DISCUSSION
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The present study was carried out to study the complement profile in 50 newborn babies and their mothers, delivered at M.L.B. Medical College and allied Hospital, Jhansi over a period of one year. The primary aim of our study was to evaluate the complement profile in full term normal healthy babies, preterm babies and babies suffering from intrauterine malnutrition (IUGR).

Besides evaluating the complement activity thorough physical examination was done in each and every case to categorise the newborn in our study groups.

Since the weight of baby has a direct impact on the complement profile, care was taken to weigh them carefully. The gestational age was assessed by the morphological characteristics and tallied with the history of last menstrual period as given by mothers.

Complement estimation was done by the method of single radial immunodiffusion technique of Mancini et al (1965).

Based on observations depicted in the Table I to XII, various inferences have been drawn and discussed in details herewith.

As shown in Table I, our study group comprised of 30 full term normal newborns and their mothers, 10 premature babies and their mothers and 10 intrauterine growth retarded babies and their mothers. Among premature
babies in our study 8 babies were AGA (babies weighing between 10-90th percentile for the period of gestation)
while 2 were SGA (babies weighing less than 10th percentile for the period of gestation), as assessed by the
intrauterine growth chart prepared at AIIMS, New Delhi.
All the 10 IUGR babies were symmetrical IUGR showing features of intrauterine malnutrition evidenced by features of decreased linearity, loss of subcutaneous, fat, loose dry skin and sparse hair (Lubchencar et al, 1963; Kaeye, 1966, Drillen, 1970 and Usher, 1970).

Fireman et al (1969) in their study took 24 normal human full term newborns and their mothers and 15 premature neonates and their mothers. Adinolfi (1970) took 22 normal full term newborns and their mothers at the time of delivery. Shapiro et al (1981) studied 28 term newborn infants, of whom 17 were SGA and 11 AGA. Tandon et al (1984) studied 60 newborns and mothers, of whom 10 were term healthy AGA. Out of 50 LBW babies, 23 were preterms (gestation <37 weeks) and 27 were term IUGR babies i.e. weight below 10th percentile for the gestation. Out of 23 preterm 18 were AGA and 5 were IUGR babies.

As depicted in Table II, of the total 50 newborn babies selected for the present study there were 34 males (68%) while the rest 16 (32%) were females.
The mean gestational age of full term newborns was 39.38±0.92 weeks and birth weight was 2.66±0.14 kg.
In preterm group, babies who were AGA had mean gestational
age of 32.5±2.29 weeks and their mean birth weight was 1.7±0.17 kg. On the other hand SGA babies had mean gestational age of 32±0 weeks, while their mean birth weight was 1.23±0.02 kg.

The mean gestational age of IUGR babies was 39.4±0.89 weeks while their mean birth weight was 1.65±1.67 kg.

As has already been mentioned, the complement profile was assessed by the single radial immunodiffusion of Mancini et al (1965). It was observed (Table III) that the C₃ level in full term normal newborns was 44.4±6.0 mg/dl. Tandon et al (1984) reported a nearly similar value 49.8± mg/100 ml as reported by us. However, Propp and Alter (1968), Fireman et al (1969) and Adinolfi (1970) reported higher value of C₃ in their control group of cases (88.8, 75.7±19.3 and 54.4 mg/dl respectively).

Serum C₃ values in the mothers of full term neonates was 90.3±9.46 mg/100 ml. Tandon et al (1984) reported a nearly similar value of 92±21.10 mg/dl as reported by us. However, Propp and Alter (1968), Fireman et al (1969) and Adinolfi (1970) reported higher maternal values of C₃ in their studies as 178.3, 139.3±35.4, and 143.4 mg/dl respectively. It is evident from these observations that the concentration of C₃ in newborns was 49.1% (44.4±6.0 mg/dl) of that in mothers (90.3±9 mg/100 ml), signifying time proven fact that complement is not passively transferred from the mother but is
synthesized in the fetus. Fisher and Pearlman (1961), Kohler (1967), Propp and Alter (1968) Fireman et al (1969) and Adinolfi (1970) and Tandon et al (1984) had also observed decreased neonatal C₃ value in comparison to its value in maternal sera. The increase in maternal C₃ concentration in these studies, took being double when compared to their neonatal values.

Various hypotheses have been put forward from time to time for the lower C₃ levels in newborns, which approximates the maternal level by 6 month of age. Tandon et al (1984) attributed the decreased level to (a) decreased hepatic protein synthesis (b) Absence of transplacental transfer, and (c) Presence of an anti-complementary substance in cord blood.

As shown in table III premature babies had lesser value of serum C₃ (31.3±1.97 mg/100 ml) in comparison to its value in full term neonates (44.4±6.0 mg/dl), the difference between these values was found to be statistically significant (p <0.05). Tandon et al (1984) also observed significantly lower value of serum C₃ in preterm babies (33.8±11.18 mg/dl) in comparison to the values in full term (51.5±14.94 mg/dl) (p <0.05).

