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Viral Origin of Wheeze in under-five population in Pakistan

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ABSTRACT

Background: One of the most common issues arising these days is wheezing that is observed in kids below five year of age accompanied with acute respiratory infections (ARIs). The main etiological causes of ARIs are viruses.
Aim: To investigate the viral cause of wheezing in kids below five years of age who were hospitalized in hospital located in Pakistan.
Methods: Forty candidates under 5 years of age were admitted complaining wheezing, in this case research. Nasal and throat swaps were taken. For screening purpose, real-time, polymerase chain reaction (PCR) assay was employed in order to rule out rhinovirus, influenza 1 and 2, respiratory para influenza virus (PIV) 1, 2, 3 and 4, syncytial virus (RSV), human meta-pneumovirus, bocavirus (HBoV), Enterovirus Coronavirus, Parechovirus and adenovirus.
Results: 30% was regarded as total viral detection rate. Candidates detected with pheumonina viral RNA markers were found from their samples (6 cases), episodic wheeze (1 cases) bronchiolitis (7 cases) and multitrigger wheeze (8 cases). It was discovered that RSV was the most common virus found (30%) which is then followed by PIV1, 2 and 3(18%), HBoV (8%) and rhinovirus (4%). Whereas mixed infection was found in case of in 32 per cent.
Conclusions: According to the case research, respiratory viral agents was found to be the culprit in 30 per cent of kids suffering from wheezing; the most common RSV and PIV were responsible for 50 per cent of the total number of cases involved. In case of 30% of cases mixed infections were reported. There was also noteworthy Seasonal variation was noted. Moreover, Further research required to accomplished with a large samples and long duration follow up span in order to clarify results of research.
Keywords: Asthma - bronchiolitis - child - incidence - PCR

INTRODUCTION

One of the most common problem observed in kids that are under five, is acute respiratory infection (ARI) along with wheezing. Its severity may lead child to be admitted to pediatric intensive care unit (PICU) and finally on mechanical ventilation in case of severity of disease. ARIs are one of the leading factor in causing deaths at the rate of 19% in children below age group of 5 years according to WHO in the whole world[3]. The exact causes of wheezing among kids below five years are hard to enumerate because specialized procedures for example viral isolation is way costly and require certain protocols that are not practiced in daily routine[6]. Moreover, tests done for pulmonary function is impossible for under 5 age group of children. So, most of the cases regarding to wheezing labeled empirically as bronchiolitis in case of babies and asthma in case of older age kid. The term Wheezing is defined as long intense pitched, musical voices from respiratory system with changeable intensity, hearable while during expiration when tiny intrathoracic airlines are restricted by bronchospasm, mucosal lining swelling, abnormal secretions or foreign body inhalation[5]. Wheezing is one of the most common presentations in case of infants and children visiting to hospital and it has been observe that about 30 per cent of kids are reported with one episode of wheezing at least in third year of their life[7].

Viruses are the main cause for ARIs in childhood[9] and become a source of mortality. The viruses that are involved in causing ARI are influenza viruses A and B, parainfluenza (PIV), respiratory syncytial virus (RSV), adenovirus (AdV) and human meta- pneumovirus (hMPV) and human rhinovirus[5]. Although some of the above mentioned viruses can become a source of morbidity and leads to hospitalization as well as repeated wheezing along with asthma in later years of life, but still there is very less research done in this aspect specifically from Pakistan. This case reach was done in order to rule out viral aetiological aspects of wheezing in case of pedriactic group under five years of age that were hospitalized in Pakistan in a tertiary care hospital.

MATERIAL & METHODS

From March 2019 to February 2020 this case reach was carried out. The candidates were selected via DHQ Sargodha. Patient enrollment was done by the department

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of Paediatrics department. The laboratory work was carried out at Private Laboratories. The candidates whose age was less than five years were admitted to the pediatric department with lower respiratory tract infection (LRTI) as well as wheezing (either audible or auscultatory). All the above candidates' samples were sent to virological tests. All those candidates were excluded whose age was more than five years, children with status asthmaticus and kids whose parents were not willing to provide any consent with respect to case research. All those candidates who were admitted to pediatric ward complaining wheezing during case study was included in case research (keeping in mind exclusion criteria) and nasopharyngeal as well throat swabs were taken for viral investigation from each. The case reach was carried out using specific designed proforma. From all the candidates, informed consent in written form was taken from parents. The case reach was carried out after taking consent from both Ethics Committees. Candidates clinical finding were documented completely. The investigations were carried out whenever necessary.

From 80 candidates, The throat swap all well as nasopharyngeal samples were taken from 80 children (7 children were not included in case research depending upon exclusion criteria) were delivered for diagnosis of viral element via , real-time PCR assay with the help of kits. After 24 hours of admission of candidates, laboratory Samples were taken and delivered to laboratory on urgent basis in ice packs through viral transport medium. All Swabs taken from samples were assessed for PIV 1, 2, 3 and 4, influenza A/B, RSV, hMPV, rhinovirus, bocavirus (HBoV), AdV, Paricovirus and Coronavirus Enterovirus by PCR assay.

