SEROPREVALENCE OF ANTI-RESPIRATORY SYNCYTIAL VIRUS ANTIBODIES IN HOSPITALIZED PATIENTS WITH ACUTE RESPIRATORY TRACT INFECTIONS IN SULAIMANI GOVERNORATE/ IRAQ

Tariq A. G. Aziz* and Ali Hattem Hussain**
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ABSTRACT

Background

Respiratory syncytial virus (RSV) is a major respiratory pathogen among children, and it is a leading cause of bronchiolitis and pneumonia among hospitalized children.

Objectives

To measure the seroprevalence of anti-RSV antibodies among hospitalized children presenting with acute respiratory tract infections in Sulaimani Governorate, Kurdistan/Iraq.

Methods

ELISA technique was used to detect serum anti-RSV antibodies (IgM and IgG antibodies) from 300 hospitalized children less than 5 years old with a diagnosis of acute respiratory tract infections.

Results

IgM anti-RSV was positive in 61 (20.3%) out of 300 children. The highest seroprevalence was found in the age group 1 to < 2 years, while the lowest in the age group 2 to < 3 years. No significant gender difference was found among seropositive children. The IgM anti – RSV seropositive children were suffering from bronchiolitis, pneumonia, or other respiratory tract infections in a frequency of 29 (47.5%), 15 (24.6%), and 17 (27.9%). The IgG anti-RSV antibodies were positive in 216 (72%) out of the 300 children, and there was a gradual increase in percentage of seropositivity with increasing age.

Conclusion

RSV is a common viral respiratory pathogen among hospitalized children in Sulaimani governorate/ Kurdistan/Iraq, and most of the children had experienced RSV infection by the age of five years.

Keywords: *Respiratory syncytial virus*, *hospitalized children*, *Sulaimani Governorate*, *ELISA technique*.

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* Department of Microbiology, School of Medicine, Faculty of Medical Sciences, University of Sulaimani
** Sulaimani Technical College, Sulaimani Polytechnic University. Correspondence: dralihattem@yahoo.com

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INTRODUCTION

Respiratory syncytial virus (RSV) is a major respiratory pathogen among children and it is a leading cause of bronchiolitis and pneumonia among hospitalized children. RSV is a member of Paramyxoviridae, subfamily Pneumovirus. Approximately 0.5% to 2.0% of all children are hospitalized with lower respiratory tract disease, of which 50% to 90% have bronchiolitis and 5% to 40% have pneumonia [(1)].

Both humoral and cellular immune responses are involved in immunity against RSV infection. The humoral immune response is obvious from the therapeutic effect of passive administration of immunoglobulin to patients infected with RSV. The cytotoxic T-lymphocyte (CTL) response plays an important role in the control of respiratory syncytial virus replication [(2)] and the establishment of a Th1-CD4+ T cell response against the virus [(3)].

The burden of diseases due to RSV was determined and it was estimated that 33·8 million new episodes of RSV-associated acute lower respiratory infection (ALRI) occurred worldwide in children younger than 5 years annually, with at least 3·4 million episodes representing severe RSV-associated ALRI necessitating hospital admission. It is estimated that 66.000–199.000 children younger than 5 years died from RSV-associated ALRI in 2005, with 99% of these deaths occurring in developing countries; however, incidence and mortality can vary substantially from year to year in any one setting [(4)].

There is no previous data about RSV seroprevalence in Kurdistan Region / Iraq, thus measuring the seroprevalence of RSV among children will help in determining the magnitude of RSV infections in Kurdistan Region of Iraq and designing measures to control and prevent this respiratory viral pathogen.

MATERIALS AND METHODS

This study involved 300 hospitalized children, less than five years of age and they were admitted to Pediatric Teaching Hospital in Sulaimani city due to respiratory tract infections of undiagnosed etiology. Both sexes were included and were chosen by systematic random sampling, 193 of children were males and 107 were females. Exclusion criteria included children aged equal or more than five years and children admitted for causes other than acute respiratory tract infections whatever the cause of admission. The parents or the children's accompanying had signed an informed – consent giving permission to use the sera of their children in this study.

All sera were tested for IgG anti-RSV antibodies using Enzyme linked immunosorbent assay (ELISA) kits (Euroimmun Company/Germany) and sera were also tested for IgM anti-RSV antibodies using ELISA kits from the same company. The duration of sample collection extended for one year between April 2011 and March 2012.

