Clinical aspects of human Bocavirus 1 in a sample of Egyptian infants with acute lower respiratory tract infection: A pilot study

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Background/aim
The recent advance in molecular technology permitted a comprehensive range of novel viral etiological causes to be detected in respiratory tract specimens. The human Bocavirus 1 (HBoV1) as a virus of the Parvoviridae family recently was defined as a human pathogen mainly linked to acute respiratory infection in children. Our aim was to identify the rate and seasonal variation of Bocavirus 1 infection and their correlation with the different clinical presentations in Egyptian infants less than 2 years old with acute lower respiratory tract infection.

Patients and methods
This study enrolled 100 infants aged from 4 weeks to 2 years presenting with symptoms of acute respiratory infection from Materia Hospital and Alzahraa University Hospital. Full medical history, general and local examination of the chest focusing on respiratory rate and plain chest radiograph were collected from each infant. In addition, pharyngeal swabs were collected from participated infants and were subjected to DNA extraction followed by PCR using different viral protein-targeted primer sets.

Results
Bronchopneumonia was the prominent diagnosis in the enrolled infants (38%) followed by bronchiolitis (34%) and bronchitis (28%) subsequently. The presence of HBoV1 among studied patients was 8% and the peak of the infection was in January (37.5%) followed by April (25%) and July (25%). Most of patients with HBoV1 positive were presented with respiratory distress and refusal of feeding. Seven percent of all patients were presented with diarrhea.

Conclusions
HBoV1 infection may be considered as a risk factor for lower respiratory tract infections in Egyptian children less than 2 years old.

Keywords:
Bocavirus, bronchopneumonia, infants, molecular

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Introduction

Respiratory tract infections are considered one of the main causes of childhood deaths and illness all over the word, especially in young children, it considered one of the main public health problem and this is owes to the easy and rapid spread of respiratory infection among the community which lead to high incidence and prevalence [1]. According to WHO reports, more than 8% of mortality in the Eastern Mediterranean Region were contributed to respiratory tract infection [2] mainly for lower respiratory tract and the age between 1 month and 5 years was the most affected. Approximately 70% of deaths under 5 years due to respiratory infection were in children living in developing countries [3,4].

Human Bocavirus (HBoV) was initially recognized in 2005 as one of parvovirus family utilizing a DNase treatment protocol, random PCR amplification, bioinformatics assessment, and high throughput sequencing [5]. HBoV1 is strongly implicated in causing lower respiratory tract infection, especially in young children, and several of the viruses such as HBoV2, 3, and 4 have been linked to gastroenteritis, although the full clinical role of this emerging infectious disease remains to be elucidated. By applying virus screening technique to samples obtained through naso-pharyngeal swabs and nasal wash from infected patient who were suffering from unresolved respiratory tract infections, it provided a 3.1% positive result rate for HBoV. Therefore, it was anticipated that HBoV1 is one of the important causative pathogen of respiratory tract diseases [5].

HBoV1 has been identified in nasopharyngeal swabs and serum samples, stool, and urine samples collected from infants around 2 years old principally during winter. HBoV is often revealed in respiratory tract infection patients consisting of symptoms as sneezing, cough, rhinorrhea, and elevated body temperature [6]. Clinically, patients infected with HBoV1 are presenting by upper and lower respiratory tract infections as bronchiolitis, bronchopneumonia, bronchitis, and triggering of asthma exacerbation [7]. Clinical presentation usually continue for 1 or 2 weeks, but some cases reported association with prolonged fever [8]. HBoV is as well recognized in stool samples from children with diarrhea with percentage between 0.8 and 9% [9].

This study aimed to identify the frequency of infection and seasonal variation of HBoV1 in infants presenting with symptoms of acute lower respiratory tract infection and to correlate it with the different clinical presentations.

