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Prevalence of IgM and IgA Antibodies for the Respiratory Syncytial Virus in Infants and Young Children in Baghdad

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Abstract

Respiratory Syncytial Virus is the most common cause of acute viral bronchiolitis and pneumonia in infants and young children. This study is designed to examine the presence of anti-RSV IgM and IgA antibodies in infants and young children aged between 2 months up to 5 years old. ELISA was used to examine the levels of IgM and IgA antibodies in the serum samples from 90 individuals (60 are with respiratory symptoms and 30 healthy as controls). The results were analysed by systematically dividing those individuals into two groups according to their age and clinical status. The age groups included infant between 2 months and 1 year of age and young children between 2-5 years whereas the clinical grouping includes the severity of infection of those hospitalized with acute respiratory symptoms and /or with chest pain from two main children hospitals in Baghdad. ELISA results revealed that anti-RSV IgM levels were 80% and 72% for those with acute infection and those with chest pain, respectively, whereas the levels of IgA were 45% for both groups. On the other hand, the level of IgM for individuals from group I and group II of age distribution were 63% and 35%, respectively; while the levels of IgA were only 27% for group I and 8% for group II. This study showed that the level of IgM antibodies for RSV is indicative of early detection of viral infection and it is more likely to be associated with the onset of recent infection with RSV regardless of the severity of infection. By including another test together with IgM detection may significantly improve early detection of RSV infections. These results may contribute for better understanding for the prevalence of RSV among infants and young children as well as the status of respiratory infection with RSV in children from Baghdad areas which may eventually lead to better rationale for the unnecessary prescription of antibiotics in community.

Keywords: RSV, respiratory infection, bronchiolitis, ELISA, IgM, IgA, children.

انتشار الاجسام المضادة المناعية IgM وال IgA لفايرس المخلوي التنفسي Respiratory Syncytial Virus في الاطفال الصغار والرضع في بغداد

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الخلاصة:

فايروس المخلوي التنفسي Respiratory Syncytial Virus (RSV) هو الأكثر شيوعا في اصابات التهاب القصيبات الفيروسي الحاد والالتهاب الرئوي عند الرضع والأطفال الصغار. صُممت هذه الدراسة لفحص وجود الاجسام المضادة IgM و IgA ضد فايروس RSV عند الرضع والأطفال الصغار الذين تتراوح أعمارهم بين 2 أشهر وحتى 5 سنوات من العمر. تم استخدام فحص ELISA لقياس مستويات الأجسام المضادة (غلوبولينات) المناعية في عينات مصل الدم من 90 طفلاً، من بينهم 30 طفل غير مصاب كسيطرة ،وقد تم تحليل النتائج وفقا لتقسيم منهجي لهؤلاء الأفراد إلى مجموعتين وفقا للأعمار والأعراض السريرية. وشملت الفئات العمرية الرضع بين 2 شهر – 1 سنة من العمر والأطفال الذين تتراوح أعمارهم بين 2–5 سنوات في حين شملت الاعراض السريرية شدة العدوى من الذين نقلوا الى المستشفيات يعانون من أعراض الجهاز التنفسي الحاد و/أو آلام في الصدر في اثنين من المستشفيات الرئيسة في بغداد. كشفت نتائج ELISA أن الاجسام المضادة لفايروس RSV IgM للمرضى بأعراض حادة هو 80% ولذوي آلام الصدر 72%، اما مستويات IgA فكانت 45% لكلا الحالتين السريريتين. اما قياس مستويات الاجسام المضادة حسب التوزيع العمري IgM فكانت 63٪ من المجموعة الأولى و 35٪ من المجموعة الثانية ، و مستويات IgA كانت 27٪ فقط من المجموعة الأولى و 8٪ من المجموعة العمرية الثانية. تظهر الدراسة مستويات عالية للأجسام المضادة IgM لفايروس RSV لكل المجاميع قيد الدراسةونسبة أقل لـ IgA مما يدل على الكشف المبكر عن الأصابة الفيروسية حيث أنه من المرجح أن تترافق مستويات ارتفاعه مع بداية الإصابة الاولية بالفيروس RSV بغض النظر عن شدة الإصابة. يمكن أن تسهم هذه النتائج لفهم أفضل لأنتشار RSV بين الرضع والأطفال الصغار، وكذلك نسبة عدوى الجهاز التنفسي لفايروس RSV مما قد يؤدي أيضا إلى الأساس المنطقي لأفضل وصفة طبية من المضادات الحيوية غير الضرورية في المجتمع.

Introduction

Respiratory viral infection is known globally as a major cause of morbidity and mortality in infants and children. There are several viruses involved in the acute respiratory infections such as adenovirus, coronavirus, enterovirus, human metapneumovirus, influenza virus, parainfluenza virus, rhinovirus, and respiratory syncytial virus (RSV) [1,2]. Among these viruses, RSV is the most common cause of acute viral bronchiolitis and pneumonia in infants and young children [3,4]. RSV is a highly contagious virus that infects most children before their second birthday. It is associated worldwide with an annual mortality rate of 160,000-600,000 deaths [5,6]. About one-third of infants with respiratory viral infections develop lower respiratory tract symptoms such as tachypnea, wheeze, severe cough, breathlessness, and respiratory distress. This may be accompanied by clinical signs including dehydration, less urination and dry skin [7, 8, 1].

