Prevalence of Respiratory Syncytial Virus (RSV) Antibodies among Infants and Young Children with Acute Respiratory Tract Infections

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ABSTRACT

A consecutive study was performed during the period from November 1988 to December 1990 on 117 infants and young children with acute respiratory tract infections. Respiratory Syncytial Virus (RSV) antibodies were detected in 56.4% by Enzyme-linked Immunosorbent Assay (ELISA) with varying amounts of antibodies in the positive sera. The highest rates of RSV antibody were detected among age groups 13-18 and 19-24 months. There were no marked differences in RSV antibody between male and female. There was also no difference between rural or urban patients. The rates of RSV antibodies were almost the same in children with or without previous history of respiratory tract infections. The majority of patients with high titers of RSV antibodies were provisionally diagnosed as bronchopneumonia. Patients with radiological findings suggestive of respiratory infections had higher titres than those with negative X-ray findings. The majority of cases with RSV antibody were mainly detected during the cold season. There was an evidence of protection among breast-fed children.

RSV is a wide spread cause of lower respiratory tract infections such as bronchitis and pneumonia in infants and young children, and it is an agent of considerable epidemiological importance[5,15,17].

Acute bronchiolitis and bronchopneumonia tend to occur in well-marked epidemic waves and to be caused mainly by RSV[6,7,16]. The youngest infants, those under one month old, shed more RSV than older children[7,10]. There is some evidence that breast-feeding gives some protection against RSV infections in infants[11,18].

Several reports have analysed the extent of RSV infections in various populations in America and Europe by detecting RSV antibodies in the sera of patients and volunteers[7,14,15]. A number of assays have been used for this detection including neutralisation, complement-fixation, haemagglutination-inhibition test and radioimmunoassay.

The number of subjects with significant RSV antibodies in their sera varied considerably depending on the population studied, time of assay, assay system used and method used to determine significant levels of antibody[7,14].

Since antiviral agents are now available, rapid viral diagnosis can aid in the treatment during the course of infection[13]. In this study, RSV antigen was used in an Enzyme-linked Immunosorbent Assay (ELISA) to measure the antibodies to this virus in the sera collected from infants and young children. The distribution of these antibodies and their correlation to various relevant variables are described. The importance of the results is discussed.

METHODS

Patients: A consecutive study was performed on 117 patients and young children less than three years of age (ranged from one day to 36 months) with acute respiratory

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Table 1
Distribution of RSV-antibody in relation to age groups and type of residence

Age Groups (months)	*Residence*				*Total*	
	Rural		*Urban*		*+/T*	*%*
	No.	*%*	*No.*	*%*		
1 day – 6 mths	8/11*	72.7	22/47	47.0	30/58	52.0
7 – 12	5/8	63.0	12/23	52.0	17/31	55.0
13 – 18	2/3	67.0	6/7	87.0	8/10	80.0
19 – 24	2/3	67.0	5/6	83.0	7/9	78.0
25 – 30	0/1	0.0	1/2	50.0	1/3	33.0
31 – 36	0/2	0.0	3/4	75.0	3/6	50.0

tract infections (RTI) during the period from November 1988 to December 1990. The patients were from the paediatric wards at Basrah General Hospital who have been hospitalised or attending the hospital due to RTI. Symptoms and clinical findings were recorded on a standard questionnaire form. Of the 117 patients, 84 (71.8%) were males and 33 (28.2%) were females. A control group of 85 children of similar age who have no symptoms or a recent history of RTI were included at the same intervals during the study period. Sera were collected from the patients and stored at –20°C before testing using ELISA method by Behring Laboratories.

RESULTS

Figure 1 shows that 56.4% of children with acute RTI contained a wide range of serum RSV antibody in the positive sera.

The peaks of RSV antibody detection was seen among age groups of 13-18 months (80%) and 19-24 months (77.8%) although lower age groups also showed relatively high values (Table 1). The rates of RSV antibody detection decreased in older age groups. There were no marked differences in RSV antibody detection between rural (60.7%) and Urban (55%) children. There was a slight difference in the presence of RSV antibody between children with previous history of respiratory tract infections (59.2%) and children with ho history of RTI (54.4%). Similarly, there was no difference in RSV antibody in relation to patient's sex (Table 2).

