

“Estimation of Fetal and Maternal Immunoglobulin Concentration in cases of vaginal delivery and elective caesarean”

K. Srivastava, J. Kar, R. K. Misra, Anita Khantwal

Department of Obst. & Gynaec, Dept. of Pathology, B. R. D. Medical College, Gorakhpur

Summary

One hundred mothers and their babies were studied in order to evaluate the serum immunoglobulins in cases of normal vaginal delivery and elective caesarean. The cases included were of more than 37 weeks gestation, out of which 80 were included in group I (normal vaginal delivery and their babies). Twenty cases were included in group II (elective caesarean and their babies). Serum Immunoglobulin were found by Single Radial Immunodiffusion method. Significant elevation of cord sera over maternal sera IgG levels were found in vaginal delivery but no significant difference was found in elective caesarean cases. A linear relationship was found between the duration of labour and elevation of cord serum IgG in vaginal deliveries. Elevated levels of IgA and IgM in cord serum indicated some kind of intrauterine infection.

Introduction

The fetus before delivery remains in a germ free state due to passive immunity supplied from the mother via placental barrier. Although the immune system of the fetus has the ability to form specific antibodies against infection, this active synthesis of antibodies against infection occurs only when the fetus is infected in uterus by organism which crosses the placental barrier. Immunoglobulins are proteins and in human beings classified as IgG, IgM, IgA, IgD, IgE.

IgG is the major serum immunoglobulin (73%) and is the only maternal immunoglobulin that is normally transported across the placental barrier and this transmission is facilitated by uterine contraction.

IgA (15-20%) is present in colostrum, saliva and tears. IgM predominantly intravascular is the earliest immunoglobulin to be synthesized by the fetus beginning at about 20 weeks of age. As it is not transmitted across the placenta, the presence of IgM in the fetus indicates intrauterine infection and its detection is useful in the diagnosis of congenital syphilis, rubella and

toxoplasmosis. IgM and IgA do not cross the placental barrier, however the neonate is quite capable of synthesizing its own provided it gets an adequate stimulus. IgD is found in very low concentration in the plasma. IgE is transmitted to the neonate from the mother via the breast milk.

Material and Methods

The present study was carried out on antenatal patients selected from the out-patient department and indoor patients in Nehru Chikitsalaya, Department of Obstetrics and Gynaecology, B.R.D. Medical College, Gorakhpur. The study was conducted on hundred patients of different age groups. Cases were both primigravida and multigravida having gestational period of more than 37 weeks and were divided into two groups.

Group-I: Comprised of 80 patients of normal vaginal delivery and their babies. Duration of labour was counted from the time of admission in the hospital.

Group-II: Comprised of 20 patients of elective caesarean section and their babies. In this group the indications of elective caesarean were varied.

Patients history and detailed examination findings including weight and height were recorded. Patients were investigated for blood group, Rh factor, VDRL and haemoglobin content. Total and differential leucocyte count, serum protein and complete urine examination were also done.

Estimation of serum immunoglobulins (IgG, IgM, IgA) levels were done by single radial immunodiffusion method using immunodiffusion tripartigen plates. Maternal venous blood was collected from the antecubital vein during parturition. Fetal blood was collected from the severed umbilical cord after delivery.

Observation and Discussion

Our study showed that there is highly significant increase in the cord blood IgG levels as compared to

maternal IgG levels in the vaginal deliveries $z=5.676$ ($p<0.001$) (Table-I). There was no significant increase in the cord IgG levels as compared to maternal IgG levels in elective caesarean ($t=0.977$ and $p>0.05$) (Table-II). When the maternal sera IgG levels of both groups were compared the difference was found to be insignificant ($z=1.68$, $p>0.05$). When the cord sera IgG of both groups were compared the difference was found to be significant ($z=6.106$, $p<0.001$). Our findings are consistent with the findings of Cochran (1972) who found a significant increase in IgG levels of maternal and cord blood in vaginal deliveries ($p<0.001$) while this difference was insignificant in elective caesareans ($p>0.05$). We have found a linear relationship between the duration of labour and the elevation of cord sera IgG levels (Table-III). These facts are corroborated by Jones and Payne (1967) and Yang et al (1971) but not by Cochran (1972).

