DISCUSSION
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The present work was carried out to study the serum levels of cholesterol and triglyceride in cord blood of newborn babies. The study was conducted at M.L.B. Medical College, Jhansi in the Department of Paediatrics, in active collaboration with Department of Obstetrics and Gynaecology, from August 1994 to July 1995. The primary aim of study was to find out the normal values of cord cholesterol and triglyceride in term babies and to observe the correlation, if any, between their levels of prematurity, birth weight, intra-uterine growth retardation and perinatal stress factors.

The mean serum level of cholesterol of all 55 cases were observed to be 82.140 ± 12.763 mg/dl. Lower values of cholesterol (≤75 mg/dl) were observed by many observers namely Rafstedt, Brown, Russ, Brody and Carlson, Kleenberg and Polisuk, Cress and Jharsa in past. More than 90 mg/dl values of cholesterol were observed by Sadowsky, Kaplan & Lee, Fosbrooke, Mathur, Lakhtakia and Jagdish in the past. Similar finding to this were observed by Gordan & Cohn, Darmandy, Desai, Haridas and Acharya, and Kumar. Mean values of triglyceride level observed in this study was 49.461 ± 20.694 mg/dl. Less than 45 mg/dl values
were observed by Brody and Carlson, Kaplan & Lee, Fosbrooke, Cress. More than 55 mg/dl observed by Tsang, and proximity to mean value were observed by Haridas and Acharya, Kumar, and Lakhtakia.

Relation with Sex :-

In the present study, an effort was made to observe a difference, if any, between males and females regarding cholesterol and triglyceride levels. In the present study, females had apparently higher levels of cholesterol (84.258 ± 15.426) in comparison with males (80.381 ± 9.84 mg/dl), though the difference was statistically insignificant (P > 0.05). Similar finding also observed by Jagdish.

Triglyceride value was 52.261 ± 20.342 in males and 47.301 ± 20.893 mg/dl in female babies. The difference was statistically insignificant (P > 0.05).

The sex of newborn did not influence the cholesterol and triglyceride values.

Relation to gestational age :-

In this study, an attempt was made to observe a correlation, if any, between the increasing gestational age and level of cholesterol and triglyceride in cord blood. It was observed that the levels of cholesterol were apparently higher (83.063 ± 14.52) in gestational age group 38-41 weeks and exhibits a downward trend as the gestational
age decrease. The levels of cholesterol were $80.778 \pm 9.371$ in 34-37 weeks gestational age group and $78.0 \pm 1.66$ mg/dl in $\angle33$ weeks gestational age groups (Figure 1). The difference in said group were statistically insignificant ($P \geq 0.05$). Fosbrooke observed no significant difference in cholesterol levels with increasing gestational age.

The triglyceride levels in present group showed a positive correlation to gestational age (Table 4). The triglyceride levels were observed to be increased with gestational age (Figure 1). The values were $37.71 \pm 26.055$ mg/dl, $42.032 \pm 20.357$ and $52.34 \pm 18.84$ in $\angle33$ weeks, 34-37 weeks and 38-41 weeks of gestational age groups respectively. On comparison with $\angle33$ weeks gestational age group to 34-37 weeks gestational age groups, the difference were significant ($P \angle 0.05$). When compared 34-37 weeks gestational age group to 38-41 weeks gestational age group, the difference were significant ($P \angle 0.05$) and difference were highly significant ($P \angle 0.01$) when compared with $\angle33$ weeks gestational age group to 38-41 weeks of gestational age groups. Similar trend was also observed by Fosbrooke et al (1973), that was an increasing trend in triglyceride levels along with advancement of gestational age and they also observed that triglyceride level did not increase much below 37 weeks of gestational age and beyond it the increase was significant in low birth weight groups. The lower triglyceride concentration in lower gestational
age group reflected lesser importance of fat metabolism earlier in pregnancy and as deposition of fat in adipose tissue took place mainly in the last month of pregnancy.

It was inferred that cord blood cholesterol levels not influenced by gestational age and elevated cholesterol levels may indicate hypercholesterolemia and on the other hand the levels of triglyceride was affected by gestational age and an inferred should not be labelled as hyperlipidemia unless the factors were considered.

Relation with birth weight:

Due emphasis was also given to weight for age status and on observing the levels of cholesterol and triglycerides in different for age groups (Table 2 & 3). There were 11 babies of appropriate for gestational age, 5 babies of large for gestational age and 4 babies of small for gestational age in pre-term groups and in term groups, 29 babies of appropriate for gestational age and 6 babies of small for gestational age. It was seen that in pre-term group, the cholesterol value was higher in small for gestational age (86.241 ± 13.353 mg/dl) in comparison with appropriate for gestational age and large for gestational age (79.404 ± 5.85 mg/dl and 78.492 ± 6.829 mg/dl respectively). The difference was statistically significant (P < 0.05) when compared appropriate for gestational age with small for gestational age.
Difference was statistically insignificant (P > 0.05) when compared appropriate for gestational age with large for gestational age. Similar to this study, Kumar (1989) observed higher value of cholesterol in low birth weight babies in comparison with normal birth weight babies. The difference was statistically significant. Contrast to this study, Haridas and Acharya (1984) had lower values of cholesterol in small for gestational age in comparison with pre-term appropriate for gestational age group. The difference was statistically insignificant. Similar finding was also observed by Fosbrooke (1973) that the cholesterol levels did not vary much between term, pre-term and small for gestational age group.

