

**ESTIMATION OF FOETAL AND MATERNAL IMMUNOGLOBULINS
CONCENTRATION AT DELIVERY AND POST-PARTUM IN CASES OF
NORMAL DELIVERY, ELECTIVE CAESAREAN SECTION AND
EMERGENCY CAESAREAN SECTION**

by

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Introduction

The mother possesses five types of Immunoglobulins in her system. Out of these five immunoglobulins named as IgG, IgA, IgM, IgE and IgD. Only IgG is transmitted from the mother to foetus through placental barrier in appreciable amount which protects the foetus against different types of infection during intra-uterine life. Gitlin, (1964), reported that all classes of immunoglobulins can pass via placental barrier from mother to foetus.

The active synthesis of antibodies in the foetal system depends upon the type, virulence and dose of antigen received. In such a situation of intrauterine infection IgA and IgM are also found in detectable quantity in the cord blood immediately after delivery of the foetus with or without manifestation of congenitally acquired diseases. It also happens that baby is born without any infection but subsequently gets infection in neonatal period. The serum of baby will reveal also increased amount of not only IgG but IgM and IgA.

The mode of delivery also has some relation with the active transport of anti-

bodies from mother to foetus as is reported by Jones and Payne (1967), Cochran (1972). They found that uterine contraction during labour play a part in the active transport of antibody from mother to foetus. They found that IgG level in the cord blood was higher than that of maternal blood in cases of vaginal delivery in comparison to elective caesarean section.

In addition to passive immunity supplied to foetus via placenta, mother also supplies antibody through colostrum in post-partum period which gives passive immunity to the mucous membrane of gastrointestinal tract (Heneberg, 1972).

The purpose of the present work is to find out the different types of immunoglobulin that are normally transmitted from mother to foetus via placental barrier and effect of mode of delivery on the amount of IgG transferred in human being.

Immune deficient state in the newborn can also be diagnosed and early specific immunotherapy can be instituted.

Material and Methods

Forty-four cases were included in the present investigation. These cases were selected from labour room having gestation period more than 38 weeks. Cases were both primigravida and multipara.

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Accepted for publication on 17-6-83.

Analysis was conducted in the following three groups of cases:

Group I: Vaginal delivery—12 cases.

Group II: Elective caesarean section—12 cases.

Group III: Emergency caesarean—20 cases.

5 ml of maternal blood was drawn from antecubital vein at the time of deli-

very. Foetal blood was collected immediately after cutting its umbilical cord. The blood of mother and new born babies were collected again on 7th post-partum day.

Single radial immuno diffusion method of Mancini and Haniman (1965) was used for quantitative determination of immunoglobulin G, A and M.

Result and Observation

TABLE I

Average Level of Maternal and Foetal Serum Immunoglobulins at the Time of Delivery in Cases of Vaginal Delivery, Emergency C.S. and Elective C.S.

| Types of Immunoglobulins | Types of sample | Average of serum immunoglobulins in mg/100 ml. | | |
|--------------------------|-----------------|--|-----------------------------|----------------------------|
| | | Vaginal delivery | Emergency caesarean section | Elective Caesarean Section |
| IgG | Maternal | 1302.33 | 1039.50 | 1164.67 |
| | Foetal | 1570.33 | 1229.20 | 1151.42 |
| IgA | Maternal | 206.63 | 199.67 | 210.64 |
| | Foetal | Nil | Nil | Nil |
| IgM | Maternal | 234.45 | 277.40 | 240.18 |
| | Foetal | Nil | Nil | Nil |

TABLE II

Average Level of Serum Immunoglobulins in the Foetus at the Time of Delivery and on 7th day of Puerperium in Cases of Vaginal Delivery, Emergency C.S. and Elective C.S.

| Type of Immunoglobulins | Time of Estimation | Average quantity in mg/100 ml. | | |
|-------------------------|--------------------|--------------------------------|----------------|---------------|
| | | Vaginal delivery | Emergency C.S. | Elective C.S. |
| IgG | At delivery | 1570.33 | 1229.20 | 1151.42 |
| | 7th day | 1643.75 | 1241.90 | 1156.92 |
| IgA | At delivery | Nil | Nil | Nil |
| | 7th day | Nil | Nil | Nil |
| IgM | At delivery | Nil | Nil | Nil |
| | 7th day | Nil | Nil | Nil |

TABLE III

Average Serum Immunoglobulins Level in Mother at the Time of Delivery and on 7th day of Puerperium in Cases of Vaginal Delivery, Elective C.S. and Emergency C.S.

| Type of Immunoglobulins | Time of Estimation | Average quantity in mg/100 ml. | | |
|-------------------------|--------------------|--------------------------------|---------------|----------------|
| | | Vaginal delivery | Elective C.S. | Emergency C.S. |
| Ig ^A | At delivery | 206.63 | 210.64 | 199.67 |
| | 7th day | 243.34 | 239.92 | 239.81 |
| Ig ^M | At delivery | 234.45 | 240.18 | 277.40 |
| | 7th day | 252.47 | 242.87 | 264.59 |
| Ig ^G | At delivery | 1302.33 | 1164.67 | 1039.50 |
| | 7th day | 1274.25 | 1161.35 | 1083.75 |