The Statistical Package for Social Science (SPSS, Chicago, II, USA), version 16 was used for data entry and analysis. Chi-square test (X^2) and Fisher's exact test were used to test the association between categorical variables. P value of ≤ 0.05 was considered as statistically significant.

RESULTS

The seroprevalence of IgM antibodies specific to RSV in the study group showed that 61 (20.3%) out of 300 children were positive, and positivity according to age group was 66.6 % in age group < 1 year, 85.2% in age group 1 to < 2 years, 53.8% in age group 2 to < 3 years, 66.6 % in age group 3 to < 4 years, and 78.5 % in age group 4 to < 5 years. The highest seroprevalence was found in the age group 1 to < 2 years, while the lowest in the age group 2 to < 3 years, the results were statistically significant (P <0.05), figure 1. There was no correlation between the number of patients with IgM seropositivity and the age group (r = 0.067).

Out of the 61 IgM anti–RSV seropositive children, 39 (64%) were males and 22 (36%) were females, the male to female ratio was 1.8:1; while for the 239 seronegative children, 148 (61.9%) were males and 91 (38.1%) were females; the differences in gender between the two groups were not statistically significant (p = 0.084).

The IgM anti–RSV seropositive children were suffering from bronchiolitis, pneumonia, or other respiratory tract infections in a frequency of 29 (47.5%), 15 (24.6%), and 17 (27.9%), while the remaining 239 IgM anti – RSV seronegative children were diagnosed as suffering from the same diseases in frequencies of 50 (20.9%), 66 (27.6%), and 123 (51.5%) respectively, these

results were statistically significant (P value < 0.05), table 1.

Measurement of IgG anti-RSV antibodies seroprevalence revealed that 216 (72%) out of 300 hospitalized patients had positive titers, while the remaining 84 (28%) were IgG seronegative. The results are illustrated in figure 2.

The IgG anti-RSV antibodies among different age groups showed that seropositivity was present in 73.8% in age group < 1 year old, 79.2% in age group 1 to < 2 years, 84.7% in age group 2 to < 3 years, 88.5% in age group 3 to < 4 years, and 100% in age group 4 to < 5 years. The highest seroprevalence is found in the age group 4 to < 5 years, while the lowest in the age group < 1 years, the results among age groups were not statistically significant (P = 0.2059); figure 3.

The results clarified the presence of gradual increase in the percentage of children with positive IgG anti-RSV antibodies in study group, these results are shown in figure 4.

Fifty four out of 61 IgM seropositive showed IgG seropositivity, while the remaining 7 IgM seropositive children were IgG seronegative table 2.

Table 1. The frequency of respiratory infections among seropositive and seronegative IgM anti-RSV antibodies in patients enrolled in the study.

	Frequency (Percentage)		
	Pneumonia	**Bronchiolitis**	**Other acute respiratory infection**
IgM Anti-RSV seropositive Children	15 (24.6%),	29 (47.5%),	17 (27.9%)
IgM Anti-RSV seronegative children	66 (27.6%),	50 (20.9%),	123 (51.5%)

Figure 1. Seroprevalence of IgM anti-RSV antibodies among different age groups of hospitalized children with respiratory tract infections.

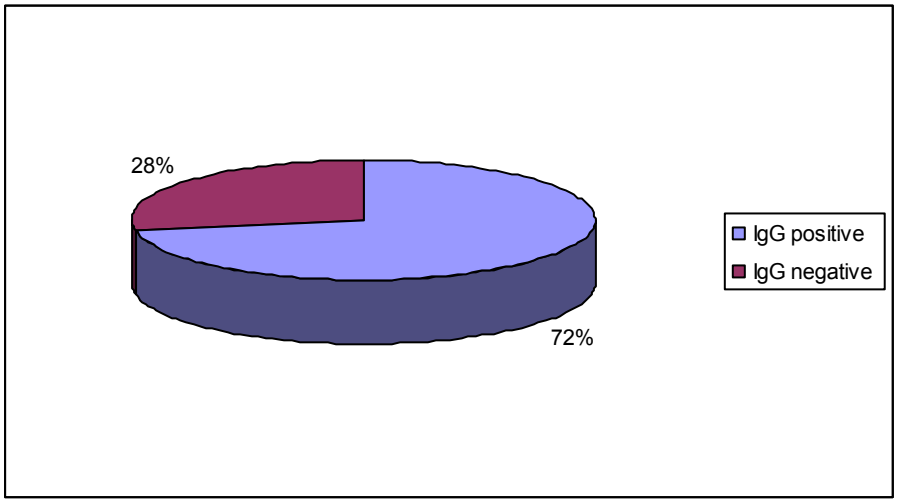

Figure 2. Seroprevalence of IgG anti-RSV antibodies among patients enrolled in the study.

