Immunological Response in Neonatal Septicemia

Varun Dwivedi[1], R. Murthy[2], S. Sao[2]

ABSTRACT

Introduction: Newborns are at increased risk of infection due to genetic, epigenetic and environmental factors. Herein we examine the roles of the neonatal humoral immune system in host defense against bacterial infections. IgG, IgM and IgA concentrations from birth to 1 month of age, and the incidence of acute infectious processes were determined in 87 full terms and in 133 preterm infants by the single radioimmunodiffusion technique in a prospective study.

Material and Methods: The study was conducted with the objective to know the immunological response in neonatal septicemia cases and serum from the suspected cases of neonatal sepsis from March 2013 to August 2015.220 neonates included 133 early onset neonatal septicemia cases and 87 late onset neonatal septicemia cases. Humoral immune response was studied by quantitative estimation of serum immunoglobulins IgG, IgM and IgA by single radial immunodiffusion (SRID).

Results: Among 220 full term neonates in whom humoral immune response was studied. 133 (60.45%) were early onset septicemia cases and 87 (39.54%) were late onset septicemia cases. Infants born at term showed significantly higher IgG levels than preterm babies.

Conclusion: In both early onset neonatal septicemia and late onset neonatal septicemia decreased IgA levels and increased IgG levels were observed in statistically significant number of cases.

Keywords: Immunoglobulin in newborns, Neonatal septicemia

INTRODUCTION

It is well recognized that the primary immunoglobulin (IgG) of the newborn is the maternal IgG. IgG1, IgG3 and IgG4 readily cross the placenta and play an important role in protecting the developing fetus. On the other hand, IgM is the first immunoglobulin class produced in a primary response to an antigen, and it is also the first immunoglobulin to be synthesized by the neonate. IgA is the predominant immunoglobulin class in external secretions such as breast milk, saliva, tears, and mucus of the bronchial, genitourinary, and digestive tracts.[1]

Neonates have also been shown to have phagocytic, cellular as well as humoral defects. Specifically, they have quantitative as well as qualitative deficiency in their humoralimmunity.[2-5] There are literatures available on studies on quantitative estimation of serum IgG, IgM, IgA in full term and preterm neonates with septicemia. In most of studies quantitative estimation of serum IgG, IgM, IgA was done by single radial immunodiffusiontechnique.[6-11]

The present study was designed to know the incidence of immunological response in neonatal septicemia, their concentration in early onset septicemia and late onset septicemia.

MATERIAL AND METHODS

The study was carried out from March 2013 to August 2015 in the Department of Microbiology, Chhattisgarh institute of medical sciences (CIMS), Bilaspur (C.G.). Ethical clearance was taken from the institution ethical board.

The study population 450 cases of clinically diagnosed neonatal septicemia admitted in the Neonatal Intensive Care Unit (NICU) of CIMS, Bilaspur.

Cases were classified into two major categories -

Early onset septicemia: Those presented within first 72 hours of life

Late onset septicemia: Those presented after 72 hours of life

All the cases included in the study were examined for general physical examination as well as systemic examination to find out the clinical profile of the cases.

Among 450 neonates in the present study, humoral immune response was studied in 220 full term neonates. These 220 neonates included 133 early onset neonatal septicemia cases and 87 late onset neonatal septicemia cases. Humoral immune response was studied by quantitative estimation of serum immunoglobulins IgG, IgM and IgA by single radial immunodiffusion (SRID) as per S.L. Pole (1984).[12]

Agar (150mg) dissolved in barbitone buffer (PH 8.6, 0.05M), admixed with optimum standardized quantity of antibody (agar antibody mixture gel) is casted on glass plate or slide. Well are then punched out at proper distance. These wells are charged with antigen to be quantitated. The antigen in the well and antibody in the gel then diffuse in double dimension to form circular precipitate in form of ring. The diameter of the ring is directly proportional to the quantity of antigen.

STATISTICAL ANALYSIS

SPSS version 21 was used to generate tables and graphs. Descriptive statistics was used to infer results.

RESULT

Among 220 full term neonates in whom humoral immune response was studied. 133 (60.45%) were early onset septicemia (EOS) cases and 87 (39.54%) were late onset septicemia (LOS) cases. The immunoglobulin IgG, IgM and IgA levels were compared in the early onset septicemia cases and late onset septicemia cases.