Patients and methods

Patients and study design

A pilot cross-sectional study included 100 Egyptian infants; aged from 4 weeks to 2 years; visiting the outpatient clinic and the inpatient Department at Alzahraa University Hospital and Mataria Teaching Hospital in Cairo; presenting with symptoms of acute respiratory infection. It was conducted all over 1 year from January to December 2020. The combination of signs and symptoms of lower respiratory tract infections including cough, fever, tachypnea (defined as rapid respiratory rate as 60 breaths each minute in children aged <2 months, >50 breaths each minute in children aged between 2 and 12 months, and >40 breaths each minute in children >12 months of age), poor feeding, irritability, lethargy, grunting, cyanosis. Infants with any congenital anomalies or immunological disorders who were presented with whooping cough were excluded.

Ethics approval

The present study was conducted with the Code of Ethics of the World Medical Association, according to the principles expressed in the Declaration of Helsinki. The protocol of this survey was approved by the Medical Research Ethics Committee of the National Research Centre with approval number 16121. A written informed consent was taken from the parents or guardians of all children enrolled in the study (mothers/or fathers/or any caregivers).

Data collection and clinical examination

Full medical history was collected from each infant joined the study and a structured questionnaire designed to fulfill the following data: history suggestive of lower respiratory tract infections including (fever, cough, difficulty of breathing, poor activity, irritability, and cyanosis) and symptoms suggestive of other system affection (gastrointestinal tract, renal, and neurological).

Detailed general and local examination of the chest focusing on respiratory rate, which was counted twice, and the average count was recorded. Signs of respiratory distress including tachypnea, working alae nasi and, subcostal and intercostal retraction were recorded.

A plain chest radiograph, posterior anterior view at the time of admission has evidence of hyperinflation, increase bronchovascular marking and heterogonous opacifications in both lung fields.

Laboratory methods

Nasal swabs were collected in sterile vials from each infant, and all collected samples were subjected to DNA extraction followed by PCR using different viral protein-targeted primer sets to detect bocaviruses.

Nasal swabs samples

Nasal swabs from participants were obtained using a mucus trap (ARGYLE DeLee; Kendall, Cambridge, Massachusetts, USA). The collected volume ranged from 0.5 to 1 ml. Viral transport media (Hank's Balanced Salt Solution; Gibco, Invitrogen, New York, New York, USA) with 2.5% w/v bovine serum albumin (Sigma, St Louis, Missouri, USA), 2% penicillin/streptomycin (Gibco, Invitrogen), and 2.5% HEPES buffer (Gibco, Invitrogen) was added to each aspirate. The nasal swabs were immediately placed at 4°C and transferred to the Center of Scientific Excellence for Influenza Viruses, National Research Center Giza, Egypt within 24 h and kept at −80°C for nucleic acid extraction and virus isolation as follows.

Extraction of DNA

Viral DNA was extracted from 140 µl of collected samples by using a viral DNA copurification kit (Qiagen, Hilden, Germany) according to the manufacturer's protocol in class III biosafety cabinet. The extracted nucleic acid from each sample was aliquoted and kept at −20°C till the setup of the PCR reaction.

Conventional PCR for detection of human Bocavirus 1 DNA

Using Phusion high fidelity PCR master mix kit (Thermo Scientific, waltham, USA) a 25 µl reaction containing 12.5 µl of 2× Phusion master mix, 1.5 µl (10 pmol) specific forward primer HBoV188F 5'-GAGCTCTGTAAGTACTATTAC-3', 1.5 µl (10 pmol) specific reverse primer HBoV542R 5'-CTCTGTGTTGACTGAATACAG-3' 7.5 µl H_2O and 2 µl of extracted DNA [10]. The PCR cycling conditions were 98°C for 30 s then 40 cycles (98°C for 10 s, 53°C for 30 s, 72°C for 30 s), then 72°C for 10 min. PCR products were visualized by staining with ethidium bromide by agarose gel electrophoresis considering a positive PCR reaction when a band of the expected size of 354 base pairs for HBoV1.

Statistical analysis

The collected data was coded, tabulated, and introduced to a PC using the Statistical Package for Social Science (SPSS 17; SOSS Inc.). All data were presented as number and percentage. The suitable analysis was done according to the type of data obtained for each parameter. Mann–Whitney test (*U* test) was used to assess the statistical significance of the difference of a nonparametric variable between two study groups.

