

Variation in platelet count with gestational age, weight and sex in hospitalized newborns

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Abstract

Introduction: Platelet count & CRP are diagnostic markers of neonatal sepsis. Though the platelet count remains the same throughout the neonatal period, variations in platelet count have been noted based on gestational age, weight & sex of neonates. Beside other hematological findings, changes in platelet count induced by neonatal sepsis have been the focus of many studies. **Objective:** To analyze the variation in platelet count with gestational age, weight and sex in hospitalized newborns. **Methods:** This is a retrospective case analysis of 533 neonates between January-2012 to December-2014. The parameters examined were Baseline Platelet Count, Change In Platelet Count, (Baseline Platelet Count- Change In Platelet Count)/ Baseline Platelet Count, Platelet Nadir, Incidence, Duration & Severity of Thrombocytopenia. **Statistical Analysis:** All data were collected in validated preformatted proforma sheet & analysed using appropriate statistical methods. **Results:** 533 babies were studied. About 21.2% had Culture negative sepsis, 9.75% had culture positive sepsis & 69.04% had no sepsis. No difference in any platelet parameter was noted between female & male babies. The prevalence of early onset sepsis in our study was 17.44% & late onset sepsis was 13.50%. Significant variations of all platelet indices were noted among lower gestational age babies. Significant variations in the Incidence, Prevalence & duration of thrombocytopenia were noted depending on the weight of the baby. **Conclusion:** The baseline platelet count of the neonates remains uniform irrespective of sex, weight or gestational age. There are quantitative differences in the platelet response based on weight and gestational age

Keywords: Platelet Count, Gestation, Weight, Sex

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Introduction

Platelet count & CRP are diagnostic markers of neonatal sepsis [1,2]. Though the platelet count remains the same throughout the neonatal period, variations in platelet count have been noted based on gestational age, weight & sex of neonates. Neonatal Sepsis is infection with or without accompanying bacteremia [3]. It is most common in the smallest and most premature infants [4,5,6].

Objectives

To analyse the variation in platelet count with gestational age, weight and sex in hospitalized newborns. Manuscript received: 15th Apr 2015 Reviewed: 26th Apr 2015 Author Corrected; 29th Apr 2015 Accepted for Publication: 17th May 2015

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Methodology

This is a retrospective case analysis between January-2012 to December-2014. Name, date of admission, age, platelet count, CRP levels, blood culture reports of 533 neonates during the study period were collected. The data was analysed for variation in platelet count with respect to gestational age and sex.

Unit Protocol for Investigation of Neonatal Sepsis:

Direct counting of platelets in an improved Neubauer's Chamber was done & counts less than 1.5 Lakh / cumm was considered abnormal. CRP in serum was estimated by CRP TurbiLatex Kit using Latex turbimetry & value more than 6 mg/ L was considered positive. Blood was collected for blood culture in BD BACTEC bottles & cultured in Sabouraud's Dextrose agar & Brain Heart Infusion Broth and colony growth was observed. The

platelet count & CRP used for this study was the one obtained at the same time as the positive blood culture or the one closest to the time the blood culture was drawn in cases of neonatal sepsis and the admission values in those babies with no sepsis.

Interventions: Management of neonatal sepsis as per standard unit protocol. The study was approved by the Hospital Research and Ethics Committee.

Definition of Parameters: The parameters that were examined in this study were

Baseline Platelet Count: Platelet count obtained at least 24 hours before the time that the blood culture was obtained in cases of neonatal sepsis or the admission values in those babies with no sepsis.

Change In Platelet Count: Platelet count at the time of onset of sepsis in cases of neonatal sepsis or the second CBC values in those babies with no sepsis.

Platelet Nadir: Lowest platelet count obtained during a 20-day period starting from the time the initial blood culture was drawn in cases of neonatal sepsis or during a 20-day period since admission in those babies with no sepsis.

Incidence of Thrombocytopenia: Number of episodes with a platelet nadir of less than 1,50,000/mm³ during a 20-day period starting from the time the initial blood culture was drawn in cases of neonatal sepsis or during

Results

Among 533 babies who were studied, 21.2% had Culture negative sepsis, 9.75% had culture positive sepsis & 69.04% had no sepsis. Among culture negative sepsis, 71 babies (62.83%) were male & 42 (37.16%) were female ; Among culture positive sepsis, 34 babies (65.38%) were male & 18 (34.61%) were female; Among babies with no sepsis, 216 babies (58.69%) were male & 152 (41.3%) were female (Chi square p= 0.5332 , not significant).

