

Thrombocytosis in relation to severity of lower respiratory tract infection in children aged 2 months to 5 years

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Abstract

Background: Primary or essential thrombocytosis in children is very rare but reactive thrombocytosis occurs in children and respiratory tract infection is the commonest cause. The study aimed to determine the association of thrombocytosis with severity of lower respiratory tract infection; and the association of degree of thrombocytosis with severity of pneumonia.

Materials and methods: This observational study was conducted in the Department of Paediatrics of Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta in Assam. This study was done on 120 children aged between 2 months and 5 years who were admitted with lower respiratory tract infection and classified according to WHO guidelines. Complete general physical examination and systemic examination with special orientation towards respiratory system was done. Complete blood count was performed with automated system sysmex xs800i cell counter. Thrombocytosis was noted and severity of thrombocytosis was classified.

Results: Among 120 cases of lower respiratory tract infections, 48 children had thrombocytosis. 13 (48.1%) children with very severe disease, 29 (46.1%) children with severe pneumonia and 6(20%) children with pneumonia had thrombocytosis. Thus it was seen that there was significant association between platelet count and severity of pneumonia (p value=0.018). Two children had severe thrombocytosis (9.01-10.00L/mm³) and both of them had very severe disease. It indicates that degree of thrombocytosis increases as severity of pneumonia increases.

Conclusion: There is a significant relationship between thrombocytosis and severity of pneumonia. Also degree of thrombocytosis increases as severity of pneumonia increases.

Keywords: thrombocytosis; lower respiratory tract infection; pneumonia; severe pneumonia

Introduction

Lower respiratory tract infections (LRI) continue to threaten the health of children worldwide. Every year, ARI in young children is responsible for an estimated 3.9 million deaths worldwide. Hospital based studies have reported that 20 – 40% of admissions in under-fives are due to acute respiratory infections (ARI) [1]. In India during 2018, about 41,996 cases of ARI were reported with 3,740 deaths. Same year 9,28,485 cases of pneumonia were reported with 4,213 deaths [2].

Platelets play a major role in antimicrobial host defense, the induction of inflammation and tissue repair [3]. Primary thrombocytosis is very uncommon in children; but infections at any body part are the common causes of reactive thrombocytosis. There are many studies that suggest platelet count as indicator of serious bacterial

infection. A study revealed respiratory tract infection as the most common cause of infectious etiology of reactive thrombocytosis [4]. Another study observed that respiratory infection (28.3%) was the main cause among infections causing increased platelet count

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[5]. Thrombocytosis can be a useful marker associated with more severe infection of the lower respiratory tract.

This study was done to determine association of thrombocytosis with severity of lower respiratory tract infection; and to see if there is any association between grade of thrombocytosis and severity of pneumonia.

Materials and methods

An observational study was carried out in the Department of Paediatrics, Fakhruddin Ali Ahmed Medical College & Hospital, Barpeta, Assam from 1st September 2020 to 31st August 2021. Approval was taken from the Institutional Ethical Committee.

Children aged from 2 months to 5 years admitted to Department of Paediatrics, FAAMCH, Barpeta with clinical diagnosis of lower respiratory tract infection as per guidelines by WHO [6] were included. Those children with connective tissue disorder, anaemia (Hb <11.8gm%) and congenital heart disease were excluded.

A predesigned performa was used to collect information regarding age, sex, socio demographic profile, presenting complaints like duration of fever, cough, fast breathing and chest indrawing. Relevant past and family history were also taken. Complete general physical examination, systemic examination with special orientation towards respiratory system like respiratory rate, SpO₂, capillary refilling time, chest indrawing, stridor, grunting, crepitations were noted. Complete blood count was performed with automated sysmex xs800i cell counter and differential was checked by an experienced hematologist for any specific abnormality. Platelet count was a part of complete blood count.

Patients were classified as per guidelines by WHO for management of ARI [6]. Thrombocytosis was considered

when peripheral blood platelet count was more than 5 Lakhs/cmm [4]. Thrombocytosis was further divided as mild (5.00-7.00Lakhs/mm³), moderate (7.01-9.00Lakhs/mm³), severe (9.01- 10.00Lakhs/mm³) and extreme (>10.00Lakhs/mm³) thrombocytosis [4]. All the patients were classified into two groups on the basis of thrombocyte count i.e., patients with or without thrombocytosis.