Results

The results reported in Table 1 shows that male patients comprised 53% while females comprised 47%. Their age ranged from 1.1 to 24 months and the mean was 10.5±8.2 months, 63 (63%) lives in urban areas and 37 (37%) lives in rural areas, 59% of patients were exposed to passive smoking.

Table 2 shows that most of the patients (93%) presented with cough and 81% were complaining of dyspnea. Twenty-nine percent of patients were presented with diarrhea and 67% had a fair general appearance. Seventy-two percent of infants showed chest retractions. There was a decrease as air entry and fine Consenting crepitations in 38.8% of patients on auscultation. In addition, conventional PCR was used for detection of HBoV1 DNA and eight (8%) cases were positive for Bocavirus1, while the remaining 92% were negative among all the studied infants with acute lower respiratory infection (Fig. 1).

Table 1 Demographic data of studied infants

Age (month)		
Mean±SD	10.5±8.2	
Median (range)	7 (1.1–24)	
	Frequency	Percent
Sex		
Female	47	47
Male	53	53
Residence		
Urban	63	63
Rural	37	37
Socioeconomic standard		
Low	84	84
Intermediate	13	13
High	3	3
Passive smoking		
Yes	59	59
No	41	41

In the current study high incidence of Bocavirus1 infection in children under 2 years old was reported on January (37.5%) followed by April and July (each 25.0%), as shown in Table 3.

The present results indicated that there were 34% diagnosed with bronchiolitis, 28% with bronchitis and 38% of patients were diagnosed with bronchopneumonia. Bronchopneumonia was a slight common diagnosis among HBoV1 positive cases. However, there was insignificant difference between HBoV1 positive and negative groups according to clinical diagnosis as reported in Table 4.

Table 5 shows a slight predominance of females over males among HBoV1 positive cases and there was no statistically significant difference ($P>0.05$) in sex between positive and negative groups. The median age among the positive group was 10 months and there was no statistical difference between residence, mother age and passive smoking between positive and negative groups.

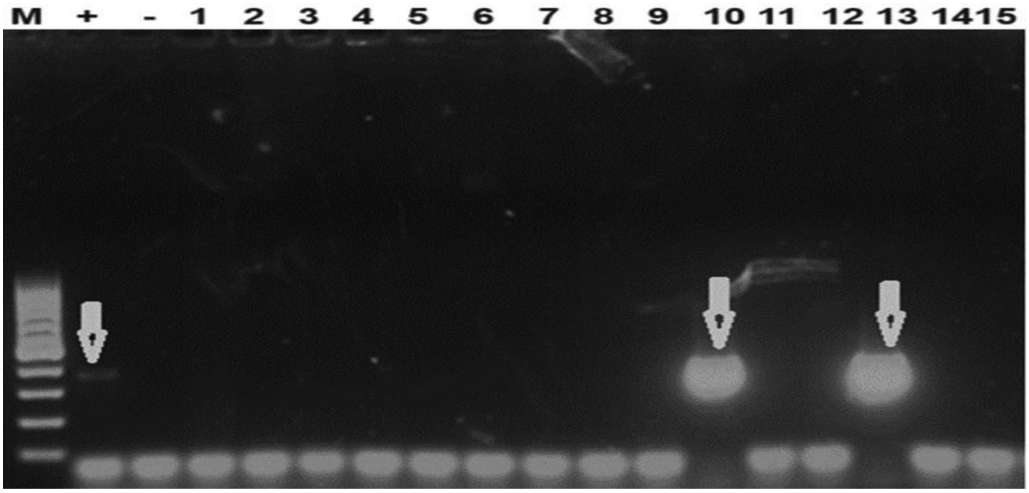
The present result exhibited that there was insignificant difference ($P>0.05$) between HBoV1 positive and negative groups regard medical history, using Mann–Whitney test. Most of the positive cases had prenatal complications. There was equality in the mode of delivery. Nearly all patients received vaccination (Table 6). Moreover, all positive cases gave the history of drinking tap water (not tabulated).