RESULTS

Respiratory complaints (LRTI) (children) who were admitted in hospital during this case research. Wheezing was reported by 80 candidates (either audible or auscultatory). This wheezing was reported as multitrigger wheeze (15), nchiolitis (21), episodic wheeze (14), pneumonia (16), bronchopneumonia (8), whooping cough (2) and foreign body aspiration (4). Congenital heart disease This case reach involved 208 candidates with cardiac failure (3). Five children out of 75 were excluded from the case research and rest 70 candidates sample were sent to laboratory for viral RNA markers. It was observed that the viral case was seen in about 30 per cent (n=24) of candidates. Viral genome was identified in four cases with respect to pneumonia, bronchiolitis about eight cases, episodic wheeze about three cases and multitrigger wheeze about seven cases.

In table, description of markers regarding viral RNA is shown. In this case research, wheezing was seen in about 45% of kids suffering from infection regarding respiratory system, having a mean age of 13.98±11.88 months. The main presenting complain was cough (92%), which was followed by nasal discharge and then respiratory distress (76%) and finally fever (66%). In case of eight (n=4) candidates, additional symptoms were seen like eye watering whereas skin rashes were observed in five candidates 3% cases, respectively. All the candidates had auscultatory rhonchi, whereas 38% of them presented with audible wheeze. In case of 70% of candidates, crepitation and Tachypnoea were observed in children, retractions in case of 59% cases , nasal flaring was observed in 59% where as grunting was observe in four per cent of candidates In different age groups, seasonal variations were seen in different cases related to viral cases. It was seen that more kids were prone to respiratory symptoms during autumn and monsoon, with a spike observed in October (26%) and August (24%). Rhinovirus (3 cases) and The RSV (10 cases) were seen in August-November (winter and autum), whereas parainfluenza cases (2 of the 4 cases) were observed March-July (summer) more. Rhinoviruses (0 case) and RSV (10 cases) were observed more in case of younger children (<1 yr) whereas parainfluenza (7 cases) as well as boca (4 cases) were observed in older children (>1 yr). It was observed that RSV was the most commonly seen virus , whereas mixed infections were observed in 30 per cent of presented cases. In case of infective origin (pneumonia was seen in 4 cases, followed by bronchiolitis in 8 cases and episodic wheeze in cases of 1) and allergy oriented (multitrigger wheeze was seen in 6 cases).

DISCUSSION

The mean age of presentation of wheezing in this study was 13.98±11.88 months, and 80% of kids who were two years of age, which was seen more as compared to studies that were done early[13].

The 30% was regarded as viral isolation rate in our case research, which shows comparison with work on respiratory infections by Chanock et al[15] in 10 countries, depicting viral isolation rate ranging between 28% and 51%. In case of Pakistan studies, RSV was regarded as single most common isolated virus and has percentage between 30-70. In case of other case researches, rhinovirus is considered to be the most common virus and then RSV[4,17]. In half of the case of wheezing bronchitis, isolation of rhinovirus was done by Horn et al[15] whereas from upper respiratory tract infection, PIV was isolated, para 1 and 2 in case of croup and para 3 in case of severe LRTI[18].

The mixed infection were observed in 32 per cent cases which has similarity with other case researches[7,15,19]. In about 20 per cent of case study, HBoV was seen in candidates suffering from mixed infection in case of our case researches where as other case studies showed high degree of co-infection (50-60%) along withHBoV[16,18].

In our case research, RSV infection was seen in case of younger age groups which shows similarity with work of Costa et al[6] in which kids who were less than 3 years of age were affected the most. In case of PIV infection, it was seen more commonly in children who were older, which shows similarity with work study done by Chanock et al[15].

It was documented by Mansbach et al[22] that rhinovirus infection is of shorter duration as well as milder but it has more risk involved in causing recurrent wheezing and asthma when comparison was made with RSV infection in later ages. In this case research rhinovirus infection cause moderate severity with respect to symptoms, and the follow up study span was small as well.

There was spike in severity in case of RSV infections as well as mixed infections when comparison was made to HBoV and PI infections. HBoV infection produced only lesser degree of symptoms in case of our study. HBoV whereas was found to be responsible for severe hypoxia, that need treatment in hospital in case of another study14. Isolation of influenza virus was done and found to be responsible for causing severe disease in kids who were below five years[10,17], whereas hMPV and AdV were found to be responsible for 10% of infections related to respiratory track in case of kids of this age 24, 25 we did not find these pathogen in our case research.

Seasonal changes were documented as causesing cluster of cases in seasons specifically[9,19,20]. We have seen rhinovirus and RSV causing more diseases in months like August and November and season winter, whereas HBoV and PIV reported to causes more diseases in months like March and July and season summers, but mixed infections were seen to happen the whole year.

CONCLUSION

With the help of this case research, we came to know the information related to viral agents of respiratory track in kids below five years of age in the region. Since it was small case study and limited sample size as well as short duration follows up, further investigation needed for more verification of results.

Conflict of interest: Nil

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