

IMMUNOGLOBULINS IgG, IgM AND IgA LEVELS IN PRETERM AND SMALL FOR DATE NEWBORNS

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ABSTRACT

Forty preterm [14 small for gestational age (SGA), 26 average for gestational age (AGA)] and 40 term (10 SGA and 30 AGA) babies were tested for immunoglobulins (Ig) G, M and A levels. IgG levels increased with gestational age from 922.00 ± 14.00 mg/dl at 34 weeks to 1827.33 ± 184.09 mg/dl at 40 weeks.

Mean immunoglobulins were lower in SGA babies. IgG was 1029.59 ± 122.80 mg/dl in SGA preterm babies and increased to 1262.00 ± 200.0 mg/dl in 2 kg babies. IgM and IgA although increased with higher birth weight but rise was not statistically significant. More care to avoid infections in preterm and SGA babies, with lower immunoglobulin levels and less resistance, is recommended.

Key words: Immunoglobulins, Small for gestational age, Preterm.

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Developmental studies of human immunoglobulin (Ig) production have indicated that the normal newborn babies are almost agammaglobulinemic at birth with the exception of transplacentally acquired maternal immunoglobulins IgG and a little IgM and IgA produced by the fetus. However, after birth and subsequent mucosal colonisation with bacteria and exposure to other antigens, the immune systems begins to mature rapidly, particularly for IgG and T cell function. IgA immune system appears to mature late and adult levels of serum IgA are attained several years after birth. The fetus is capable of producing immunoglobulin (IgG and IgM) as early as 20th week of gestation in response to an intrauterine infection(1). Various studies have demonstrated that premature infants and small for gestational age (SGA) babies have higher morbidity and mortality from infections than the normal birth weight babies(2,3). The present prospective study was planned to measure various immunoglobulins levels in preterm and small for date newborns.

Material and Methods

The present prospective study was carried out over 40 preterm [14 small for gestational age (SGA) and 26 average for gestational age (AGA)] and 40 term babies (10 SGA and 30 AGA) born in Government Medical College, Patiala. Only preterm and term newborns without any complication, born to mothers without any pregnancy complication or apparent infection were taken. Within 24 hours of birth, 2 ml of femoral venous blood of the newborn was collected by means of a sterile, dry disposable needle and syringe and serum was separated. Estimation of serum immunoglobulin (IgG, IgM and IgA) was

done using radial immunodiffusion technique described by Mancini *et al.* (4) on tripartigen plates where 5 μ ml serum for IgG and 10-20 μ ml for IgM and IgA was put in the wells in tripartigen plate. After keeping the plates at room temperature for 50 hours for IgG and IgA and 80 hours for IgM, diameter of precipitation ring was measured with the partigen ruler and the concentration of immunoglobulins were calculated in milligram/decilitre of serum from reference table for the diameter of the precipitation ring. Mean, standard deviation and standard error of mean were calculated. The 't' test was applied and results were compared at 5% level of significance in the various groups.

Results

Mean IgG, IgM and IgA levels in term group were 1544.65 ± 331.41 mg/dl, 34.00 ± 15.143 mg/dl and 3.45 ± 4.599 mg/dl, respectively in contrast to 1123.25 ± 153.88 mg/dl, 34.05 ± 6.515 mg/dl and 2.40 ± 3.666 mg/dl, respectively in the preterm group (Table I). It was observed that levels of IgG, IgM and IgA rose in direct proportion to the increase in gestational age. However, statistically significant increase was found only in IgG levels (Table II). Thus while IgG levels were 922.00 ± 14 mg/dl at 34 weeks, levels rose to 1138.75 ± 150.88 at 36 weeks and 1827.33 ± 184.09 mg/dl at 40 weeks ($p < 0.05$).

There were 14 babies in preterm group weighing 1.5 kg or less and their mean IgG was 1029.59 ± 122.80 mg/dl. Another 22 newborns weighing between 1.6 to 2 kg had mean IgG 1152.18 ± 135.00 mg/dl, while 4 babies between 2.1 \pm 2.5 kg had mean IgG levels 1262.00 ± 200.00 mg/dl (Table III). Hence, levels of IgG rose with increase in birth weight ($p < 0.05$). IgM and IgA levels also rose with increase in birth weight but the difference was not statistically significant.

Table IV shows mean immunoglobulin levels in term babies in relation to birth weight. Mean IgG levels were significantly higher in AGA babies than SGA babies. Even in SGA group, IgG levels were 1541.00 ± 337.08 mg/dl if weight was more than 2 kg and only 1056.00 ± 34.00 in babies weighing less than 2 kg. IgG levels rose to 1635.88 ± 276.27 mg/dl in babies weighing between 2.5 to 3 kg. IgM levels also were significantly more in 2 to 2.5 kg babies (46.00 ± 7.11 mg/dl) than in babies weighing less than 2 kg (10.00 ± 10.00 mg/dl) but with further increase in birth weight there was no rise in IgM level. IgA levels although rose with increase in birth weight but the rise was not statistically significant.