Table 7 showed that cough is a prominent feature among all HBoV1 positive cases, eight (100%) out of eight cases. Most of patients with HBoV1 positive were presented with respiratory distress and refusal of feeding. Seven percent of all patients were presented with diarrhea. Cyanosis was uncommon among positive cases. Most of cases of HBoV1 infection were associated with chest radiographs abnormalities (hyperinflation, increase bronchovascular marking, and heterogonous opacifications in both lung fields). There was no statistically significant difference ($P>0.05$)

Table 2 Frequency and percent of clinical presentation and Bocavirus 1 results among the studied infants with acute lower respiratory infection

Symptoms	*N*=100 [*n* (%)]
Cough	93 (93)
Dyspnea	89 (89)
Refusal of feeding	71 (71)
Irritability	45 (45)
Poor activity	22 (22)
Diarrhea	29 (29)
Signs	
General appearance	
Fair	66 (66)
Ill	30 (30)
Toxic	4 (4)
Appearance	
Cyanosis	3 (3)
Pallor	31 (31)
Normal	66 (66)
Chest shape	
Normal	94 (94)
Deformity	6 (6)
Chest retractions	
Positive	72 (72)
Negative	28 (28)
Auscultation	
Decrease air entry and fine crepitation	38 (38)
Bilateral expiratory wheezes	33 (33)
Coarse crepitation and transmitted nasal sound	25 (25)
Normal	4 (4)
Investigations	
Abnormal chest radiograph	45 (45)
Normal chest radiograph	55 (55)
BOCA result	
Negative	92 (92)
Positive	8 (8)

Figure 1



Agarose gel electrophoresis pattern of amplified products (354 bp) by PCR. M: 100 bp DNA ladder; Lane 1: control positive (arrow); Lane 2: control negative, Lane: 3, 4, 5, 6, 7, 8, 9, 11, 12, 14, and 15: negative and Lane 10 and 13: positive Bocavirus 1 bands of 354 bp amplicon (arrow) (NB. loading volume of PCR product in controls is 5 μl but in other samples are 20 μl).

Table 3 Monthly distribution of human Bocavirus 1 in positive and negative groups of infants with acute lower respiratory infection

Monthly distribution	Boca positive (*N*=8) [*n* (%)]	Boca negative (*N*=92) [*n* (%)]	*P* value
January	3 (37.5)	10 (10.9)	0.031*
February	0	2 (2.2)	0.673
March	1 (12.5)	17 (18.5)	0.673
April	2 (25.0)	11 (12.0)	0.029*
May	0	20 (21.7)	0.140
June	0	10 (10.9)	0.325
July	2 (25.0)	5 (5.4)	0.037*
August	0	0	1.000
September	0	1 (1.1)	0.766
October	0	2 (2.2)	0.673
November	0	7 (7.6)	0.328
December	0	7 (7.6)	0.328

*Significant difference at *P* value less than 0.05 using Mann–Whitney test.

between HBoV1 positive and negative groups according to clinical presentations using Mann–Whitney test.

Discussion

HBoV1 recently was identified as a novel virus that is one of the Parvoviridae family that has a single linear positive sense or negative sense single stranded deoxyribonucleic acid genome. It was detected in nasopharyngeal lavage, sera and blood samples of young children with respiratory tract infections and in fecal samples of patients infected with gastro-enteritis [11].

Acute respiratory tract infection is one of the prevalent pediatric diseases especially under 5 years [12]. In our study the median age of Bocavirus positive infants was 10 months which agreed with other study that recorded

Table 4 Statistical comparison between human Bocavirus 1 positive and negative groups according to clinical diagnosis

Clinical diagnosis	Total *N*=100	HBoV1 negative [*n* (%)]	HBoV1 positive [*n* (%)]	*P* value
Bronchiolitis	34	32 (94.1)	2 (5.9)	0.754
Bronchitis	28	26 (92.9)	2 (7.1)	
Bronchopneumonia	38	34 (89.5)	4 (10.5)	

HBoV1, human Bocavirus 1. *P* value more than 0.05 is insignificant, using Mann–Whitney test.