In Iraq the role of RSV is not well defined yet because of limited epidemiological investigations across the country. This study was undertaken to evaluate an ELISA to detect specific RSV-IgM and RSV-IgA using serum samples from individuals with clinically identified hospitalized infants and young children over a period of March to June 2013 into two main hospitals in Baghdad. The work is undergoing to test larger sample numbers from various areas of the country using a more sensitive techniques such as reverse transcription polymerase chain reaction (RT-PCR) for detection and typing of various strains of RSV in Iraq.

Materials and Methods

Infants and young children age ranged from 2 months up to 5 years old with acute respiratory infection and some had chest pain infections. Patients with respiratory infection symptoms were all hospitalized into two main children hospitals in Baghdad. Ninety samples (60 individuals with respiratory tract infection and 30 control children) were collected over four months from March to June of 2013. Patients were assessed by x-ray and flu-like symptoms such as runny nose, wheezing and fever. Therefore, the study was divided into two groups: the first group had acute respiratory infection and the second group had a confirmed chest pain respiratory infection. In addition, patients were divided for two groups according to their age as group I with an age range between 2 months and 2 years and group II of age ranged from 2 up to 5 years. Blood samples were collected and serum was separated to be analysed for the detection and quantitation of anti-RSV IgM and IgA antibodies by using an

indirect enzyme-linked immunosorbent assay (ELISA) assay following the manufacturer's instructions (kits were purchased from immunolab GmbH, Germany). Serum samples and controls were similarly diluted to 1/100 with normal saline.

Results and Discussion

Detection of anti-RSV antibodies of IgM and IgA were examined in infants of less than 2 years of age and in young children of age ranged between 2 to 5 years by using an indirect ELISA. Results of both antibodies were analysed as patients were divided into two main categories: clinical status of the respiratory infection Table-1 and according to their age stage Table-2.

Detection of anti-RSV IgM and IgA in group I with acute infection

In group I patients, 60 (plus 30 controls) serum samples collected from infants and children with acute respiratory symptoms or infections, 80% (48/60) were shown to be positive for anti-RSV IgM whereas 45% (27/60) were shown to be positive for IgA antibodies by using ELISA Table-1.

Detection of anti-RSV IgM and IgA antibodies in group-II with chest pain signs

For the second group, 72% (43/60) of patients were positive for IgM antibodies of RSV and 45% (27/60) were positive for anti-RSV IgA antibodies by using ELISA Table-1.

Prevalence of anti-RSV IgM and IgA according to age groups, irrespective of symptoms or clinical status

The recruited population was grouped into infants of less than 2 years old and the second age group of young children was ranged between 2 to 5 years old. The ELISA testing for the anti-RSV IgM revealed that 63% (38/60) from group I (with a median age of 1.5 years old) and 35% (21/60) from group II (with a median age of 2.5 years old) were positive. On the other hand, only 27% (16/60) from group I (with a median age of 9 months old) and 8%(5/60) from group II were positive for the RSV IgA antibodies. It worth noted that some individuals who showed positive for IgA (from group II) were also positive for IgM Table-2.Control children of similar age showed negligible to undetectable levels of IgM andIgA.

Table 1-Detection of anti-RSV IgM and IgA antibodies in children with acute respiratory infection and/or chest pain

Anti- RSV	Acute Respiratory Infection	Chest Pain	Controls
IgM	**80%**	**72%**	**N**
IgA	**45%**	**45%**	**N**

N= negative result with values are below the detectable levels of both IgM and IgA for control group.

Table 2-Prevalence of IgM and IgA anti-RSV antibodies in infants and young children according to their age group.

Anti- RSV	Group I 2 months-2 yr old	Group II 2 - 5 yr old	Controls
IgM	**64%**	**36%**	**N**
IgA	**27%**	**8%**	**N**

N= negative result with values are below the detectable levels of both IgM and IgA for control group of children from both age group.

In conclusion, this study showed that the level of IgM antibodies for RSV is indicative of early detection of viral infection. It is more likely to be associated with the onset of recent infection with RSV regardless of the severity of infection (acute infection or chest pain) or children's age. The detection of IgA anti RSV in general was lesser in its distribution particularly among infected young children (2-5 years old) but very much steady in either clinical conditions of infection Table-1. These results may contribute for better understanding for the prevalence of RSV among infants and young children as well as the status of respiratory infection [9]. These data need to be supported by using a more sensitive commonly available reverse transcription (RT)-PCR technique for detection of RSV RNA, although it may be not indicative for disease progression [10,11]. It is more important to recruit

a larger cohort of individuals from various categories of respiratory infection representing the geographic distribution and population scale of Baghdad larger city. It worth mentioning that in another study carried out on patients without respiratory infection and children with cancer showed 26% and 96% were positive for anti-RSV antibodies, respectively whereas 79% of infants with respiratory infection showed positive antibody response [12]. Results of this study of IgM and IgA secretion after RSV infection is very similar to those obtained by [13] who found that majority of children had an IgM response during the first month of infection while IgA detection appeared later in more than half of patients. Although it has not been stated which type of anti-RSV antibodies, the findings are similar to results obtained in this study of infants with respiratory infection but contradicts with results of secreted IgA in nasopharangeal aspirates of RSV infected infants in India[14] which it may be attributed to differences of samples sources and types of assays used.

With the intention of expanding this study to have a larger number of infants and young children we may be able to better understand the epidemiological status of the prevalence of RSV infection among different age groups of children in Iraq. Such investigations may accompanied by studying the variants of RSV strains that are common in this country which may effectively contribute to diagnosis and definition of variants for vaccine preparation.

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