Among premature babies a significant finding observed was that premature SGA babies had lower values of serum C₃ (28.5±0.71 mg/dl) in comparison to its value in premature AGA babies (32.06±1.45 mg/dl). The difference between these values was found to be statistically significant as determined by student 't' test (p <0.05).
No other worker in the past had divided these preterm babies into AGA and SGA hence a comparison of our values to that of other worker could not be ascertained.

Kaur et al (1979) has opined that complement plays a role in the heat labile opsonic system and enhances phagocytosis of organism, a depression of this factor of immune response predisposes the premature baby to greater infection.

It was observed that premature babies had 32.2% (33.8±1.97 mg/dl) of serum complement C3 in comparison to its value in mothers (97.3±5.89 mg/100 ml).

Table IV depicts the values of complement C3 in IUGR babies when compared to that in full term babies. It was seen that IUGR babies had lesser values of C3 (38.9±1.89 mg/100 ml) in comparison to the value observed in full term normal neonates (44.4±6.01 mg/dl). The difference in these values was found to be statistically significant as determined by student 't' test (p <0.05).

Shapiro et al (1981) observed lower value of serum C3 in term SGA babies (75±15 mg/dl) in comparison to its value in AGA babies (90±18 mg/dl). Difference in these values was found to be statistically significant (p <0.02). Tandon et al (1984) also reported lower value of serum C3 in IUGR babies (47.5±19.75 mg/dl) in comparison to that observed in full term neonates (51.5±14.94 mg/dl), however, the difference was not found to be significant.

It is evident from table IV that IUGR babies had 43.2% of serum complement C3 (38.9±1.83 mg/dl) in comparison to its value in mothers (90±5.13 mg/dl).

We also tried to observe a comparison between complement level in premature and IUGR babies as
depicted in Table V. A significant finding of our study was that premature babies, especially preterm SGA babies had the least values of $C_3$ when compared to the values in term and IUGR babies. Premature babies with AGA had lesser value ($32.06 \pm 1.45$ mg/100 ml) in comparison to its value observed in IUGR babies ($38.9 \pm 1.83$ mg/100 ml). Difference between the two values was found to be statistically significant ($p \leq 0.05$).

Premature babies with SGA had also lesser values of $C_3$ ($28.5 \pm 0.71$ mg/100 ml) in comparison to its value observed in IUGR babies ($38.9 \pm 1.83$ mg/100 ml). Values being statistically significant ($p \leq 0.05$).

Tandon et al (1984) like us had also observed significantly ($p \leq 0.05$) lower value of $C_3$ in premature babies ($33.8 \pm 11.8$ mg/100 ml) in comparison to the values observed in IUGR babies ($47.5 \pm 19.75$ mg/100 ml).

An attempt was also made to observe a correlation of the complement $C_3$ level according to the birth weight group in both preterm and term babies irrespective of their gestational age. According to it our babies were divided into various birth weight groups viz. 1000-1500, 1500-2000, 2000-2500 and 2500-3000 gm as depicted in Tables VI and VII.

Among term neonates, babies weighing between 1000-1500 gm had lesser values of serum $C_3$ ($35 \pm 1$ mg/dl) in comparison to the values observed in babies weighing between 1500-2000, 2000-2500 and 2500-3000 gms, values
being 39.9±1.81, 43.90±6.94 and 46.56±5.38 mg/100 ml respectively, the difference in the values was found to be statistically significant (p < 0.05) in all the groups.

Babies weighing between 1500-2000 gms had lesser values of C₃ (39.9±1.8 mg/100 ml) in comparison to its value in babies weighing between 2000-2500 and 2500-3000 gms values being 43.90±6.94 and 46.56±5.38 mg/100 ml respectively. Statistically significant difference was observed between these groups (p < 0.05). Babies weighing between 2000-2500 gm had lesser value of C₃ (43.90±6.94 mg/100 ml) in comparison to its value in the group 2500-3000 gms (46.56±5.38 mg/100 ml). However, no statistically significant difference was observed between these values (p > 0.5).

Among premature babies, babies weighing between 1000-1500 gms had lesser value of serum C₃ (28.5±0.71 mg/100 ml) in comparison to the value in babies weighing between 1500-2000 gms, who had serum C₃ value (32.66±1.45 mg/100 ml). Difference in these values was found to be statistically significant as determined by student 't' test (p < 0.05). Thus, a significant finding of our study was that babies with the least birth weight (1000-1500 gms) had the lowest values of complement C₃ making them more prone to infections as compared to their counterpart who weighed more.
Sawyer et al (1977) in their study indicated that newborn infants with birth weight greater than 2500 gms have a functionally normal complement system, while 50% of infants with birth weights less than 2500 gms have significant complement deficiencies. He further stated that the significant difference in complement level in infant with birth weight above and below 2500 gms, suggested either accelerated synthesis or placental transport in the late weeks of gestation.

