wjpmr, 2020,6(6), 143-146

SJIF Impact Factor: 5.922

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Review Article

ISSN 2455-3301

WJPMR

PERTUSSOID ILLNES IN SEVEN INFANTS TREATED IN A SECONDARY CARE CENTRE IN NORTH EAST INDIA

***[1]Dr. (Colonel) Mahendra Narain Mishra, [2]Dr. Murugan Timri Palani, [3]Dr. Bianchi Sangma, [4]Dr. Pallavi Mishra and [5]Dr. Divya M. George**

[1]MD Pathology, ESHI Diploma Baptist Christian Hospital, Tezpur, Assam.
[2]MD Paediatrics Christian Medical College, Vellore, Tamil Nadu.
[3]MBBS Paediatrics Resident, Baptist Christian Hospital, Tezpur, Assam.
[4]Pathology Trainee MBBS, FRCP Part I VMMC Medical College Safdarjang Hospital, New Delhi.
[5]MD Paediatrics Baptist Christian Hospital, Tezpur, Assam.

***Corresponding Author: Dr. (Colonel) Mahendra Narain Mishra**
MD Pathology, ESHI Diploma Baptist Christian Hospital, Tezpur, Assam.

Article Received on 08/04/2020 **Article Revised on 29/04/2020** **Article Accepted on 19/05/2020**

ABSTRACT

Introduction *Bordetalla pertussis* infections are underreported in India due to paucity of advanced diagnostic facilities and lack of clinical suspicion. A presumptive diagnosis is therefore often based on clinical and haematological profile without confirmation by culture or polymerase chain reaction. In this paper we present laboratory and clinical profile of seven infants with pertussoid illness treated in a secondary care centre in Assam of which three had leukemoid counts. **Case Series Description** Seven infants aged two -five months were brought with variable symptoms including paroxysmal cough, fever, rapid breathing and feeding difficulty. Investigations included complete blood counts (CBC), C reactive proteins, serum creatinine, Blood culture, Plain X –Ray chest and blood gas analysis for two patients. Leukocytosis with increased absolute lymphocyte count, and raised C - reactive protein, normal serum creatinine was present. A probable diagnosis of Pertussoid illness was made and aggressive indoor treatment was administered resulting in a successful outcome in five infants in spite of limited resources. **Conclusion** In resource poor settings it is possible to manage pertussoid illness successfully with limited laboratory facilities. High ALC and thrombocytosis were useful in prognostication.

KEYWORDS: Absolute lymphocyte count, infants, Pertussis, secondary care centre, Total Leukocyte count.

INTRODUCTION

Pertussis (whooping cough) is a highly contagious, vaccine preventable, respiratory illness caused by *Bordetella pertussis* which is associated with significant pediatric morbidity and mortality.[1] Paroxysmal cough with facial discoloration followed by history of post tussive vomiting are the primary symptoms in the clinical diagnosis of Pertussis infection as per WHO case definition.[2] In recent years, pertussis infections have re-emerged worldwide. The constellation of bronchopneumonia, refractory hypoxemia, extreme leukocytosis, and pulmonary hypertension (PHT) is well described in severe *Bordetella pertussis* infection in infants.[3,4] Pertussis leukocytosis is caused by pertussis toxin, which is a soluble protein released by *Bordetella pertussis* during infection, but the exact mechanisms are still unclear.[5] In the absence of facility for culture and polymerase chain reaction-based identification of the bacteria, a diagnosis of Pertussoid infection is often made in resource poor settings. This case series is from a 130 bedded secondary care hospital in North -East India where confirmatory diagnosis of *Bordetella. pertussis* was not possible. The clientele belonged to poor socioeconomic strata which restricted the range and repetition of tests as well as comprehensive treatment. Clearance was obtained from the Ethical Committee of the institution for carrying out the study and publication.

CASE SERIES

Seven infants aged 2-5 months with symptoms of paroxysmal cough, fever, feeding difficulty and rapid breathing were admitted in the paediatric ward of a secondary care hospital emerge in North- East India. None of the infants had history of seizures. Two patients had more severe disease of which one (case 1) had already received treatment for a week and parents also gave a history of lethargy in the last one day. Examination revealed features of respiratory distress including severe tachypnoea (respiratory rate > 68/minute) and severe tachycardia (HR >180/ min) with signs of respiratory failure laboured breathing, sub costal and intercostal restrictions in two infants. A probable diagnosis of Pertussoid illness was made on admission for three infants, while the remaining four were

diagnosed as possible complications of Pertussoid illness as all had history of characteristic "whooping cough" and leukocytosis with lymphocytosis. Details of symptoms, signs, investigations and outcome for all patients are depicted in Table 1. Baseline investigations included complete blood count (CBC), serum creatinine, blood culture, C reactive protein and plain X -Ray chest. Radiologically, most of the infants had perihilar infiltrates with homogenous patchy opacity. Serum creatinine was normal in all patients. Treatment administered included azithromycin, piperacillin, tazobactam, Augmentin clavulanic acid, antihistamines, beta agonists, short acting steroids nebulisations systemic steroids and Oxygen as required.