Table-I
Showing Comparison of IgG Levels in Maternal and Cord Sera in Both Modes of Delivery (in mg/dl)

Mode of Delivery	Range	Mean	S.D.
Vaginal delivery			
Mother (A)	658.7 – 1183.0	1080.42	600
Baby (B)	1127.0 – 2182.0	1654.16	646.37
Elective caesarean section			
Mother (C)	666.6 – 1263.0	1131.76	505.96
Baby (D)	660.0 – 1260.0	1141.66	508.81

Table-II
Showing Statistical Evaluation of Table-I

Groups	Values	p value
A Vs B	z value 5.676	< 0.001
C Vs D	t value 0.977	> 0.05
A Vs C	z value 1.68	> 0.05
B Vs D	z value 6.106	< 0.001

Table-III
Showing Relation of Cord IgG Levels with Duration of Labour

Duration of labour in (hours)	Values of IgG (in mg/dl) Range	No. of cases	Mean	S.D.
0 - 6	1000 - 1250	10		
7 -12	1251 - 1500	25	1634.80	1392.29
13-18	1501 - 2000	28		
>18	> 2000	17		

In the present study, we found detectable amount of IgA in the cord blood of most of the neonates (Table IV). Our findings are similar to those of yang et al (1971) and Cochran (1972). This is in contrast to the study of Gitlin (1967) who could not demonstrate detectable amounts of IgA in the cord blood in the newborn. In the present study, we have found that the IgA levels of the maternal sera in both types of delivery were significantly higher than cord sera ($p < 0.001$) (Table-V). Cochran (1972) had also made similar observation.

In our present study in a case of pulmonary tuberculosis in whom elective caesarean was done, we found higher concentration of IgA in the cord blood than in maternal blood. Cherry and Rosenfield (1967) also found that the IgA concentration in the neonates is significantly higher when there is some intrauterine

infection.

We have been able to detect IgM levels in the cord blood of most of the neonates, but not in all, irrespective of the mode of delivery (Table-IV). Our findings are consistent with those of Gitlin (1967). Allansmith (1968) and Cochran (1972) have detected IgM levels in all infants irrespective of the mode of delivery. In the present study, we have found that IgM levels of the mother in both types of delivery were significantly higher than those in the cord sera ($p < 0.001$). (Table VI & VII). Our findings are similar to Cochran (1972) and Yang et al (1971) who also demonstrated significantly higher levels of IgM in maternal than cord blood sera. There is no significant difference in maternal IgM levels in both groups with cord sera of both groups ($p > 0.05$) (Table VI & VII).

Table - IV
Showing Comparison of IgA Levels in Maternal and Cord Sera in Both Modes of Delivery (in mg/dl)

Mode of delivery	Range	Mean	S.D.
Vaginal delivery			
Mother (A)	80.0 – 300.0	182.00	74.52
Baby (B)	Nil – 150.0	85.00	40.20
Elective caesarean section			
Mother (C)	91.0 – 490.0	149.26	96.84
Baby (D)	Nil – 476.2	76.40	45.00

Table - V
Showing Statistical Evaluation of Table-IV

Groups	Values	p value
A Vs B	z value 3.006	< 0.001
C Vs D	t value 2.78	< 0.001
A Vs C	z value 0.862	> 0.05
B Vs D	z value 0.502	> 0.05

Table-VI
Showing Comparison in IgM Levels in Maternal Sera and Cord Sera in Both Modes of Delivery (in mg/dl)

Mode of delivery	Range	Mean	S.D.
Vaginal delivery			
Mother (A)	170.0 – 220.22	198.00	65.00
Baby (B)	Nil – 54.20	43.10	18.20
Elective caesarean section			
Mother (A)	174.4 – 426.8	227.62	54.61
Baby (B)	Nil – 330.0	49.00	16.01

Table - VII
Showing Statistical Evaluation of Table - VI

Groups	Values	p value
A Vs B	z value 4.58	< 0.001
C Vs D	t value 3.75	< 0.001
A Vs C	z value 0.544	> 0.05
B Vs D	z value 1.21	> 0.05

Conclusion

From this study, it is concluded that only serum IgG can cross the placenta and uterine contractions facilitate it. IgA was found in small quantities in most of the cord sera and uterine contractions play no role in its transmission through the placenta. IgA and IgM present in cord sera in neonate were synthesized by the fetus's own immune mechanism. IgM cannot cross placental barrier because of its molecular weight. IgM levels in the cord blood were not affected by the mode of delivery. Raised levels of IgA and IgM were due to intrauterine infection.

References

1. Allansmith M.: J. Paediatric, 72: 276, 1968.
2. Cherry SH and Rosenfield RE: Am J of Obst and Gyn. 98: 275, 1967.
3. Cochran: J. Obst. Gyn. of Brit. C. Wealth. 79: 38, 1972.
4. Gitlin D: Acta Pediat. Scandinav Supplement. 6: 172, 1967.
5. Jones WR and Payne RB: Am. J. Obst. and Gyn. 99: 1160, 1967.
6. Yang S, Kleinman AM, Rosenberg EB and Wei P: Am. J. Obst. and Gyn. 109: 78, 1971.