In term group, small for gestational age had higher levels of cholesterol (91.101 ± 23.054 mg/dl) in comparison with appropriate for gestational age group (81.4 ± 11.32 mg/dl). The difference was statistically significant (P < 0.05). When compared pre-term appropriate for gestational age with term appropriate for gestational age group, the term appropriate for gestational age had apparently higher levels of serum cholesterol (81.404 ± 11.32 mg/dl) in comparison with pre-term appropriate for gestational age (79.404 ± 5.85 mg/dl) group. The difference was statistically insignificant (P > 0.05) and when term small for gestational age compared with pre-term small for gestational age, the difference was statistically
insignificant ($P \geq 0.05$). Similar finding was also observed by Fosbrooke (1973) that the cholesterol levels did not vary much between term, pre-term and small for gestational age group. The authors concluded that cord blood cholesterol levels were not influenced by birth weight and elevated cholesterol levels may indicate hypercholesterolemia.

The elevated level of cholesterol in small for gestational age groups attributed to intra-uterine malnutrition and in response to this mobilisation of intra-uterine fetal adipose store takes place and it is comparable with those found in marasmic children due malnutrition developing postnatally.

In table 2 it was seen that pre-term small for gestational age group had higher levels of triglycerides (62.493 ± 25.76 mg/dl) in comparison with appropriate for gestational age and large for gestational age groups (40.77 ± 23.324 mg/dl and 39.703 ± 4.537 mg/dl respectively). The difference were statistically highly significant ($P \leq 0.01$). Similar to this study, Haridas and Acharya (1984) had observed the higher values of triglyceride in pre-term small for gestational age in comparison with pre-term appropriate for gestational age. The difference was statistically significant. Kumar (1989) also observed significantly higher levels in pre-term small for gestational age 104.50 ± 20.80 mg/dl in comparison with pre-term
appropriate for gestational age 70.6 ± 32.68 mg/dl and in term small for gestational age 55.34 ± 23.95 mg/dl in comparison with term appropriate for gestational age 35.27 ± 17.49 mg/dl respectively. Fosbroke also observed higher values of triglyceride 45.4 ± 28.9 in small for gestational age in comparison with 29.5 ± 12.0 mg/dl in term babies. The difference was significant (P < 0.01).

The raised levels of triglyceride seen in small for gestational age group babies can be explained by considering them to be malnourished in intra-uterine life. Thereby switching over from carbohydrate metabolism to fat metabolism for energy requirements.

Term small for gestational age had triglyceride levels (52.692 ± 14.86 mg/dl) in comparison with term appropriate for gestational age (50.560 ± 19.551 mg/dl). The difference was statistically insignificant (P > 0.05). This observation was similar to those observed by Haridas and Acharya (1984). In contrast to this study, Kumar (1989) had observed significant higher value of triglyceride in term small for gestational age 55.34 ± 23.95 mg/dl in comparison with term appropriate for gestational age 35.27 ± 17.49 mg/dl.

On observing the cholesterol and triglyceride levels in different groups of increasing birth weight (table 7 & 8). It was evident from table 7 that the cholesterol values were found to be high in 1st & 1Ind
FIGURE SHOWING:

1. RELATION OF CHOLESTEROL WITH INCREASING BIRTH WEIGHT

2. RELATION OF TRIGLYCERIDE WITH INCREASING BIRTH WEIGHT
groups (1000 - 1500 gm & 1501 - 2000 gms) as compared with group V (3001 gms & above). The cholesterol values were 86.659; 96.989 ± 25.039 and 75.992 ± 9.284 mg/dl respectively in said groups. The difference were statistically highly significant (P ≤ 0.01).

Similar to cholesterol levels, triglyceride levels demonstrated an inversely proportion to the birth weight that is highest level observed in lowest birth weight groups (93.744 mg/dl) and lowest value (41.664 ± 17.696) in birth weight 2001 - 2500 gms. It was also lowered in birth weight groups 3001 and above. The difference was statistically significant (P ≤ 0.05) for group IIInd & IIInd. Group Ist had single case. Therefore statistically not comparable. Posbrooke and Whartan (1973) had high values of triglyceride in low birth weight babies in comparison to normal birth weight babies, difference were statistically significant.