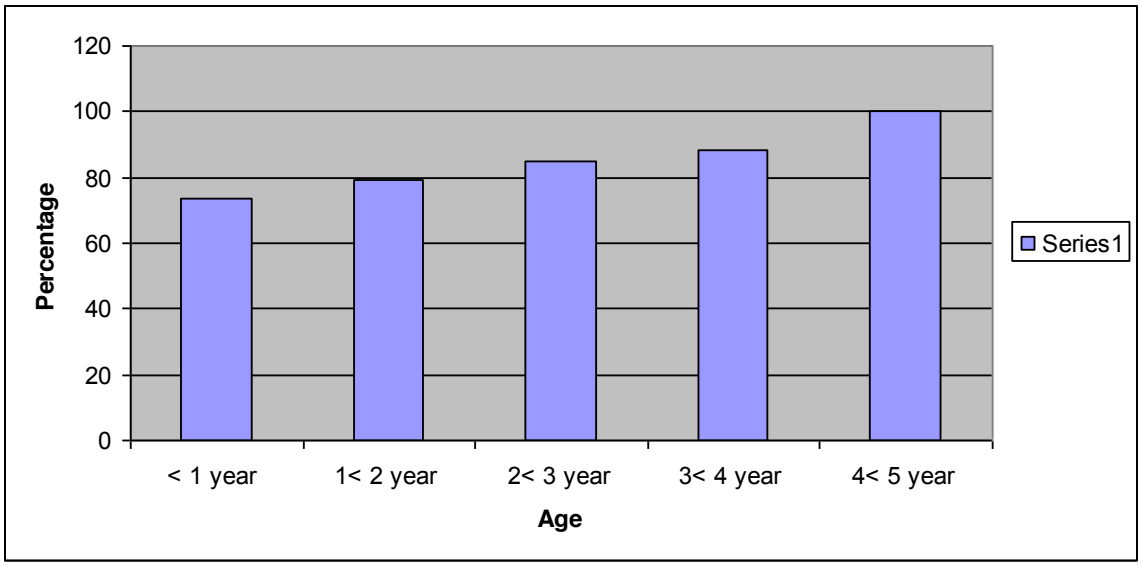

Figure 3. Seroprevalence of IgG anti-RSV antibodies among different age groups of patients enrolled in the study.

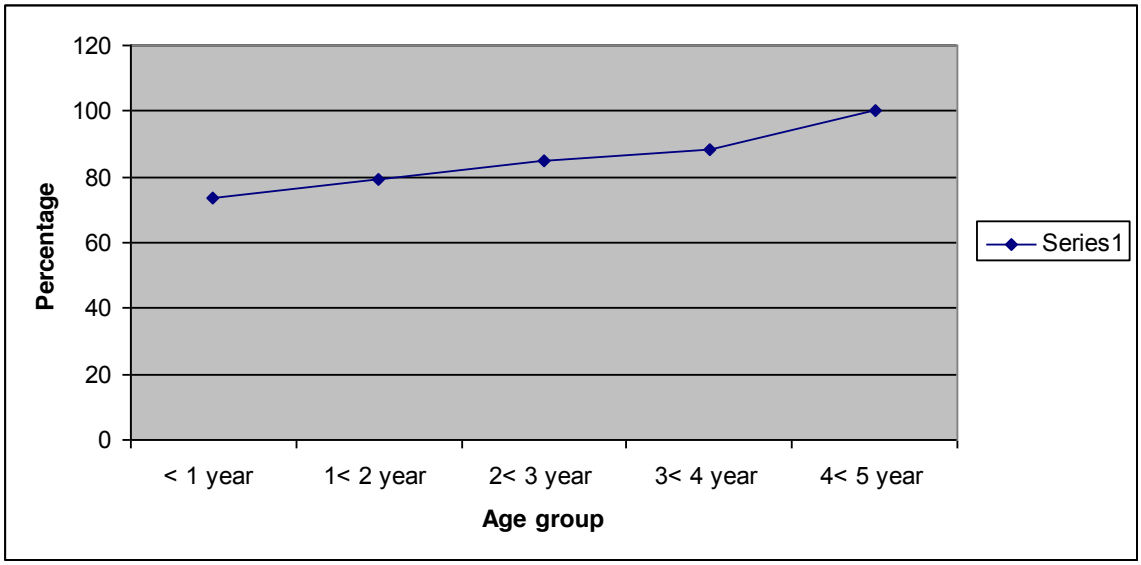

Figure 4. Percentage of positive IgG anti-RSV antibodies among hospitalized children in different age groups.

