

Article

A study of clinico-pathological relation of adenovirus associated with respiratory infections in children

Dr. Shabarna Roy¹, Dr. Shibani Pal², Dr. Suvomoy Karan³ and Dr. Shreya Dutta^{4,*}

¹ Associate Professor, Department of Pediatrics, R.G. Kar Medical College, Kolkata, West Bengal, India.

² RMO, Department of Pediatrics, R.G. Kar Medical College, Kolkata, West Bengal, India.

³ Senior Resident, Department of Pediatrics, R.G. Kar Medical College, Kolkata, West Bengal, India.

⁴ Junior Resident, Department of Pediatrics, R.G. Kar Medical College, Kolkata, West Bengal, India.

* Correspondence: shibanimc@gmail.com

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Abstract: Introduction: Adenoviruses are DNA viruses responsible for varieties of human diseases that affect the gastrointestinal tract, respiratory tract, and eye. There are seven species of adenoviruses categorized from A to G with two subgroups. The classification correlates with clinical presentation, antigenic character, and epidemiological spread and can be identified by the genetic methods.

Aims: To study the clinico-pathological relation of adenovirus associated with respiratory infections in children.

Material and Methods: Department of Pediatrics, R.G. Kar Medical College, Kolkata.

Results: In the present study, this was performed by two steps molecular techniques. The first was by the determination of adenovirus by the use of PCR for fiber gene with common primers for adenovirus. The PCR was confirmed to be positive in 11 samples. The differences in the determination of adenovirus in respiratory infections can be attributed to the difference of the studied population.

Conclusion: The prevalence of adenovirus with respiratory tract infections mainly in pneumonia with genotypes 3 and 7 as the predominant geno types in those in children.

Keywords: Adenovirus; Predominant geno types; PCR; DNA; Respiratory tract infections and pneumonia.

1. Introduction

A Adenoviruses are DNA viruses responsible for varieties of human diseases that affect the gastrointestinal tract, respiratory tract, and eye [1]. There are seven species of adenoviruses categorized from A to G with two subgroups. The classification correlates with clinical presentation, antigenic character, and epidemiological spread and can be identified by the genetic methods. Species B, C, and E are associated with respiratory tract infections [2]. Previous studies reported that around 10% of acute respiratory tract infections in children were attributed to adenoviruses. The infections may range from mild flu-like symptoms to severe infections with pneumonia and high mortality up to 50% in immunocompromised patients [3]. The respiratory tract infections can be complicated with pleural effusion, acute respiratory distress syndrome, myocarditis, and even central nervous dysfunction [4]. The vaccine and specific systemic antiviral therapy for adenoviruses are still unavailable. The human adenovirus 3 and 7 (HAdV-3 & HAdV-7) that belong to subgenus B1 are usually associated with mild respiratory tract infections; however, there is evidence that severe and even life-threatening infection outbreaks associated with adenovirus 3 and adenovirus 7 were reported [5]. Epidemiology of the disease suggests that HAdV-3 and HAdV-7 are the major types responsible for lower respiratory diseases in children less than 5 years old worldwide [6].

There are few reports about the prevalence of adenovirus respiratory infections in Egyptian children and the genotypes associated with these infections [7]. To study the clinico-pathological relation of adenovirus associated with respiratory infections in children.

2. Material and methods

2.1. Study area

Department of Pediatrics, R.G. Kar Medical College, Kolkata.

2.2. Study design

Observational and descriptive study.

2.3. Period of study

Jan 2022 to Dec 2022.

3. Statistical Analysis

For statistical analysis data were entered into a Microsoft excel spreadsheet and then analyzed by SPSS 27.0. and GraphPad Prism version 5. Data had been summarized as mean and standard deviation for numerical variables and count and percentages for categorical variables. Two-sample t-tests for a difference in mean involved independent samples or unpaired samples. Unpaired proportions were compared by Chi-square test or Fischer's exact test, as appropriate. p -value ≤ 0.05 was considered for statistically significant.

4. Results and Discussion

In the present study, the mean age \pm SD of children with adenovirus infection was 49.3 ± 8.9 months. This finding was similar to previous reports [8]. This can be attributed to the immaturity of the immune systems of young children, which leaves them prone to more severe adenovirus disease.