The highest values of triglyceride in low birth weight babies can possibly be explained on the basis of these group mainly comprised of small for gestational age, low birth weight babies and term small for gestational age and as earlier all these groups have demonstrated higher triglyceride levels which have been explained by stress of delivery and intra-uterine malnutrition.
Relation to perinatal stress factors:

The cholesterol of normal newborn and stress newborn babies were 81.336 ± 10.579 mg/dl and 83.186 ± 15.252 mg/dl respectively. The difference were statistically insignificant.

On observing the level of cholesterol in babies affected by these factors individually (Table 12 & 13), in prolong labour the level was 75.992 ± 1.332 in comparison with 81.336 ± 10.579 mg/dl in normal newborn. The difference was insignificant (P > 0.05). Similar findings were observed by Tsang (1974) and Cress (1977).

Babies suffered by birth asphyxia showed cholesterol level 76.659 ± 3.33 mg/dl in comparison with 81.336 ± 10.579 mg/dl in normal newborn. The difference was insignificant (P > 0.05). Similar finding were observed by Sobte (1994) and Cress (1977).

Babies delivered by caesarean section had cholesterol levels 84.317 ± 15.921 mg/dl and in normal newborn babies it was 81.336 ± 10.579 mg/dl. The difference was insignificant (P > 0.05). Similar finding were observed by Cress (1977) and Sobti (1994).
The triglyceride levels of normal newborn and stress newborn babies were $41.027 \pm 17.037$ mg/dl and $60.355 \pm 19.881$ mg/dl respectively. The difference were statistically highly significant ($P < 0.01$).

In babies affected by prolong labour, the triglyceride level was $72.502$ mg/dl and in normal newborn it was $41.027 \pm 17.037$ mg/dl. The difference were highly significant ($P < 0.001$). Similar finding was observed by Tsang (1974), Cress (1977) and Sobti (1994).

On observing the babies affected by pre-eclamptic toxaemia the level was $58.703 \pm 20.711$ mg/dl and in normal newborn it was $41.027 \pm 17.037$ mg/dl. The difference was highly significant ($P < 0.01$). Similar finding were observed by Tsang (1974), Cress (1977), Lakhtakia (1990) and Sobti (1994).

Babies suffered by birth asphyxia had the triglyceride level $61.89 \pm 27.930$ mg/dl and in normal newborn it was $41.027 \pm 17.037$ mg/dl. The difference was highly significant ($P < 0.01$). Similar findings were observed by Tsang (1974) and Cress (1977).

Babies delivered by caesarean section had the triglyceride level $63.025 \pm 19.87$ mg/dl and in normal newborn it was $41.027 \pm 17.035$ mg/dl. The difference was highly significant ($P < 0.01$). Similar finding were observed by Tsang (1974), Cress (1977) and Sobti (1994).
FIGURE SHOWS:

1. RELATION OF CHOLESTEROL WITH INCREASING NUMBER OF PERINATAL STRESS FACTOR.
2. RELATION OF TRIGLYCERIDE WITH INCREASING NUMBER OF PERINATAL STRESS FACTOR.
The triglyceride values were high in prolong labour in comparison with normal newborn. The difference was statistically significant ($P \leq 0.01$). The triglyceride levels exhibiting a direct positive correlation with increasing number of perinatal stress factors and the differences were highly significant ($P \leq 0.001$). The triglyceride levels were high ($56.458 \pm 2.613$ mg/dl) when two perinatal stress factors were involved in comparison to normal newborn ($41.027 \pm 17.037$ mg/dl). The differences were statistically highly significant ($P \leq 0.01$). It is also observed that the triglyceride levels were further increased when three or four factors were involved and differences were highly significant ($P \leq 0.01$) as shown in Figure 3. Under normal circumstances foetal energy requirement are nearly exclusively catered by oxidation of carbohydrate stress as respiratory Quotient at birth is nearly unit. Stress in utero, in birth canal leads to high energy requirements and thereafter depletion of glycogen and carbohydrate stores, so the energy requirements are then catered by fat mobilisation and utilisation along with increased synthesis of triglycerides in the liver. Also during stress sympathetic system is stimulated and catecholamines elicit an immediate response as adipose tissue mobilisation and utilisation. All these mechanisms collectively lead to increased triglyceride levels at birth during stress. These findings were in close proximity to
those of Tsang and Glueck who also observed significantly raised levels of triglyceride under stressful conditions individually and collectively (P < 0.001). They also observed that the triglyceride levels significantly increased with the increase in number of perinatal stress factor (P < 0.001). Cress had observed the effect of perinatal stress factor over the biochemical parameter in cord blood. They observed elevated triglyceride levels in prolong labour, birth asphyxia, leaking P/V and pre-eclamptic toxemia. Tsang and Glueck, and Cress had observed elevated triglyceride level in increased perinatal stress factors. Lakhtakia et al (1980) had also observed raised triglyceride level in babies born to mother with essential hypertension.

From the above said discussion it was inferred that triglyceride levels were mostly affected by perinatal stress factors in comparison to cholesterol level.