[1]Ph D Research Scholar, Department of Microbiology, Dr. C.V. Raman University, [2]Professor, Department of Microbiology, Chhattisgarh Institute of Medical Sciences, Bilaspur (C.G.), India

Corresponding author: Ms. Varun Dwivedi, Research Scholar, Department of Microbiology, CIMS, Bilaspur (C.G.) 495001

How to cite this article: Varun Dwivedi, R. Murthy, S. Sao. Immunological Response in Neonatal Septicemia. International Journal of Contemporary Medical Research 2016;3(4):1110-1112.

Amongst 220 cases of neonatal septicemia, out of 133 EOS cases IgG levels were decreased in 24 (18.04%) cases, normal in 40 (30.07%) and increased in 69 (51.87%) cases (table-1).

Amongst 220 cases of neonatal septicemia, out of 87 LOS cases IgG levels were normal in 28 (32.18%) cases and increased in 59 (67.81%) cases. IgG levels less than 800 mg/dl (decreased) were not observed in LOS (Fig. 1).

Amongst 220 cases of neonatal septicemia, out of 133 EOS cases IgM levels were decreased in 22 (16.54%) cases, normal in 103 (77.44%) and increased in 8 (6.01%) cases (table-2).

Amongst 220 cases of neonatal septicemia, out of 87 LOS cases IgM levels were decreased in 22 (25.28%) cases and normal in 65 (74.71%) cases. IgM levels more than 16 mg/dl were not observed in LOS (Fig. 1).

Amongst 220 cases of neonatal septicemia, out of 133 EOS cases IgA levels were decreased in 62 (46.61%) cases, normal in 42 (31.57%) and increased in 29 (21.80%) cases (table-3).

Amongst 220 cases of neonatal septicemia, out of 87 LOS cases IgA levels were decreased in 32 (36.78%) cases, normal in 40 (45.97%) cases and increased in 15 (17.24%) cases (Fig. 1).

Immunoglobulin levels		EOS N=133	LOS N=87
IgG	<800 mg/dl	24(18.04%)	00(0.00%)
	800-1200 mg/dl	40(30.07%)	28(32.18%)
	>1200 mg/dl	69(51.87%)	59(67.81%)
Normal IgG levels 800-1200 mg/dl			

Table-1: Immunoglobulin G levels in EOS and LOS

Immunoglobulin levels		EOS N=133	LOS N=87
IgM	<6 mg/dl	22(16.54%)	22(25.28%)
	6-16 mg/dl	103(77.44%)	65(74.71%)
	>16 mg/dl	8(6.01%)	0(0.00%)
Normal IgM levels 6-16 mg/dl			

Table-2: Immunoglobulin M levels in EOS and LOS

Immunoglobulin levels		EOS N=133	LOS N=87
IgA	<1 mg/dl	62(46.61%)	32(36.78%)
	1-5 mg/dl	42(31.57%)	40(45.97%)
	>5 mg/dl	29(21.80%)	15(17.24%)
Normal IgA levels 1-5 mg/dl			

Table-3: Immunoglobulin A levels in EOS and LOS

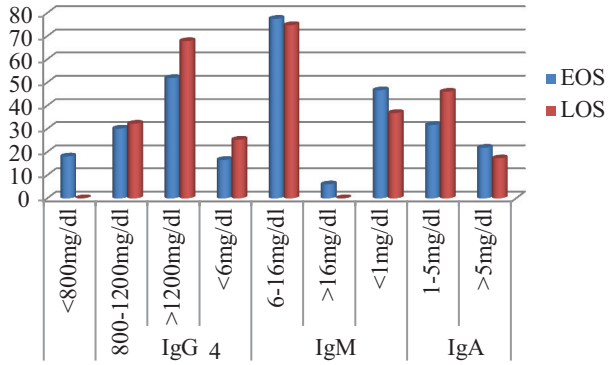

Figure-1: Humoral immune response in EOS and LOS

DISCUSSION

S Sadana *et al*[6] in the study of 40 neonates with suspected septicemia reported IgG levels of 302mg/dl to 2125 mg/dl. Noor Suryani M.A. *et al.* reported mean ±SD levels of 725±620 mg/dl in their study. Ahmed S.S. *et al.* in their study of 60 preterm neonates reported mean ±SD levels of 529.16±147.73 mg/dl. In our study we have found, Among 220 cases of neonatal septicemia, out of 133 EOS cases IgG were in the range of <800 mg/dl in 24(18.04%) cases, 800-1200 mg/dl in 44(30.07) cases and 1200 mg/dl were observed in 69(51.87) cases. In LOS group no case showed levels less than <800 mg/dl, 800-1200 mg/dl in 28(32.18%) cases, >800 mg/dl in 59(67.81) cases. These findings are comparable to Sadana S. *et al.*[6]