Table 2. The seropositivity of IgM and IgG anti-RSV antibodies in patients enrolled in the study.

Antibodies	Frequency	(%)
Only IgM	7	2.3
Only IgG	162	54
IgM and IgG	54	18
Total IgM	61	20.3
Total IgG	216	72

DISCUSSION

The presence of IgM anti-RSV seropositivity in nearly fifth of children who were hospitalized due to acute respiratory tract infections indicates that RSV is an important respiratory viral pathogen among hospitalized children. Few papers reported the use of IgM anti-RSV antibodies as diagnostic markers although other molecular and antigen detection methods are available and more sensitive than serological techniques [5, 6]. N. Vaesano, *et al*. also used the ELISA technique for detection of IgM anti-RSV antibodies and they showed that serological technique can be used as a diagnostic technique after the onset of symptoms [7]. While Popow-Kraupp, T. and J. H. Aberle reported that screening for RSV-specific antibodies is mostly performed for epidemiological and research purposes [8]. There is a time needed for the rise in IgM antibody titer specific to RSV, thus infection with RSV occurred few days before hospital admission and the clinical features were mild at the beginning then progression in symptoms was behind the hospital admission. The results of the current study showed that IgM anti-RSV is an important diagnostic tool, and in absence of antigen or molecular detection methods IgM anti-RSV antibody detection might be an acceptable diagnostic method.

The highest IgM seroprevalence was in age group 1 to < 2 years. This result might reflect a decline in maternal neutralizing antibodies in the second year of age which pay attention to monitor hospitalized children with respiratory tract infection in this age group for RSV infections. Many other studies found that age group < 1 year is the risk group for RSV infections [9]. These differences might be due to different sample sizes selected in different studies or the more frequent use of breast feeding in Sulaimani Governorate which provides relatively more protective antibodies for infants in the first year of life.

Most of children with positive IgM anti-RSV antibodies were diagnosed as bronchiolitis and this result is in accordance to many other studies that found RSV as the main causative agent of bronchiolitis among hospitalized children [10].

IgG anti-RSV antibodies were investigated among all patients in this study and the total prevalence rate was 72%. This result is close to a previous study done in Baghdad/Iraq, in which 79% of infants with acute respiratory tract infections had positive titers of antibodies [11], though the patients in the previous study were limited to one year old infants, while in this study, 73.3% of the age group < 1 year old was IgG seropositive. In Iran, the neighboring country, IgG anti-RSV antibodies were also estimated, and the percentage of IgG anti-RSV antibodies among hospitalized children was 2% which is lower than results of the current study [12].

The 100% of IgG anti-RSV antibodies among age group 4 to < 5 years indicates high rate of previous infections with RSV, or in infants less than 1 year of age might be due to the transport of IgG anti-RSV antibodies from mothers to infants during intrauterine life. In a study performed by Hacímustafaoğlu *et al*., 83 % of the pregnant women as well as all the babies of these mothers were anti-RSV IgG positive [13]. Most other studies showed that RSV is still the main viral pathogen among hospitalized children with respiratory tract infection [14, 15].

The results clarified the presence of gradual increase in the percentage of children with positive IgG anti-RSV antibodies. This result reflects the cumulative increase in RSV infections with the increase in the age of children. In a study done in Thailand, Bhattarakosol P. et al found that the prevalence of IgG anti-RSV antibodies was increasing with age, lowest (11.76%) in age group 6 to 11 months and highest (100%) in age group 42 to 60 months; these findings are comparable to the results of this study [16].

Most IgM anti-RSV positive cases were also IgG anti-RSV positive, however, it is difficult to correlate between the two results as many IgM anti-RSV negative children were IgG anti-RSV positive, thus a second blood specimen should have been taken few weeks later to estimate the rise in IgG anti-RSV, but it was difficult to be done as all children enrolled in the study were discharged within one week from admission.

Seroprevalence of IgG anti-RSV antibodies was high among hospitalized children which reflects high incidence of infections with this virus, and detection of IgM anti-RSV antibodies might be an applicable parameter for the diagnosis of RSV infections. In Sulaimani governorate, the RSV infections occur mainly in children less than two years of age, and bronchiolitis was the main presenting disease due to RSV among hospitalized children.

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