Among 165 babies with sepsis, 105 babies (63.63%) were male & 60 babies were female (36.36%). Analysing Prevalence of thrombocytopenia among the male and female, 72 babies (22.42%) among 321 male babies had thrombocytopenia, 60 babies (28.30%) among 212 female babies had thrombocytopenia, (Chi square p <0.1514 , not significant).

a 20-day period since admission in those babies with no sepsis.

Duration of Thrombocytopenia: Number of continuous days that the platelet count remained less than 1,50,000/mm³. If the neonate had no Thrombocytopenia at the time of sepsis, the duration was considered to be zero.

Severity of Thrombocytopenia: [7]

No Thrombocytopenia - Platelet count more than 1,50, 000/mm³

Mild Thrombocytopenia - Platelet count between 1,00,000 to 1,50,000/mm³

Moderate Thrombocytopenia - Platelet count between 50,000 to 1,00,000/mm³

Severe Thrombocytopenia - Platelet count less than 50,000/mm³

Culture Negative Sepsis was defined as those with clinical signs and symptoms of sepsis, without growth of any pathogen from blood, but with presence of CRP > 6mg/L [8].

Statistical Analysis: Chi-square analysis with Yates correction was used for categorical variables & Student 't' test to compare the means. A p-value of < 0.05 was considered significant. Analysis of variance was used to compare groups, and data are expressed as mean ± standard deviation. Scheffe test was used for pairwise comparisons. Software Statistical Package for Social Sciences was used.

Table 1: Platelet Variations among Male and Female Neonates

FACTOR	Levene's p ANOVA p		FEMALE MEAN	FEMALE SD	MALE MEAN	MALE SD
	BASELINE	p = 0.365	p = 0.363	2.2719	0.8495	2.3359
COUNT CHANGE	p = 0.975	p = 0.824	1.874	0.9148	1.8495	0.9168
NADIR	p = 0.859	p = 0.445	1.9679	0.9415	2.0297	0.8955
SEVERITY	p = 0.672	p = 0.859	0.4623	0.8338	0.4486	0.8934
INCIDENCE	p = 0.585	p = 0.561	0.6745	1.357	0.6044	1.3656
DURATION	p = 0.500	p = 0.549	1.3585	2.7128	1.215	2.6985

Analysis of variance was used to compare the groups, and data was expressed as mean ± standard deviation. No difference in any platelet parameter was noted between female & male babies. The mean Baseline platelet count was a little higher among male babies. The response to sepsis in the form of drop in platelet count was a little more in male babies, however platelet nadir was noted to be low in female babies who already had a lower baseline platelet counts. Female babies had a little higher incidence of thrombocytopenia with prolonged duration. However none of the differences in platelet parameters between male & female babies reached statistical significance

Table 2: Platelet Variations among different gestational age groups

GA WK	n	BASELINE MEAN	BASELINE SD	CHANGE MEAN	CHANGE SD	NADIR MEAN	NADIR SD	SEVERITY MEAN	SEVERITY SD	INCI MEAN	INCI SD	DURATION MEAN	DURATION SD
28	10	2.281	0.5925	1.7744	1.2587	1.188	0.657	1.3	1.0593	2.1	1.912	4.9	4.1218
29	1	1.77	?	.	.	1.77	?	0	?	0	?	0	?
30	12	2.0858	0.3837	1.1555	0.609	0.9942	0.755	1.75	1.2154	2.75	2.4541	5.5833	4.6015
31	6	2.11	0.8515	1.4467	1.049	1.2183	0.993	1.5	1.3784	2.5	2.1679	5.3333	4.6762
32	21	2.0243	0.6545	1.4425	0.6132	1.5271	0.777	0.7619	0.9437	1.0952	1.3381	2.4286	3.295
33	17	2.1041	0.4684	2.054	0.9611	1.8276	0.739	0.5294	0.9432	0.6471	1.2217	1.1765	2.3515
34	34	2.2465	0.6084	1.9535	0.8321	1.96	0.728	0.3529	0.6912	0.4706	0.9288	0.9706	2.0373
35	33	2.4252	0.6372	2.3123	0.7748	2.1888	0.665	0.2424	0.6629	0.4242	1.2755	0.8182	2.4932
36	87	2.2349	0.7624	1.7736	0.785	1.9797	0.842	0.4598	0.8734	0.5057	1.077	1.0805	2.3189
37	201	2.4304	0.9396	1.859	0.9815	2.1405	1.045	0.408	0.8618	0.5871	1.4435	1.1343	2.6376
38	65	2.3691	0.6947	2.2114	1.0281	2.1712	0.743	0.2154	0.5726	0.3077	0.9001	0.6	1.8439
39	26	2.1964	0.8019	1.8527	0.8183	2.0336	0.849	0.44	0.8699	0.52	1.0847	0.92	2.0191
40	21	2.031	0.6096	1.5033	0.458	1.8762	0.692	0.3333	0.6583	0.4286	0.8106	0.7143	1.4193

Analysis of variance was used to compare the groups, and data was expressed as mean ± standard deviation. Chi Square was used to compare categorical variables. We observed that the Baseline platelet count was comparable among all gestational groups. However the severity of thrombocytopenia & incidence of thrombocytopenia was more among babies with lower gestational age as compared to more mature babies. Likewise the duration of thrombocytopenia was prolonged in babies with lower gestation as compared to more mature babies.