Statistical analysis

Statistical analysis was performed using the online tool openepi [7]. Data has been presented with descriptive methods, and between group difference was analyzed with chi-squared test for test of significance, and chi-squared test for trend as applicable. P-value of ≤ 0.05 was considered statistically significant.

Results

A total of 120 cases of lower respiratory tract infection were recruited for the study. 84 (70%) children were aged between 2 months and 12 months and 36 (30%) children were aged between 13 months and 60 months. 76 (63.3%) children were male and 44 (36.7%) were female. 30 (25%), 63 (52.5%), 27 (22.5%) children had pneumonia, severe pneumonia and very severe disease respectively.

Among total 120 cases of lower respiratory tract infections, 48 cases had thrombocytosis and 72 cases were without thrombocytosis. 20%, 46.1% and 48.1% of children with pneumonia, severe pneumonia and very severe disease respectively had thrombocytosis. Significant association between platelet count and severity of pneumonia was seen (p value=0.018). Among 27 cases of very severe disease, 13 (48.1%) cases had thrombocytosis. Data of relationship between platelet count and severity of pneumonia is given in table 1.

Table 1: Relationship between platelet count and severity of pneumonia.

Platelet count	Pneumonia N (%)	Severe pneumonia	Very Severe disease	Total	Statistics
Without thrombocytosis	24 (80)	34(53.9)	14(51.8)	72(60)	Chi-squared=6.70, df=2, p value=0.035
With thrombocytosis	6 (20)	29(46.1)	13(48.1)	48(40)	
Total	30(100)	63(100)	27(100)	120 (100)	

All values are in no. (%).

As seen in table 2, out of 2 children who had severe thrombocytosis (platelet count 9.01-10.00 L/mm³), both (100%) had very severe disease. Only 1 case was found to have extreme thrombocytosis (platelet count >10L/mm³) and it (100%) had severe pneumonia. On

the other hand, most (78.5%) of the cases with moderate thrombocytosis and almost half (54.8%) of the cases with mild thrombocytosis had severe pneumonia. Thus it is seen that with the increase in degree of thrombocytosis the severity of pneumonia increases (P=0.035).

Table 2: Relationship between severity of thrombocytosis and severity of pneumonia.

	Platelet count Lakhs / cumm.	Pneumonia	Severe pneumonia	Very severe disease	Total
Without thrombocytosis	<5.00	24(33.3)	34(47.2)	14(19.4)	72(100)
With thrombocytosis	5.00-7.00 (mild)	5(16.1)	17(54.8)	9(29.1)	31(100)
	7.01-9.00 (moderate)	1(7.1)	11(78.5)	2(14.2)	14(100)
	9.01-10.00 (severe)	0(0.0)	0(0.0)	2(100)	2(100)
	>10.00 (extreme)	0(0.0)	1(100)	0(0.0)	1(100)
	Total	30(25)	63(52.5)	27(22.5)	120(100)

All values are in no. (%).

‘Chi-squared for trend’ analysis was performed to find the significance of severity of thrombocytosis to pneumonia and severe pneumonia/ very severe disease. For the calculation, thrombocytosis levels as shown in table 3 was considered as exposure; while pneumonia cases were considered as ‘control’ and severe pneumonia and very severe disease together were considered as ‘cases’. This analysis shows significance at P=0.012 for linear trend, and Odds Ratios (OR) are (pneumonia without thrombocytosis vs severe pneumonia/very severe disease with mild thrombocytosis=2.6, and pneumonia

without thrombocytosis vs severe pneumonia/very severe disease with moderate thrombocytosis=6.5). Mild thrombocytosis has almost 2.6 times probability of severe pneumonia/ very severe disease compared to pneumonia without thrombocytosis, while the same probability increases to 6.5 when thrombocytosis is ‘moderate’. Comment cannot be made about ‘severe’ and ‘extreme’ thrombocytosis as the number of pneumonia cases are nil, in this group and hence OR could not be calculated.

Table 3: Chi-square for trend analysis for severity of thrombocytosis and severity of pneumonia.

Thrombocytosis	Severe pneumonia and very severe disease (Cases)	Pneumonia (Controls)	Total	Odds ratio
< 5.00	48	24	72	1
5.00-7.00 (mild)	26	5	31	2.6
7.01-9.00 (moderate)	13	1	14	6.5
9.01-10.00 (severe)	2	0	2	‘undefined’
>10.00 (extreme)	1	0	1	‘undefined’
Total	90	30	120	

Note: Extended Mantel-Haenszel chi square for linear trend = 6.18; p-value (1 degree of freedom) = 0.01290.