Most children with relatively high titers of RSV antibodies (69%) showed positive chest x-ray findings (Table 3). The majority of clinical cases were provisionally diagnosed as bronchopneumonia (31.6%) from whom 70.3% were positive for RSV antibodies. Although there were varying amounts of RSV antibody in various clinical

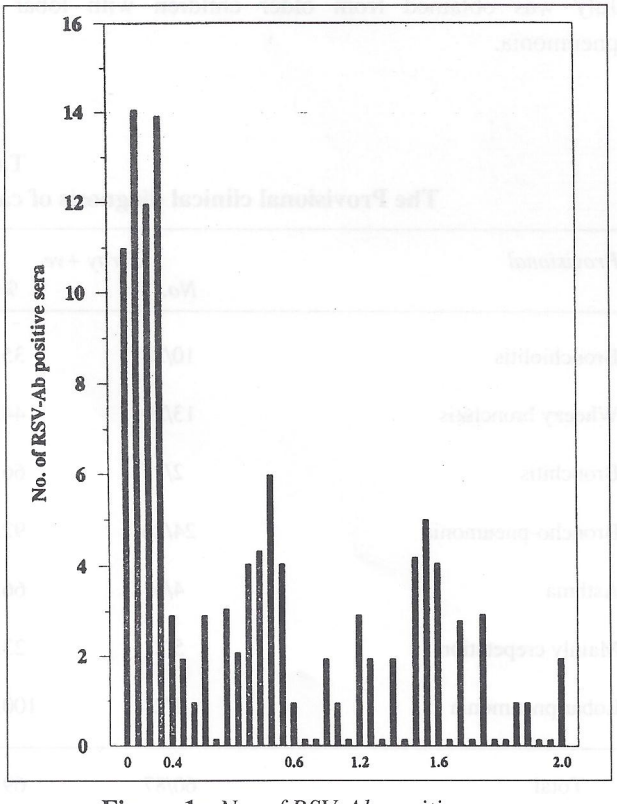

Figure 1: *No. of RSV-Ab positive sera*

Table 2
Distribution of RSV-antibody in relation to sex and previous history of respiratory tract infections (RTI)

Patients group	*Male*		*Female*		*Total*	
	+/T	*%*	*+/T*	*%*	*+/T*	*%*
Children with history of RTI	22/34	64.7	7/15	46.7	29/49	59.2
Children with no history of RTI	26/50	52.0	11/18	61.1	37/68	54.4
Total	48/84	57.1	18/33	54.5	66/117	56.4

presentations, there was a marginal increase of RSV antibody in patients diagnosed as bronchopneumonia, bronchiolitis, lobar pneumonia and asthma.

There was a marked reduction in the detection rate of RSV antibody among breast-fed children (25.5%) compared to bottle fed (82.2%) or combined-fed (68%) children (Table 4). The seasonal distribution of RSV antibodies in infants and young children with RTI is shown in Figure 2. The highest rate of RSV antibody detection was recovered during the winter season. Exceptionally, a rate of 20% recovered during July was obtained from older children with lobar pneumonia.

DISCUSSION

Previous studies have shown a wide spread prevalence of RSV antibodies among population with variable titres reported depended on the population studied and season of sample collection[3,7,8,14,15]. Prevalence of 56.4% was shown in children less than three years of age with acute respiratory tract infections, and this is consistent with the reported figures from other studies[14,15]. However, a prevalence of RSV antibodies higher than this figure was also reported by others[3,7]. This variation probably does not reflect significant differences in the antibody prevalence in these populations rather the sensitivity of the test used in the detection of antibodies like complement

Table 3
The Provisional clinical diagnosis of cases with RTI in relation to X-ray findings

Provisional	*X-ray +ve*		*X-ray -ve*		*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*
Bronchiolitis	10/28	35.7	0/2	0.0	10/30	33.3
Wheezy bronchitis	13/29	44.8	1/4	25.0	14/33	42.2
Bronchitis	2/3	66.7	0/1	0.0	2/4	50.0
Broncho-pneumonia	24/26	92.3	2/11	18.2	26/37	70.3
Asthma	4/6	66.7	0/2	0.0	4/8	50.0
Mainly crepetation	5/21	23.8	2/8	25.0	7/29	24.0
Lobar pneumonia	2/2	100.0	1/2	50.0	3/4	75.0
Total	60/87	69.0	6/30	20.0	66/117	56.4