Four arguments have been marshalled against the possibility of placental transport. Firstly, no correlation was found to exist between maternal and fetal complement proteins as observed by Traub (1943), Kohler (1968) and Sawyer et al (1971). Secondly there is no consistent or rapid decrease of C-protein levels in the first days of life as would be expected if neonatal levels were derived transplacentally. Fireman et al (1969) reported a rise rather than a fall of C₃, C₄ and C₅ in the first 45 days of life and Gitlin et al (1969) reported a stability of C₃ levels in the first 15 days of life. Thirdly there are allotypic difference (as detected by starch gel electrophoresis) of C₃ between mother and newborn sera indicating that synthesis of a different allotype of C₃ is occurring within the fetus and that little or no maternal C₃ crosses the placenta. Fourthly Gitlin et al (1969) have shown that cells from human embryos of 29 days gestation are capable of
synthesizing C₃. Thus this evidence strongly support
the notion that complement proteins are synthesized by
the fetus and do not cross the placenta.

Drew and Arroyave (1978) found a statistically
significant correlation between increasing birth weight
or gestational age and increasing serum concentration
of total haemolytic activity C₁q, C₄ and C₃.

Tandon et al (1984) also observed increasing
level of serum C₃ with increasing birth weight in both
preterm and term babies. According to them preterm
babies weighing ≤1500 gms had serum C₃ value of 38.85±
11.89 gms while babies weighing between 2000-2500 gms
had serum C₃ value of 40.50±15.90 mg/dl, on the other
hand full term babies weighing ≤1500 mg/dl had serum C₃
value of 46.0±5.65 mg/dl while babies weighing ≥2500 gms
had serum C₃ value of 51.5±14.94 mg/dl.

As depicted in Table VIII, serum C₄ values in
full term neonates was 14.78±2.79 mg/100 ml. Fireman et
al (1969) and Adinolfi (1970) have also reported nearly
similar value of C₄ (15.8±3.8 mg/dl and 16.3 mg/dl)
respectively as reported by us.

Serum C₄ values, in the mothers of full term
neonates was 29.48±4.11 mg/dl. Fireman et al (1969) and
Adinolfi (1970) have also reported nearly similar value
of C₄ in the mothers (29.3±7.9 and 28.1 mg/dl) respecti-
vively as reported by us. It was seen that the mothers of
full term neonates had higher value of C₄ (29.48±4.11
mg/100ml) in comparison to the values observed in neonates
(14.78±2.77 mg/100 ml).

It is evident from table VIII that C₄ levels in
full term babies was 50.1% in comparison to its level in
mothers.

On comparison of C₄ levels in term and preterm
babies it was observed (Table VIII) that the premature
babies had lesser values of C₄ (9.8±1.67 mg/100 ml) in
comparison to the values observed in full term neonates
(14.78±2.79 mg/100 ml) (p ≤0.05). Among premature babies,
babies with SGA had lesser value of C₄ (9±1 mg/100 ml) in
comparison to its value in premature babies with AGA
(9.9±1.76 mg/100 ml). However, no statistically signifi-
cant difference was observed between these two values.

Since no worker in the past has divided the
preterm babies into AGA and SGA hence a comparison of our
values to that of other worker could not be ascertained.

It is evident from table VIII that concentration
of C₄ in premature babies was 39.7% (9.8±1.67 mg/100 ml)
of that in mothers (24.9±2.25 mg/100 ml).

As depicted in table IX, IUGR babies had lesser
value of serum C₄ (10.5±2.15 mg/100 ml) in comparison to
its value in full term neonates (14.78±2.79 mg/100 ml),
difference in these two values was found to be statisti-
cally significant (p ≤0.05).

Shapiro et al (1981) also observed lower though
statistically insignificant values of C₄ in term neonates
SGA (20±10 mg/100 ml) in comparison to the values in their AGA babies (25±10 mg/100 ml).

As depicted in Table X, premature babies had lesser value of serum C₄ (9.8±1.67 mg/100 ml) in comparison to the values observed in IUGR babies (10.5±2.15 mg/100 ml) though the values were not found to be statistically significant (p 70.5).

Attempt was also made to compare the values of C₄ in both groups of preterm babies to the values observed in IUGR babies (Table X). A significant finding of our study, unlike C₃ values was, that though the preterm babies demonstrated least values of complement C₄ when compared to that observed in IUGR babies, the values were not statistically significant (p 70.5).

It is evident from Table IX that concentration of serum C₄ in IUGR babies was 42.4% (10.5±2.15 mg/100 ml) in comparison to its value in their mothers (27.8±2.73 mg/100 ml).

An attempt was also made to observe a correlation of the complement C₄ level according to birth weight groups in both term and preterm babies irrespective of their gestational age. Accordingly, our babies were divided into various birth weight groups viz. 1000-1500, 1500-2000, 2000-2500 and 2500-3000 gms and a linear correlation was found that babies having lesser birth weight had lesser values of serum C₃.
As depicted in Table XI and XII, babies weighing between 1000-1500 gms had least values of serum C₄ (9.5±0.50 mg/100 ml) on the other hand babies weighing between 2500-3000 gms had maximum value of serum C₄ (14.25±1.6 mg/dl).

Among preterm babies, babies weighing between 1500-2000 gms had higher value of serum C₄ (9.9±1.76 mg/100 ml) in comparison to the values observed in babies weighing between 1000-1500 gms (9±1 mg/100 ml). However, the values between these two groups were not found to be statistically significant (p 70.5).