BVS Krishna *et al*[9] in the study of 57 cases reported IgM levels between 8-93 mg/dl with ≥20 mg/dl in 22 cases and <20 mg/dl in 35 cases. Sadana S. *et al.* in their study reported IgM level of 1.92 mg/dl to 436.9 mg/dl in neonatal septicemia. Noor Suryani M.A. *et al.* reported mean ±SD levels of 14± 11 mg/dl in septicemic neonates. In our study we have found, Among 220 cases of neonatal septicemia, out of 133 EOS cases IgM were in the range of <6 mg/dl in 22(16.54%) cases, 6-16 mg/dl in 103(77.44%) cases and 16 mg/dl in 8(6.01%)cases. In LOS cases IgM were in the range of <6mg/dl in 22(25.28%) cases, 6-16mg/dl in 65(74.71%) cases. Levels more than 16mg/dl were not observed. These findings are comparable to Krishna B.V.S. *et al.*[9] and Sadana S. *et al.*[6]

Noor Suryani MA *et al*[13] reported mean ±SD levels of 19±2 mg/dl. SS Ahmed *et al*[14] reported mean ±SD levels of 5.34±2.24 mg/dl. Sadana S. *et al.* reported IgA levels of 1.18 mg/dl to 118.9 mg/dl. In our study we have found, among 220 cases of neonatal septicemia, out of 133 EOS cases IgA levels were in the range of <1 mg/dl in 62(46.61%) cases, 1-5mg/dl in 42(31.57%) cases and >5mg/dl in 29(21.80%) cases. In LOS cases IgA were in the range of <1mg/dl in 32(36.78%) cases, 1-5mg/dl in 40(45.97%) cases and >5 mg/dl in 15(17.24%) cases.

CONCLUSION

Statistically significant number of casesin both early onset neonatal septicemia and late onset neonatal septicemia categories showed decreased IgA levels indicating compromised mucosal immunity while the IgG levels were found to have increased.

REFERENCES

1. Goldsby RA, Kindt TJ, Barbara AO. Kuby immunology: fourth edition.2000; 88-91.ISBN 0-7167-3331-5.
2. Rodgers RPC.Clinical laboratory methods for detection of antigens and antibodies. Stites basic and clinical immunology.1994;12:151-194.
3. Miller ME, Stiehm ER. Phagocytic, opsonic and immunoglobulin studies in newborn (Medical progress). Western Journal of Medicine.1973;119:43-63.

4. Abbas AK, Lichtman AH. Basic immunology: Functions and disorders of the immune system. Chap 8.Effectors mechanisms of humoral immunity. 3rd edition.2009;153-171.
5. Lawlor GJ, Fischer TJ. Diagnosis and therapy. Manual of allergy and immunology. 1998;425.
6. Sadana S, Mathur NB and Thakur A. Exchange transfusion in septic neonates with sclerema.Effect on immunoglobulin and complement levels: Indian pediatrics. 1997;34:20-25.
7. Petrova A, Hanna N, Mehta R. Gestational age related maternal-fetal-neonatal humoralimmunity. The journal of applied research. 2004;4:44-49.
8. Pinhata MM, Goncalves AL. Serum immunoglobulin levels and incidence of infection during the first year of life in full-term and preterm infants. Journal of tropical pediatrics. 1989;35:147-153.
9. Krishna BVS, Nagdir SD, Tallur SS. Immunoglobulin-M estimation and C-reactive protein detection in neonatal septicaemia.Indian journal of pathology and microbiology. 2000;43:35-40.
10. Wolach B, Dolfin T, Regev R, Gilboa S, Schlesinger M.The development of the complement system after 28 weeks gestation. ACTA Pediatrica. 1997;86:523-527.
11. Sharma M, Laroia D, Taluja RK, Mathur PS. Serum IgG at birth in preterm appropriate and small for gestational age newborns. Indian Journal Pediatrics. 1991;58:657-660.
12. SL Pole. Single radial immunodiffusion (SRID): Gel immunodiffusion techniques in research and laboratory medicine: Edited by SS Kelkar and PM Khare.Published by popular prakashan, Bombay. 1984;108-142.
13. Noor suryani MA, Hussin CMC, Musa M, Rostenberghe HV. Association of immune status in preterm babies and occurrence of sepsis: Health and environmental journal. 2010;1:55-58.
14. Ahmed SS, Chowdhury M, Hoque MM, Begum D, Ahmed A.Role of intravenous immunoglobulin (IVIG) as an adjuvant in the treatment of neonatal sepsis in preterm babies. Journal of Bangladesh College of physicians and surgeons. 2006;24:97-104.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 20-02-2016; **Published online**: 21-03-2016