Table 1 Salient history, clinical features and management of Seven infants with Pertussoid Illness.

	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case7
Age in months	3	2	5	3	2	3	2
Gender	Female	Male	Female	Male	Female	Male	Male
Pertussis vaccine	yes	No	Yes	Yes	yes	No	No
Symptoms							
Cough	1 week	3 days	3 days	3 days	30 days	4 days	7 days
Fever	1 week	1 day	3 days	-	-	4 days	7days
Failure to thrive	1 week	1 day	-	3 days	-	-	-
Rapid Breathing	1 day	1 day	-	-	-	-	+, 7 days
Difficulty in breathing	Yes RR 80/min	-	-	Yes RR 78/min	-	-	Yes RR 68/min
Lethargy	1day	-	-	-	-	-	-
Investigations							
Haemoglobin gm/dl	9.8	10.1	9.6	9.7	12.1	9.1	8.4
TLC $X10^3$ /µl	36.7 32.2*	36.4	25.6	64 72.2	52.1	38.5 37.4	75.8
ALC $X10^3$/µl (%)	6.3 (17)	21.8(60)	12.3(48)	34.6 48) 34.6(54)	37.5 (72)	28.9(75) 30.7 (80)	40.2 (53)
Platelets **(**$X10^5$)	6.6	7.01	2.21	7.34	1.06	6.2	7.62
CRP mg/L	59	36	28	ND	6	23 05	ND
Blood Culture	Coag –ve Staph	Negative	ND	NG	MRSA	NG	ND
Blood gas analysis	Respiratory acidosis						SPO_2 67%
Electrolytes Milimols	K^+ 5.6	ND	Normal	PO_4^{3-} + Na^+ K^+ Normal	K^+ 5.8, 4.6	ND	ND
Treatment Oxygen	Yes, ventilator	No	No	Yes, intra nasal	No	No	Yes, ventilator
Piperacillin and Tazobactam Amikacin	Yes	No Amikacin	No Amikacin	yes	Yes	Yes, with Meropnem	No
Azithromycin	No	yes	Yes	Yes	yes	Yes	Yes
Steroids	No	yes	No	Yes	yes	No	No
Diagnosis	Acute RDS	Penumonia	LRTI	LRTI	? Pertussis	Pertussoid illness	? Pertussis
Outcome	Died	Rec	Rec	Rec	Rec	Rec	Died
Hospitalization (days)	1 LAMA	4	4	4 LAMA	2	8	6 LAMA

Abbreviations – ALC – Absolute lymphocyte count, CRP – C reactive protein, Coag- Coagulase negative, K^+ - Potassium, LAMA – left against medical advice, LRTI lower respiratory tract infection, Na^+ -Sodium, ND - not done, PO_4^{3-} - Phosphate ion, RDS – Respiratory distress syndrome, Rec – recovered, RR – respiratory rate, TLC – total leukocyte count

One severely ill infant (Case 1) was brought late after failure to respond to treatment given by a general practitioner, with respiratory rate of 80/ minute and heart rate of 180/minute. Arterial blood gas findings indicated severe respiratory acidosis with low blood pH, raised pCO_2, reduced O_2 saturation and dyseletrolytemia. Although mechanical ventilation was instituted, the clinical condition deteriorated and the parents took her

home the following day. An unimmunised child (case7) with marked tachycardia (190/minute), tachypnoea (68/minute) and peripheral capillary oxygen saturation of 67 % on admission showed clinical improvement with a partial Oxygen pressure of 92mm Hg on discharge, but succumbed later at home. Follow up data was obtained 6 – 18 months post discharge.

DISCUSSION

Except for one immunised infant who was symptomatic since a month, the others were symptomatic for 3-7 days (Table 1). Four infants were considered to be probable complications of the Pertussis infection on basis of history, clinical features, and investigations which showed hyperleukocytosis with absolute lymphocytosis in six (85.7%) infants. On microscopy reactive lymphocytosis >15% was seen in all smears with the lymphocytes showing cleaved nuclei. Total Leukocyte Count (TLC) exceeded 50,000/µl in three infants with occasional lymphoblast in Case 4, but the diagnosis was never in doubt as neutrophils percentage was > 35 %.