Table 5 Statistical comparison between human Bocavirus 1 positive and negative groups as regards demographic data

	HBoV negative	HBoV positive	*P* value
Age/months [median (range)]	7 (1.1–24)	10 (1.2–24)	0.674
	n (%)	*n* (%)	
Sex			
Male	50 (94.3)	3 (5.7)	0.469
Female	42 (89.4)	5 (10.6)	
Residence			
Urban	59 (90.5)	6 (9.5)	0.794
Rural	33 (93.9)	2 (6.1)	
Passive smoking			
Yes	55 (91.7)	5 (8.3)	1.000
No	37 (92.5)	3 (7.5)	

HBoV, human Bocavirus. *P* value more than 0.05 is insignificant.

Table 6 Statistical comparison between human Bocavirus 1 positive and negative groups as regards medical history

Medical history	HBoV negative [*n* (%)]	HBoV positive [*n* (%)]	*P* value
Prenatal illness			
Negative	15 (88.2)	2 (11.8)	0.530
Positive	77 (92.8)	6 (7.2)	
Natal complication			
Normal	29 (87.9)	4 (12.1)	0.286
C/S	63 (94)	4 (6)	
NICU admission			
Yes	23 (92)	2 (8)	1.000
No	69 (92)	6 (8)	
Obligatory vaccination			
Positive	84 (92.3)	7 (7.7)	0.718
Negative	8 (88.9)	1 (11.1)	
Recurrent ALRTI			
Positive	32 (88.9)	4 (11.1)	0.390
Negative	60 (93.8)	4 (6.3)	

HBoV, human Bocavirus. *P value* more than 0.05 is insignificant, using Mann–Whitney test.

Table 7 Statistical comparison between human Bocavirus 1 positive and negative groups according to clinical presentations

Clinical presentations	HBoV1 negative [*n* (%)]	HBoV1 positive [*n* (%)]	*P* value
Cough			
Yes	85 (91.4)	8 (8.6)	0.419
No	7 (100)	0	
Dyspnea			
Yes	83 (93.3)	6 (6.7)	0.187
No	9 (81.8)	2 (18.2)	
Refusal of feeding			
Yes	65 (91.5)	6 (8.5)	0.795
No	27 (92.9)	2 (7.1)	
Irritability			
Yes	42 (93.3)	3 (6.7)	0.727
No	50 (90.9)	5 (9.1)	
Poor activity			
Yes	21 (95.5)	1 (4.5)	0.499
No	71 (91)	7 (9)	
Diarrhea			
Yes	26 (89.7)	3 (10.3)	0.581
No	66 (93)	5 (7)	
Cyanosis			
Yes	3 (100)	0	1.000
No	89 (91.8)	8 (8.2)	
Radiograph			
Normal	8 (80)	2 (20)	0.446
Abnormal	40 (88.9)	5 (11.1)	

HBoV, human Bocavirus. *P* value more than 0.05 is insignificant, using Mann–Whitney test.

the same age [13]. In contrast with other research which reported higher median age 14 months and this can be explained by different sample size [14].

The higher rate of lower respiratory tract infection among infants may be ascribed to immature immunity, and due to the fact that the children usually exposed to a greater load of viruses which associated with living circumstances such as crowding. Moreover, parental anxiety is more for the young infants leading to early health care consultation in the course of disease [14–16].

In our study males with respiratory tract infection were 53% while females were 47%. The slight predominance of males over females among children with respiratory illness was endorsed by other researchers [13] who represented 57.4, 54.5% males, respectively, among their studied cases. The higher rate of respiratory tract infection among males due to biological variations between males and females primarily due to sex hormones. Hormones like steroids is responsible for the arrangement of actions through the stimulation of the immune system. The X chromosome is partially controlling the hyperresponsiveness of the immune system in females. As females have two X chromosomes, inherited one chromosome from each parent, while males have one X chromosome inherited from the mother and one Y chromosome from the father. To prevent paired quantity of proteins in females, one of the X chromosomes is at random silenced during X chromosome inactivation that happens in the earliest embryogenesis in females. The X chromosome inactivation result in a female, around half of the cells express genes resulting from the mother X chromosome and the other half express genes from the father X chromosome. Therefore, detrimental alterations that appear in an X chromosome-related gene will end in protein loss in all cells in a male but in only half of cells in a female. The X chromosome has various genes which, directly or indirectly, are implicated in immunity [17,18].