Table 4
Impact of feeding practice on the prevalence of RSV-antibody

Type of feeding	*Rural*		*Urban*		*Total*	
	No.	*%*	*No.*	*%*	*No.*	*%*
Breast	6/14	42.9	6/33	18.2	12/47	25.5
Bottle	6/7	85.7	31/38	81.6	37/45	82.2
Combined	5/7	71.4	12/18	66.7	17/25	68.0
Total	17/28	60.7	49/89	55.0	66/117	56.4

fixation (CF), neutralisation test (Nt) or haemagglutination-inhibition (HAI) test. The ELISA method used in the study is more sensitive in the detection of antibodies of respiratory viruses than other assays used previously[3,12]. The presence of single raised or stable high antibody titer to RSV was common in all groups in the study. Nevertheless, some of the symptomatic patients particularly those with high titers of RSV antibody may represent very recent RSV infection whereas the acute rise in antibody titer was missed because of the delay by the patient in entering the study. These findings are similar to those of Beem's study in children[1]. However, since so many individuals in the community have antibodies to RSV we are unable to claim that a high RSV antibody titer together with fever and respiratory illness necessarily represent an acute RSV infection as has been previously suggested[4].

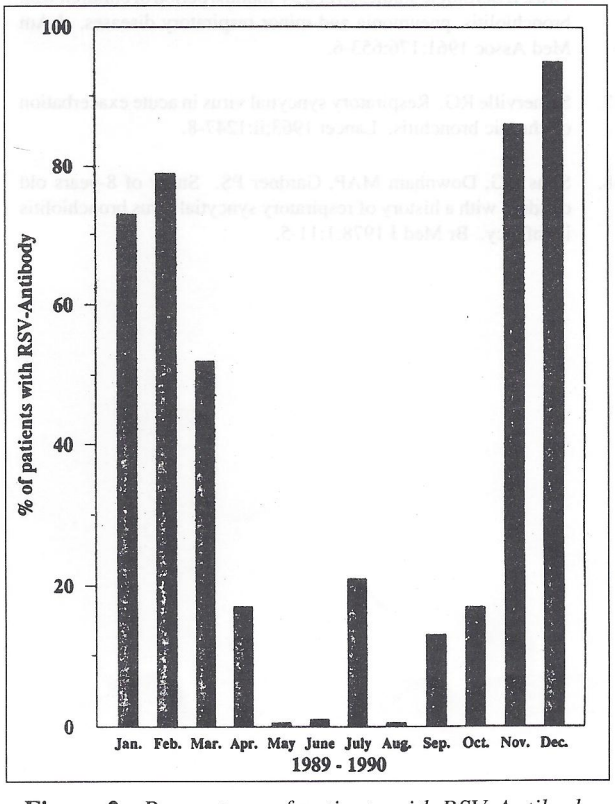

Figure 2: *Percentage of patients with RSV-Antibody*

Infections with RSV occurs in almost all children during the first five years of life and about one third of the infections occur in the first year[2,3]. The youngest infants, those under one month old, are reported to shed more RSV than older children, while in this study, the peak of RSV antibody recovery was obtained from older age groups which may reflect the previous experience of RSV infections[2,7,10]. There were no marked differences in the presence of antibody among children with or without previous history of RTI although frequent reinfection with RSV occurring in all age groups may explain the mild occurrence of RSV clinical infections in young adults[3,7,14,15]. However, reinfection in the presence of relatively high titers of RSV antibody was also reported from other studies[3,7,14].

Other reported only 16.6% of individuals with RSV infections with positive radiological changes compared to 69% in our study[15]. The most distinctive diseases associated with primary RSV infections are bronchiolitis, pneumonia, croup and trachiobronchiolitis[3]. However, the results obtained from this study showed that the majority of patients with RSV antibody were provisionally diagnosed as bronchopneumonia and there were a significant number of them with asthma which is consistent with the above findings. Reported observations suggest association of RSV bronchiolitis in infancy and respiratory infections in later life, may be attributed to environmental rather than any other influence[7,18]. There were no marked differences in RSV infections between urban and rural children in this study which is in contrast with the results reported

from other studies where the rates of RSV infections and hospitalisation is more frequent among urban than rural children[2,9,18]. Most of RSV antibody positive cases were recovered during the cold season which is in agreement with reported observations from other areas[7,17]. However, cases of RSV infections was also detected in warmer climates which appear in a pattern of circulation characterised by epidemic outbreaks during certain season[3,14].

Breast feeding gave some protection against RSV infections in our patients. This trend was also shown by other studies[3,7,11,14].

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