nd trimester to labour while in pts. with preeclampsia total rise was 24% and 14% from 3rd trimester to labour in pts. with preeclampsia.
Rise in LDL value was not statistically significant. LDL value was also lowest in pts. with IUGR and difference in pts. with IUGR with pts. of toxaemia was statistically significant.

Observed mean HDL value was though highest in pts. with IUGR during 2nd trimester but it’s level declined rapidly reaching to 31.8 ± 1.94 during labour. Total decrease in HDL was 14% in pts with IUGR while it was 8% in pts. with preeclampsia and 10.4% in pts. with eclampsia (from 3rd trimester only). The fall in HDL level in this group was statistically highly significant, but fall in HDL was highest from 2nd trimester to labour among pts. with IUGR in comparison to preeclampsia.

Mean STG and VLDL levels during 2nd trimester were 87.88 ± 4.13 and 17.52 ± 2.5, these values raised to 97.2 ± 7.1 and 19.44 ± 2.13 during labour. These levels gradually declined to 92.7 ± 5.62 and 18.54 ± 2.2 on 1st P.P. day and 91 ± 4.27 & 18.2 ± 2.6 on the 30th P.P. day. Rise in STG and VLDL was statistically not significant. When we compared these values with values of preeclamptic and eclamptic patients, values were the lowest in pts with IUGR and these differences were statistically significant during pregnancy & labour.

The rapid fall and low levels of HDL during pregnancies complicated by IUGR may be due to the chronic placental insufficiency leading to the decreased production of Oestrogen and ultimately causing marked fall in HDL level.

In normal pregnancy rising maternal plasma titre of Oestrogen appears to be the principle hormonal factor responsible for enhanced endogeneous synthesis of triglycerides. It has been studied by Berzin and Vonstudintz (1957) that oestrogen causes rise in circulatory lipid levels. In cases of IUGR lower Oestrial between 32-34 weeks are valuable in predicting IUGR when screening high risk cases (Beischer et al, 1984) so lower oestrial may in turn lead to lesser rise in triglyceride levels in IUGR cases.

The serum concentration of VLDL is dependant on it’s rate of secretion by liver & degradation by lipoprotein lipase and lipoprotein lipase activity was found to be significantly increased in cases of chronically deprived fetuses like in case of IUGR in order to supply free fatty acids to the fetus (Y. Biale, 1985). In these situations of chronic fetal distress like in IUGR there is decreased supply of glucose to fetus, so complimentary changes take place in the placenta leading to an increased supply of free fatty acids to fetus which are liberated by hydrolysis of circulating maternal triglycerides.
It is known that cholesterol is transported in the form of lipoprotein in the plasma and higher proportion of cholesterol is formed in LDL (beta lipoprotein). Studies on cultured fibroblast lymphocytes and arterial smooth cells have shown existence of specific binding sites or LDL receptors. After binding LDL is internalized by an adsorptive endocytotic process and hydrolysed by lysosomal enzymes giving rise to amino acids cholesterol and free fatty acids. It is postulated that in cases of IUGR there may be defect in receptor level of LDL, but the exact nature is not known. In our study we found slight rise in LDL level during pregnancies of Pts with IUGR, but we could not find out the exact cause for which further study is needed.

We broadly divided IUGR group into two subgroups depending on its severity decided by USG examination of fetus and monitoring its growth as pregnancy advanced. We studied the difference in lipoproteins in both subgroup and found that though STC, LDL values were lower in pt's with severe IUGR in comparison to patients with mild IUGR but it was not significant statistically. HDL values were much lower in pts with severe IUGR and it was statistically significant.

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