Out of the total 120 cases of lower respiratory tract infection, majority i.e. 84 (70%) children were aged between 2 to 12 months while 36 (30%) children were aged between 13 to 60 months. Out of the 84 cases in the age group of 2 months to 12 months, almost half i.e. (52.3%) of the cases were admitted with severe pneumonia followed by very severe disease in 21 (25%) children. Whereas, in the age group of 13 months to 60 months almost half i.e. 19 (52.7%) children were admitted with severe pneumonia and 11 (30.5%) children were admitted with pneumonia. 21(25%) children in the age group of 2 to 12 months had very severe disease while 6 (16.6%) children in the age

group of 13 to 60 months had very severe disease. Thus it is seen that severity of pneumonia is more in infancy.

Discussion

In present study, among total 120 cases of lower respiratory tract infections, 48 (40%) cases had thrombocytosis and 72 (60%) cases were without thrombocytosis. 20%, 46.1% and 48.1% of children with pneumonia, severe pneumonia and very severe disease respectively had thrombocytosis. This study revealed significant association between thrombocytosis and severity of pneumonia (p value of 0.018). In a study by Vlach V et al., 48% of total admission with LRTI had

thrombocytosis which is similar to this study. They also found that children with thrombocytosis had more serious illness (p value <0.001) [8]. Unsal et al., noted that the severity of symptoms in patients with thrombocytosis is more than in patients with normal platelet count (p value $=0.004$) [9]. Choudhury and Rath also found similar results in their study where there was significant association between platelet count and severity of pneumonia ($p<0.05$) [10]. In contrast to this study, Prina et al., found that 8% cases of lower respiratory tract infection had thrombocytosis and 90% had normal platelet count [11].

In present study, 40% had thrombocytosis. Among children with thrombocytosis, 64.5% had mild thrombocytosis, 29.1% had moderate thrombocytosis, 4.16% had severe thrombocytosis and 2.08% had extreme thrombocytosis. This is comparable to studies done by Sutor et al., Yohannan et al., Heng and Tan, where mild thrombocytosis was seen in 72-86%, moderate thrombocytosis in 6-8%, severe thrombocytosis in 3%, and extreme thrombocytosis in 0.5% [12-14].

In this study, out of 2 children with severe thrombocytosis ($9.01-10.00$ L/ mm^3), both (100%) had very severe disease. Only one case was found to have extreme thrombocytosis (platelet count >10 lakhs/ mm^3) and it (100%) had severe pneumonia. On the other hand, most (78.5%) of the cases of moderate thrombocytosis and almost half (54.8%) of the cases with mild thrombocytosis had severe pneumonia; while none had very severe disease. Thus it was seen that, degree of thrombocytosis increased with increase in severity of pneumonia. Choudhury and Rath had similar findings. They found that all the 4 children with very severe thrombocytosis also had very severe pneumonia which indicated an association between severity of pneumonia and degree of thrombocytosis [10].

In this study, out of 84 infants, 44 (52.3%) and 21 (25%) infants had severe and very severe disease respectively and out of 36 children in the age group of 13 to 60 months, 19 (52.7%) and 6 (16.6%) children had severe pneumonia and very severe disease respectively. This showed that severity of pneumonia was more in infants than in children aged in between 13 to 60 months age group. Choudhury and Rath also had similar findings where they found that out of 170 infants, 80, 52 and 38 had very severe pneumonia, severe pneumonia and pneumonia respectively and in 12 to 60 months age group, out of 60 children, 32, 16 and 12 had very severe pneumonia, severe pneumonia, and pneumonia respectively [10]. Kiyawat et al., also had similar findings where severity of pneumonia was higher in infancy than in children aged 12 to 72 months old children

[15]. However, Guven and Kislal found that there was no statistically significant difference in age between severe and mild groups ($p>0.05$) [16].

The study was done in low sample size. A large sample size would be more beneficial in arriving at a conclusion about relationship between degree of thrombocytosis and severity of pneumonia.

Conclusion

Percentage of cases with thrombocytosis increases with severity of pneumonia. Also degree of thrombocytosis increases with increase in severity of pneumonia. Hence, platelet count may be used as a useful marker associated with severity of lower respiratory tract infection. Increased severity of pneumonia is found to be more in infancy.

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Conflicts of interests

Authors declare no conflicts of interests.

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