Table 3: Platelet Variations Gestation Wise- Statistical Analysis

PARAMETER	LEVENE P	ANOVA P	CHI SQUARE P
BASELINE PLATELET COUNT	0.02	0.217	
CHANGE IN PLATELET COUNT	0.06	0.013	
PLATELET NADIR	0.229	<0.001	
INCIDENCE OF THROMBOCYTOPENIA	<0.001	<0.001	
DURATION OF THROMBOCYTOPENIA	<0.001	<0.001	
PREVALENCE OF THROMBOCYTOPENIA			<0.0001
TYPE OF SEPSIS (EARLY/ LATE)			0.0001

We analyzed the platelet variations based on gestation using Anova & chi square. There was no statistical difference in the baseline platelet count among the babies with different gestational age. However we noted a significant difference in all the other platelet parameters (change in count, nadir, incidence, prevalence & duration of thrombocytopenia) when we analysed the multiple gestational groups using anova. Significant variations of all platelet indices were noted among lower gestational age babies.

Table 4: Gestational age wise prevalence of thrombocytopenia & type of sepsis

GA WK	NO TCP	TCP		EARLY ONSET	LATE ONSET	NO SEPSIS	
28	3	7	10 (1.9%)	2	6	2	10 (1.9%)
29	1	0	1 (0.2%)	0	1	0	1 (0.2%)
30	3	9	12 (2.3%)	4	5	3	12 (2.3%)
31	2	4	6 (1.1%)	0	3	3	6 (1.1%)
32	11	10	21 (3.9%)	2	2	17	21 (3.9%)
33	12	5	17 (3.2%)	2	2	13	17 (3.2%)
34	26	8	34 (6.4%)	7	2	25	34 (6.4%)
35	29	4	33 (6.2%)	5	2	26	33 (6.2%)
36	67	20	87 (16.3%)	12	7	68	87 (16.3%)
37	155	46	201 (37.7%)	41	27	133	201 (37.7%)
38	55	10	65 (12.2%)	7	9	49	65 (12.2%)
39	21	4	25 (4.7%)	6	3	16	25 (4.7%)
40	16	5	21 (3.9%)	5	3	13	21 (3.9%)

Among the 533 babies in the study group majority (nearly 50%) were near term (35-37 weeks). The prevalence of thrombocytopenia was noted to be more in babies less than 32 weeks. Beyond 34 weeks early onset sepsis onset was more common than late onset sepsis, however in babies less than 32 weeks, late onset sepsis was more common than early onset sepsis.

Table 5: Platelet Variations Weight Wise- Statistical Analysis

PARAMETER	LEVENE P	ANOVA P
BASILINE PLATELET COUNT	0.063	0.736
CHANGE IN PLATELET COUNT	<0.001	0.583
PLATELET NADIR	0.041	0.065
INCIDENCE OF THROMBOCYTOPENIA	<0.001	0.003
DURATION OF THROMBOCYTOPENIA	<0.001	<0.001
PREVALENCE OF THROMBOCYTOPENIA	<0.001	<0.001
TYPE OF SEPSIS (EARLY/ LATE)	<0.001	0.324

We analysed the platelet variations based on weight using Anova & chi square. There was no significant difference in the baseline platelet count, change in count and platelet nadir or the occurrence of early/ late onset sepsis based on the weight among the neonates. However statistical significant difference was noted in the incidence, duration & prevalence of thrombocytopenia based on the weight of the newborns. Babies with lower weight had more incidence & prevalence of thrombocytopenia. Neonates with lower weight had more prolonged thrombocytopenia. There are quantitative differences in the platelet response based on weight and gestational age

Discussion

Platelet variations among male and female neonates:

In our study the, among 165 babies with sepsis, 105 babies (63.63%) were male & 60 babies were female (36.36%). Several other workers have reported similar

finding. Khalessi N et al [9], Muhammad Ali Sheikh et al [10], Chandra A et al [11], Antoniette BWM et al [12], Schuchat A et al [13] & Kuruvilla KA et al [14] noted that the incidence of neonatal sepsis was higher in

male than female neonates. This is probably due to the fact that the factors regulating the synthesis of gamma globulin are situated on the X- chromosome and male has only one X-chromosome [11]. In Indian scenario we think high male:female birth ratio and neglected female neonates add to high rate of neonatal sepsis in male child. The male: female ratio was 1.36: 1 in a study by Ramesh Bhat Y et al [15].