In contrast, some researcher reported no significant difference between males and females [19]. Moreover, females were more susceptible to respiratory infection in other researches [20]. According to HBoV1 positive cases we found that the females are more susceptible to infection.

A percentage of 63% of our respiratory infection cases were urban populations while 37% were living in rural areas. This is in agreement with other researcher who conducted a study aimed to identify the prevalence of respiratory tract in Egypt and reported that children living in urban areas had a higher rate of respiratory infection events than children living in rural areas

which is assumed to be linked to distance from medical facilities [21]. In contrast to our finding the rate of viral infection was higher in rural patients than urban patients in some research, we reported that the rate of viral infection was higher in urban patients than rural patients [22].

Bronchopneumonia was the predominant clinical diagnosis in the present study (38%), while 34% of patients were diagnosed with bronchiolitis. Clinical diagnosis was variant in other researches between bronchiolitis and pneumonia [23] but the predominant was bronchiolitis as it was reported in 75 and 27% of cases in previous researches [24–26].

Multiplex PCR helped different labs to identify a group of viruses concurrently while timesaving and with more analytical sensitivity. There are numerous complex assays assessed for respiratory viruses' identification [27].

As HBoV first identified in 2005, it has been discovered commonly all over the world in respirational samples, with a prevalence between 5 to 19% [28,29]. In the present study, HBoV1 was detected in eight (8%) cases of 100 nasal swabs. Although, we found lower percentage than two previous studies in Egyptian studies [30,31] who reported that HBoV1 was discovered in 56.8 and 22%, correspondingly, as well the results of other studies which found a 17.7% [32]. This wide range of percentage is contributed to the different age groups, using different diagnostic methods, different study periods and different sample size.

Previously some studies had detected HBoV1 DNA by PCR methods in nasal and pharyngeal samples between 5.7 and 7% in children with respiratory tract infection [6,33,34]. This variation is assumed because of climates changes and several factors affecting each country's respiratory infections prevalence. In our study, the HBoV1 infections peak happened through January 3/8 (37.5%) followed by April and July (25%) and least incidence in March 1/8 (12.5%), similar finding had been reported by other studies [31,35] which reported that HBoV positive cases occurred during late fall and winter.

Our results revealed that patients age ranged from 1.1 to 24 month with mean age 10.5±8.2 months which agreed with Meligy *et al.* [24] who was work on detection of viral respiratory tract infection in infant by PCR and found that age ranged from 1 to 30 months and mean 9±7.92 months. The higher rate of lower respiratory tract infection among infants and young children can be explained by underdeveloped immune system, and a higher load of the infectious agent associated with living conditions such as crowding. Furthermore, the parents of younger children may seek healthcare earlier in the course of disease due to parental anxiety [36,37]. In our study the median age of positive cases of HBoV1 was 10 months which agreed with other studies [23,38].

Regarding dietetic history HBoV1 was detected 4/8 (8%) in bottle fed infants and the infection rate of HBoV1 between different patterns of feeding was statistically insignificant ($P>0.05$) which were in accordance with previous studies [22].

Concerning the clinical presentation of HBoV1 positive cases, all positive cases presented with cough which agreed with previous studies who reported cough in 69% up to 97.9% of patients [31,38] reported cough in 69.9% of patients and. Our results demonstrated that there were no significant statistical differences between positive and negative groups as regard tachypnea, dyspnea, and refusal of feeding. On contrary, in the same research [38] authors reported that patients with high virus load were more likely the patients who presented by tachypnea, wheeze, and or dyspnea.