Discussion

It is a well known fact that infants born at term have normal adult level of IgG as a result of active transport of maternal IgG across the placenta. Since IgM and IgA are

TABLE I—Mean Immunoglobulin Levels in Preterm and Term Babies

| Group | No. of cases | IgG (mg/dl) | | IgM (mg/dl) | | IgA (mg/dl) | |
|---------|--------------|-------------|----------------------|-------------|--------------------|-------------|------------------|
| | | Range | Mean \pm SD | Range | Mean \pm SD | Range | Mean \pm SD |
| Preterm | 40 | 908-1462 | 1123.25 ± 153.88 | 20-48 | 34.05 ± 6.515 | 0-12 | 2.40 ± 3.666 |
| Term | 40 | 1022-1982 | 1544.65 ± 331.41 | 0-52 | 34.00 ± 15.143 | 0-15 | 3.45 ± 4.599 |

TABLE II—Mean Immunoglobulin Levels at Various Weeks of Gestation

| Gestational age (weeks) | No. | IgG (mg/dl) | | IgM (mg/dl) | | IgA (mg/dl) | |
|-------------------------|-----|------------------|---------|---------------|---------|-------------|---------|
| | | Mean ± SD | p value | Mean ± SD | p value | Mean ± SD | p value |
| 34 | 4 | 922.00 ± 14.00 | <0.05 | 25.00 ± 5.00 | >0.05 | 0.00 ± 0.00 | >0.05 |
| 35 | 20 | 1065.10 ± 95.82 | <0.05 | 33.00 ± 5.45 | >0.05 | 1.60 ± 2.65 | >0.05 |
| 36 | 16 | 1138.75 ± 150.88 | <0.05 | 57.62 ± 5.29 | >0.05 | 4.00 ± 4.47 | >0.05 |
| 37 | 12 | 1121.00 ± 165.76 | <0.05 | 25.0 ± 12.41 | >0.05 | 0.56 ± 1.49 | >0.05 |
| 38 | 8 | 1306.25 ± 191.72 | <0.05 | 32.75 ± 9.09 | >0.05 | 3.00 ± 3.37 | >0.05 |
| 39 | 8 | 1809.00 ± 72.50 | <0.05 | 47.75 ± 3.63 | >0.05 | 3.00 ± 3.31 | >0.05 |
| 40 | 12 | 1827.33 ± 184.09 | | 34.16 ± 18.46 | | 6.83 ± 5.84 | |

TABLE III—Mean Immunoglobulin Levels in Preterm Babies in Relation to Birth Weight

| S. No. | Birth weight (kg) | No. | IgG (mg/dl) | | IgM (mg/dl) | | IgA (mg/dl) | |
|--------|-------------------|-----|------------------|---------|--------------|---------|-------------|---------|
| | | | Mean ± SD | p value | Mean ± SD | p value | Mean ± SD | p value |
| 1. | 1.5 and less | 14 | 1029.59 ± 122.80 | <0.05 | 33.14 ± 6.26 | >0.05 | 1.14 ± 2.80 | >0.05 |
| 2. | 1.5 to 2.0 | 22 | 1152.18 ± 135.00 | <0.05 | 33.81 ± 6.84 | >0.05 | 2.90 ± 3.84 | >0.05 |
| 3. | 2.0 to 2.5 | 4 | 1262.00 ± 200.00 | | 38.50 ± 2.50 | | 4.00 ± 4.00 | |

impermeable, their levels are very low as compared to adult levels. Presence of IgM in cord blood thus reflects intrauterine infection. High levels of IgM in both the SGA and AGA in present study could be due to subclinical intrauterine infection. Hobbs and Davis(5) demonstrated a linear relationship between the logarithm of the gammaglobulin levels at birth and

gestational age. Yeung *et al.*(6) found that since the fetus is not normally subjected to antigenic stimulus, it produces very little immunoglobulins but as maternal IgG is transferred to the fetus in last few months of pregnancy, so serum levels are lower in babies born prematurely. Results of present study are also similar with less levels of IgG in premature babies than in

TABLE IV—Mean Immunoglobulin Levels in Term Babies in Relation to Birth Weight.

| Group | Birth weight (kg) | No. | IgG (mg/dl) | | IgM (mg/dl) | | IgA (mg/dl) | |
|-------|-------------------|-----|------------------|---------|---------------|---------|-------------|---------|
| | | | Mean ± SD | p value | Mean ± SD | p value | Mean ± SD | p value |
| SGA | 2 | 4 | 1056.00 ± 34.00 | <0.05 | 10.00 ± 10.00 | <0.05 | 0.00 ± 0.00 | >0.05 |
| SGA | 2-2.5 | 6 | 1541.00 ± 337.08 | <0.05 | 46.00 ± 7.11 | >0.05 | 4.00 ± 3.26 | >0.05 |
| AGA | 2.5-3 | 16 | 1635.88 ± 276.27 | <0.05 | 33.75 ± 16.24 | >0.05 | 4.87 ± 5.32 | >0.05 |
| AGA | 3 | 14 | 1581.57 ± 313.77 | | 36.00 ± 8.53 | | 2.57 ± 4.10 | |

SGA: Small for gestational age.

AGA: Average for gestational age.

term babies. Ahmad *et al.*(7) found less IgG levels in SGA term and preterm babies and results of present study are similar. However, Hyvarinen *et al.*(8) found no statistically significant difference in the levels of IgG in SGA and AGA term babies. Small for date and premature babies are at a higher risk for morbidity and mortality probably due to low immunoglobulin levels(2,3).

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