In our study the mean incidence of Thrombocytopenia among neonatal sepsis was 0.6745 ± 1.357 in female & 0.6044 ± 1.3656 in male babies.(Anova p was 0.561; not significant).Anil K Gupta et al [16] also observed that sex does not predict the thrombocytopenia among NICU neonates.

Platelet Variations among Different Gestational Age:

In our study, there was significant variations of platelet count based on the gestational age. Significant Change in platelet count { anova P = 0.013}, platelet Nadir {anova P <0.001}, severity of thrombocytopenia {anova P <0.001}, Incidence of thrombocytopenia {anova P <0.001}, duration of thrombocytopenia {anova P <0.001 }, prevalence of Thrombocytopenia {Chi Square p <0.0001}, the type of sepsis (early onset or late onset sepsis) {Chi Square p = 0.0001} were noted. Ramesh Bhat Y et al [15], Hussein AB et al[17], & Karen M.Puopolo et al [18] observed that the incidence of septicemia was higher in preterm neonates. Chakravorty S et al[19] noted that Thrombocytopenia occurs in up to a third of preterm neonates.

However Abdalla Alshorman et al[20] & Anil K Gupta et al[16] observed that gestational age does not predict the thrombocytopenia among NICU neonates. Roberts I et al [21,22,23], Aman I et al [24], Van den Hof MC et al [25] & Sainio S et al[26] noted that the prevalence of thrombocytopenia is much higher among preterm and low birth weight neonates.

Platelet variations among different weight babies: In our study, there were significant variations of platelet count based on the weight. Significant variations in the Incidence of thrombocytopenia {anova P =0.003}, duration of thrombocytopenia {anova P <0.001 } and prevalence of Thrombocytopenia{ anova P <0.001} were noted depending on the weight of the baby.

Betty C et al [27] & Soman et al [28] observed that septicemia was more common in low birth weight and preterm babies. Higher incidence of sepsis in low birth

weight is because of the low maternal acquired IgG and inherent susceptibility to infection.

Placental transport of IgG from maternal to fetal circulation increases with maturity, & this transport is hampered in Low birth weight babies neonates who are often the products of placental insufficiency [29].

Anil K Gupta et al [16] stated that LBW babies showed statistically significant (P 0.009) thrombocytopenia due to their limited ability to compensate for accelerated destruction of platelets.

Summary

No difference in any platelet parameter was noted between female & male babies. There was a statistically significant difference in all the platelet parameters except baseline platelet count among the gestational subgroups. Statistical significant difference was noted in the incidence, duration & prevalence of thrombocytopenia based on the weight of the newborns.

Conclusion

The baseline platelet count of the newborns remains uniform irrespective of sex, weight or gestational age. There are quantitative differences in the platelet response based on weight and gestational age which may help in prompt diagnosis and management of the newborns.

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References

1. Modanlou HD, Ortiz OB. Thrombocytopenia in neonatal infection. Clin Pediatr (Phila). 1981 Jun;20(6):402-7.
2. Storm W. Use of thrombocytopenia for the early identification of sepsis in critically ill newborns. Acta Paediatr, Acad Sci Hung. 1982(23):349-355.
3. Shankar MJ, Agarwal R, Deorari AK. Sepsis in the new born. Indian J Pediatr; 2008 Mar;75(3):261-6
4. Moro ML, De Toni A, Stolfi I, Carrieri MP, Braga M, Zunin C. Risk factors for nosocomial sepsis in newborn intensive and intermediate care units. Eur J Pediatr. 1996 Apr;155(4):315-22.