In the current study, we found that comparison between negative and positive groups as regards sex shows no statistically significant difference and female were more than males in positive group. This is in agreement with a study carried out in Saudi Arabia by Abdel-Moneim *et al.* [39], where they found slightly more females were infected compared to males, and Bharaj *et al.* [40] and EL-Mosallamy *et al.* [22], where both males and females were equally affected by HBoV1. In UK, studies reported that the distribution of HBoV among females and males was not significantly different from the distribution of females and males in the entire cohort which was 53 and 47%, respectively [41,42].

As regards residence, 63% of the studied cases were urban inhabitants while 37% were rural inhabitants. This result is in agreement with the study by other study [43] in which the prevalence of respiratory tract infection in Egyptian children was investigated and it was reported that urban children had a higher rate of respiratory episodes than rural children which is owed to the limited health services and hospital facilities. In our study, the rate of viral infection was higher in urban patients than rural patients in contrast to EL-Mosallamy *et al.* [22] who found that the rate of viral infection was higher in rural patients than urban patients. While, by comparison HBoV1 positive and negative cases regarding our study did

not report any significant difference and this can be explained by the small positive cases.

It is well studied that exposure to environmental tobacco smoke is an important modifiable risk factor for child hospitalization due to respiratory tract infection [44] but still results are conflicting. Our results revealed that 59% of studied infants were exposed to passive smoking [45]. Some studies confirmed that exposure to passive smoking, in particular maternal smoking, causes a statistically significant increase in the risk of developing lower respiratory infections in the first 2 years of life which did not agree with other studies who failed to report an association between the presence of smokers in the house and severe respiratory tract infection [46,47]. This is in agreement with our study as we did not report any significant difference between HBoV1 positive and negative cases.

Diarrhea was detected in positive cases in a percentage of 10.3% from all cases in our study, this is in contrast to a study which was conducted on children present by gastroenteritis [33] where diarrhea observed in 100% of cases. This discrepancy is owed to different study designs and type of patient. In our cases, although we studied a respiratory infection case only and we did not study diarrheic patients, but it was documented previously by other researcher that there is a positive correlation between detection of HBoV and diagnosis of respiratory disease in diarrheic children [48].

Regarding clinical presentation of HBoV positive cases, all positive cases presented with cough which agreed with Jiang *et al*. [38], who reported cough in 97.9% of patients. Our results showed that insignificant statistical differences were reported between positive and negative groups as regard tachypnea, dyspnea, and refusal of feeding. On contrary, it was reported the patients who had wheeze and tachypnea/dyspnea at presentation were more strongly related to the patients with high virus load [38].

According to abnormal chest radiographs (hyperinflation, increase bronchovascular marking, and heterogonous opacifications in both lung fields), 11.1% of patients who showed abnormal radiograph were positive for HBoV1. On contrary, other researchers were reported that 47% of patients had an infiltrate in radiograph [49,50].

Although HBoV1 is mainly causing respiratory infection and is less common to cause gastroenteritis but the environmental source of infection was studied. Waterborne transmission was studied [51] and a high incidence of HBoV1 in sewage samples was detected which delivered evidence of its rotation in the local population. Moreover, other study [52] found even though there is no suggestion of water-borne transmission for HBoV1, the significant presence in sewage waters contribute that HBoV1can be transmitted to other water environments. So, a possible role of water transmission in the HBoV1 circulation should not be ignored in the present study. In our study all positive cases gave the history of drinking house tab water, while the role of HBoV in respiratory or gastrointestinal infections remains to be completely explained, the risk of infection via polluted water should be taken into consideration.

Conclusion and recommendation

The prevalence of HBoV1 was 8% among the Egyptian infants aged from 4 weeks to 2 years with acute lower respiratory tract infection. The peak of the infection was in winter. HBoV1 infection may be considered as a risk factor for respiratory tract infection in children less than 2 years old. However, a limitation of this study was that current results cannot be extrapolated to the entire population of Egyptian children as it included two hospitals and one government only in Egypt. Thus, we recommend further studies with a larger sample size on larger age scales and different governorates.

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Conflicts of interest

There are no conflicts of interest.

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