The clinical characteristics of children with confirmed adenovirus were similar to children without adenovirus. It is known that clinical diagnosis has similar symptoms and signs with different viral etiologies in respiratory infections [9]. Therefore, there is a need to identify the specific viral pathogen. The use of conventional PCR for the detection of adenovirus with species and type-specific primers was proved to be an efficient and rapid method for the detection and typing of adenovirus associated with respiratory infections. Accurate and rapid identification of HAdV infection in the respiratory tract not only avoids unnecessary antibiotic prescription but also prevents or inhibits HAdV-related outbreaks [10].

In the present study, this was performed by two steps molecular techniques. The first was by the determination of adenovirus by the use of PCR for fiber gene with common primers for adenovirus. The PCR was confirmed to be positive in 11 samples. This result was consistent with previous reports with a range from 2% up to 13% [11]. The differences in the determination of adenovirus in respiratory infections can be attributed to the difference of the studied population; the method used for the detection of adenovirus and even to the difference of the weather between countries as adenovirus is known to be more prevalent in hot dry weather [12].

The genotype determination of the positive samples for adenovirus revealed that adenovirus genotype 3 was determined in 6 samples and genotype 7 was present in 5 samples positive by Multiplex PCR. The common genotypes in respiratory infections in children were reported to be B (B3, B7, B21), C (C1, C2, C5, C6), and E (E4) [13]. HAdV 2, 3, and 7 are the most prevalent species and are associated with severe pneumonia [14]. In the present study, the diagnosis in children with adenovirus was pneumonia in 72.7% and bronchitis in 27.7%. This finding was online with previous studies [15].

In general, the clinical characteristics of respiratory infections may vary with adenovirus and may vary upon the age of the patients and the immune status. Therefore, there is a requirement for an extensive study of adenovirus in respiratory infections in children with different ages and immune status.

Table 1. Comparison between children positive for adenovirus and children negative for adenovirus

	Children with Confirmed Adenovirus (n=22)	Children Negative for Adenovirus (n=178)	P-value
Age (mean± SD) months	49.3 ± 8.9	46.9 ± 9.8	-
Gender Male no (%)	8 (72.2%)	62 (69.7%)	P=1.00
Female no (%)	14 (127.3%)	116 (130.3%)	
Residence Rural no (%) Urban no (%)	12 (109.1%) 10 (90.9%)	128 (143.8%) 50 (56.2%)	P=0.3
Cough no (%)	20 (181.1%)	162 (182.0%)	P=1.00
Fever no (%)	18 (163.6%)	122 (137.0%)	P=0.5
Wheezing no (%)	14 (127.3%)	54 (60.7%)	P=0.04
Croup no (%)	14 (127.3%)	94 (105.6%)	P=0.8
Dyspnea no (%)	6 (54.5%)	48 (53.9%)	P=1.00
Dry rales no (%)	8 (72.7%)	64 (71.9%)	P=1.00
Moist rales no (%)	4 (36.4%)	56 (62.9%)	P=0.5
Seizure no (%)	2 (18.2%)	2 (2.24%)	P=0.2
Bronchitis no (%) Pneumonia no (%)	6 (54.5%) 16 (145.5%)	23 (25.8%) 138 (155.0%)	P=0.9
Upper respiratory infections no (%)	0 (0%)	8 (8.9%)	
Hemoglobin gm/dl (mean ± SD)	18.0 ± 1.6	15.0 ± 2.3	P=0.2
Lymphocytes103/cmm (mean ± SD)	4.5 ± 2.00	3.9 ± 1.3	P=0.1
Neutrophil103/cmm (mean ± SD)	4.6 ± 1.00	5.7 ± 1.2	P=0.1
Platelets103/cmm (mean ± SD)	165.8 ± 8.3	189.4 ± 81.6	P=0.4

5. Conclusion

The present study highlights the prevalence of adenovirus in Egyptian children with respiratory tract infections mainly in pneumonia with genotypes 3 and 7 as the predominant geno types in those in children the finding which confirmed a world- wide trend of distribution of adenovirus infection in children.

Author Contributions: All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript.

Conflicts of Interest: The authors declare that they do not have any conflict of interests.

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