Leukocytosis due to increase in absolute lymphocyte count (ALC), which was recognised as a feature of Pertussis infection over a century ago is usually seen at the commencement of paroxysmal cough and persists for 3-4 weeks. Many other respiratory infections cause relative lymphocytosis, but it is usually not associated with leukocytosis or significant increased ALC.[5] Elevated and rapidly rising WBC count especially high ALC value is suggested as a predictor of severe *Bordetella. pertussis* infection in young infants, making early and repeated TLC determinations is critical in the evaluation of all infants with suspected or proven pertussis.[7,8] CBC was done twice for two infants and except for Case 1 ALC, ranged from 12,100 - 40,200 /µl. This patient had neutrophilia with absolute neutrophil count of 29,400 /µl, left shift, toxic granules and vacuolation probably due to septicaemia as a result of secondary infection. Leukocytosis (15,000-50,000/µL) with absolute lymphocytosis which occurs during the late catarrhal and paroxysmal phases is a nonspecific finding but correlates with the severity of the disease. Guinto Campo *et al*. concluded that among infants suspected of having pertussis, ALC < 9400/ µL had a negative predictive value of 97%.[9]

Moderate and severe thrombocytosis was observed in two and three infants respectively and may serve as a surrogate marker of severe disease as seen in two cases with a fatal outcome that had platelet counts of 6.6 $X10^5$/ µL and 7.62 $X10^5$/ µL. Pertussis vaccine is not included in antenatal care in India, so in spite of a history of having received first dose of Pertussis vaccine in four infants, we suspected Pertussoid illness because vaccine failures are known. Immunity provided by vaccine tends to wane with time and usually the disease is less severe in vaccinated individuals (10, 11). Facility for confirmation of the diagnosis of *Bordetella Pertussis* is not available in a distance of 1000 kms and is too expensive for the patients' parents to pay and it would not have had changed the management. Some of the lacunae in management include inability to do repeat CBC, lack of aggressive management in case 7. The first patient had severe respiratory failure at admission and parents decided to discontinue treatment on learning regarding the prognosis. Simultaneous use of multiple antibiotics at our centre for six infants may not be in agreement with the standard practice in other nations.

CONCLUSION

A high index of suspicion in patients with history of paroxysmal cough supported with ALC exceeding 10000 / µl and cleaved nuclei should be considered as Pertussoid infection in resource poor settings in the absence of laboratory support for confirmation of *Bordetella pertussis*. Secondly ALC, thrombocytosis, tachycardia and tachypnea can be used as prognostic markers and managed more aggressively.

REFERENCES

1. Centers for Disease Control and Prevention. Epidemiology and Prevention of Vaccine-Preventable Diseases. Hamborsky J, Kroger A, Wolfe S, eds. 13th ed. Supplement. Washington D.C. Public Health Foundation, 2017. Available at https://www.cdc.gov/vaccines/pubs/pinkbook/downloads/supplement.pdf Accessed Mar 2020
2. World Health Organization. Pertussis surveillance: a global meeting, Geneva, 16-18 October 2000. World Health Organization, 2001; 16–8. [Google Scholar]
3. Goulin GD, Kaya KM, Bradley JS. Severe pulmonary hypertension associated with shock and death in infants infected with Bordetella pertussis. *Crit Care Med*, 1993; 21: 1791–4.
4. Kuperman A, Hoffmann Y, Gilikman D, Dabbah H, Zonis Z. Severe pertussis and hyperleukocytosis: is it time to change for exchange? Transfusion, 2013; 54(6): 1630 -33.
5. Carbonetti NH. Pertussis leukocytosis: mechanisms, clinical relevance and treatment *Pathogens and Disease*, 2016; 74(7): 1- 8. https://doi.org/10.1093/femspd/ftw087.
6. Shojaei J, Saffar M, Hashemi A, Ghorbani G Rezai M, Shahmohammadi S. Clinical and laboratory features of pertussis in hospitalized infants with confirmed versus probable pertussis cases. Ann Med Health Sci Res, 2014; 4(6): 910–914. PMID: 25506485. doi: 10.4103/2141-9248.144911: 10.4103/2141-9248.144911
7. Murray EL, Nieves D, Bradley JS, et al. Characteristics of severe Bordetella pertussis infection among infants 90 days of age admitted to pediatric intensive care units: Southern California, September 2009-June 2011. J Pediatric Infect Dis Soc., 2013; 2(1): 1- 6.
8. Waknine Y. Infant Pertussis: Early White Blood Cell Counts Crucial. Available

at http://www.medscape.com/viewarticle/777732. Accessed, 21 Apr 2020.
9. Guinto-Ocampo H, Bennett JE, Attia MW. Predicting pertussis in infants. *Pediatr Emerg Care*, 2008; 24(1): 16-20. [Medline].
10. Vitek CR, Pascual FB, Baughman AL, Murphy TV. Increase in deaths from pertussis among young infants in the United States in the 1990s. *Pediatr Infect Dis J*, 2013; 22: 628–34.
11. Chisholm H, Howe A, Best E, Petousis-Harris H. Pertussis Vaccination Failure in the New Zealand Pediatric Population: Study Protocol. *Vaccines (Basel)*, 2019; 7(3): 65. doi:10.3390/vaccines7030065.