5. Khadilkar V, Tudehope D, Fraser S. A prospective study of nosocomial infection in a neonatal intensive care unit. *J Paediatr Child Health*. 1995 Oct, 31(5):387–391
6. Escobar GJ. The neonatal “sepsis work-up” personal reflections on the development of an evidence-based approach toward newborn infections in a managed care organization. *Pediatrics*. 1999 Jan;103(1 Suppl E):360–373.
7. Zacheaus A Jeremiah, Justina E Oburu. Pattern and prevalence of neonatal thrombocytopenia in Port Harcourt, Nigeria; *Pathol Lab Med Int*. 2010;(2) 27–31
8. Marzban AI, Samaee H, Mosavinasab N. Changing trend of empirical antibiotic regimen: experience of two studies at different periods in a neonatal intensive care unit in Tehran, Iran. *Acta Med Iran*. 2010 Sep-Oct; 48(5):312-5.
9. Sanii S, Khalessi N, Khosravi N, Zareh Mehrjerdi F. The Prevalence and Risk Factors for Neonatal Thrombocytopenia among Newborns Admitted to Intensive Care Unit of Aliasghar Children’s Hospital. *IJBC*. 2013; 5 (2) :41-45.
10. Sidra Younis, Muhammad Ali Sheikh, Amjad Ali Raza. Diagnostic Accuracy of C-Reactive Protein in Neonatal Sepsis; *J. Bioresource Manage*. 2014; 1(1): 33-42.
11. Chandra A, Rao MN, Srinivas M and Shyamala S (1988). Rapid diagnostic tests in neonatal septicemia. *Indian J Pediatr* 1988;55(6); 947-953.
12. Antoniette BWM and Flora DIP (2005). Clinical correlation of neonatal and maternal haematological parameters as predictors of neonatal sepsis. *Pediatric Infect Dis Society Of Philippines J*;9(2)36-43.
13. Schuchat A, Zywicki SS, Dinsmoor MJ, Mercer B, Romaguera J, O’Sullivan MJ. Risk factors and opportunities for the prevention of early – onset neonatal sepsis: a multicenter case-control study. *Paediatrics* 2000; 105: 21-26.
14. Kuruvilla KA, Pillai S, Jesudasan M, Jana AK. The bacterial profile of sepsis in a neonatal unit in south India. *Indian Paediatr* 1998; 35:851-58.
15. Ramesh Bhat Y, Lincy P. Early Onset of Neonatal Sepsis: Analysis of the Risk Factors and the Bacterial Isolates by Using the BacT Alert System; *J Clin Diagn Res*. 2011-November(Suppl-2),Vol-5(7):1385-1388
16. Anil K Gupta, Sudarshan Kumari, Abhishek Singhal, Aruna Bahl; Neonatal thrombocytopenia and platelets transfusion; *Asian J Transfus Sci*. 2012, July-Dec; 6(2): 2012: 161-164
17. Hussein AB, Khaled MAR. CRP in neonate with suspected septicemia; *Rawal Medical J*;(20070;32(1)24-27.
18. Karen M. Puopolo. In: *Manual of Neonatal Care*, 5th ed. Cloherty JP, Stark AR (Eds.), Lippincott-Wilkins, Philadelphia, 2004; 287-313.
19. Chakravorty S, Murray N, Roberts I. Neonatal thrombocytopenia. *Early Hum Dev*. 2005; Jan;81(1):35-41
20. Abdalla Alshorman. The Effect of Neonatal Sepsis on Platelet Count and their Indices et al. *83 J Med J* 2008; June: Vol. 42(2) <http://dar.ju.edu.jo/jmj>. 83.
21. Roberts I, Murray NA. Neonatal thrombocytopenia. *Semin Fetal Neonatal Med*. 2008 Aug; 13(4):256-64
22. Roberts I, Stanworth S, Murray NA. Thrombocytopenia in the neonate. *Blood Rev*. 2008 Jul;22(4):173-86. doi: 10.1016/j.blre.2008.03.004.
23. Roberts IA, Murray NA. Neonatal thrombocytopenia: new insights into pathogenesis and implications for clinical management. *Curr Opin Pediatr*. 2001;13:16–21.
24. Aman I, Hassan KA, Ahmad TM. The study of thrombocytopenia in sick neonates. *J Coll Physicians Surg Pak*; 2004 May; 14(5):282-5.
25. Van den Hoogen A, Gerards LJ, Verboon-Maciolek MA. Long-term trends in the epidemiology of neonatal sepsis and antibiotic susceptibility of causative agents. *Neonatology*. 2010;97(1):22-8. doi: 10.1159/000226604
26. Sainio S, Jarvenpaa A S, Renlund M. Thrombocytopenia in term infants: a population-based study. *Obstet Gynecol* 2000 Mar;95(3):441– 446.
27. Betty C, Sohi I. Early onset neonatal sepsis. *Indian J Paediatr* 2005;72(1) :23-26.

28. Soman M, Green B, Daling J. Risk factors for early neonatal sepsis. *Am J Epidemiol* 1985 May;121(5): 712-9

29. Bhakoo ON and Singh M. Perinatal risk factors in neonatal bacterial sepsis. *Indian J Pediatr* 1988;55(6) 941-946.

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