TABLE IV

Average Serum Immunoglobulins M Level in Foetus at the Time of Delivery and on 7th day of puerperium in Cases of Emergency Caesarean Section

| Type of Immunoglobulins | Time of Estimation | No. of cases | Average quantity in mg/100 ml. | SD | t | p | Remarks |
|-------------------------|--------------------|--------------|--------------------------------|----|---|---|---------------|
| Ig ^M | At delivery | 3 | 35.9 | | | | Insignificant |
| | 7th day | 3 | 35.9 | | | | |

TABLE V

Average Level of Serum, Immunoglobulins A in Lactating and Non-lactating Mother at the time of Delivery and on 7th day Puerperium

| Type of Immunoglobulins | Type of cases | Time of delivery | Average quantity in mg/100 ml. |
|-------------------------|---------------|------------------|--------------------------------|
| Ig ^A | Lactating | at delivery | 203.10 |
| | | 7th day | 250.69 |
| Ig ^A | Non-lactating | at delivery | 209.54 |
| | | 7th day | 207.16 |

The difference in IgM level of foetus at the time of delivery and on the 7th day of puerperium is statistically not significant.

Discussion

In the present work immunoglobulins level in mothers and foetus were studied at the time of delivery and on 7th day of puerperium in cases of vaginal delivery, emergency caesarean and elective caesarean.

The foetal IgG levels were statistically higher than maternal levels in cases of vaginal delivery and emergency caesarean, but in cases of elective caesarean section there were no significant difference in maternal and cord serum IgG levels. Cochran (1972) also studied the maternal and foetal sera at the time of delivery and on 7th day of puerperium. His findings were consistent with the present study. IgG detected in Cord blood at the time of delivery was mainly of maternal

stock transferred, via placental barrier. Uterine contractions play definite role in active as well as selective transfer of IgG from mother to foetus. Gradient in IgG level between mother and foetus was only found in cases of vaginal delivery and emergency caesarean section.

IgA was absent in all the sample of cord sera (Table I), but high level of IgA was present in maternal sera in cases of vaginal delivery, emergency caesarean section and elective caesarean section. It appears that absence of IgA in all cord sera of present series may firstly be due to absence of intrauterine infection. Normally IgA is not detectable in cord blood. It has been shown by Hobbs and Hughes (1968) that if the foetus is stimulated with appropriate antigen, IgA can be produced in good concentration and cord sera may have detectable quantity of IgA at the time of delivery of foetus. Steihm and Fundenberg (1966), Alford *et al* (1968), Macracken *et al* (1969) found that IgA was only detectable in cases of intrauterine infection.

In the present series of investigation IgM in cord blood was detected only in 3 cases out of 44. It therefore appears that foetus might have low level of IgM which was not possible to detect by the tripartigen immunodiffusion plates used for estimation of IgM in the present work, because IgM level was less than 34.2 mg.%, and therefore can not be estimated by this diffusion plates. Detectable quantity of IgM in all the 3 samples of cord sera may be due to intrauterine infection as there was definite history of pyrexial episode in 2 mothers 10 days before delivery and history of leaking membrane in 1 mother 7 days before delivery. It has been postulated by Steril, G. and Silverstein (1967) that IgM is the part of immunoglobulin which predominate in primary

immune response due to any infection. The high level of maternal IgM in the present work may be due to subclinical or clinical types of protozoal, viral, bacterial and parasitic infection as they are very common in our part of country.

Serum levels of IgG, IgM, and IgA in mothers and newborns were estimated on 7th day of puerperium in cases of vaginal delivery, emergency caesarean and elective caesarean section. There was no change in the levels of IgG of mothers and foetus on 7th day in all the above mentioned three groups of cases. The above findings are consistent with those of Cochran (1972).

IgM level in mother and foetus did not show any significant change on the 7th day of puerperium. If foetal system is stimulated with appropriate antigens, there only rise of IgM level occurs. There was no significant change in the level of foetal IgA on 7th day of their perinatal life. Lactating mothers had significant rise in the serum level of IgA on 7th day of puerperium. According to Heneberg (1974) rise in IgA levels in mothers during puerperium are related to activity of the breast. Thus it may concluded that rise in IgA level of mother during puerperium were due to increase in the breast activity. The newborn had undetectable quantity of IgA on 7th day. Therefore it appears that infants were disease-free in the first week of life or there might be formation of small quantity of IgA in the foetus which could not be detected by the immunodiffusion plates used in the present series of work.

Summary

Forty-four cases were included in this study. It was observed that IgG alone is normally present in high concentration in cord blood at the time of delivery. IgG

present in foetus is transferred from mother via placental barrier. The mechanism of transfer of IgG is facilitated by the uterine contraction as observed in cases of vaginal delivery and emergency caesarean section. It was also observed that normally IgA and IgM are not transmitted from mother to foetus via placenta. However, elevated levels of IgA or IgM in foetus at the time of birth were found in cases of intrauterine and perinatal infection. This rise in the level of IgA or IgM is due to its synthesis in foetal system in response to antigenic stimuli, soon after birth. Immunoglobulins rise at a variable rate due to new antigenic stimuli received in extrauterine environment. This rate of rise may be enhanced with the onset of certain infection acquired shortly before, during or soon after birth. Therefore, elevated IgM level in newborns provides a clue to acute or chronic perinatal infection in high risk population. Serum IgA level in lactating mothers has been found to be increased on the 7th day of puerperium and this increase in IgA level is

associated with increased amount of secretory IgA in milk, which is transferred to the newborns via colostrum.

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