

## SHORT COMMUNICATION

# Seroprevalence of Anti-RSV IgG in Thai Children Aged 6 Months to 5 Years

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Respiratory syncytial virus (RSV) is the most common cause of lower respiratory tract infection in infants and young children worldwide. RSV was first isolated from chimpanzees which coryza in 1956 but was soon shown to be the major cause of bronchiolitis and pneumonia in human infants.<sup>1</sup> RSV is a member of the *Paramyxoviridae* family, subfamily *Pneumovirus*.<sup>2</sup> It accounts for approximately 50% of all pneumonia cases and up to 90% of the reported cases of bronchiolitis in infancy.<sup>2</sup> Both the magnitude and intensity of the infection as well as the host response to the RSV infection determine the severity and intensity of the disease. RSV epidemics occur annually at regular, predictable intervals.<sup>3</sup> Although two-thirds of infants are infected during the first year of life, 76% of children are reinfected during the second year of life.<sup>4</sup>

In Thailand, high numbers of RSV infections are found during

**SUMMARY** Respiratory syncytial virus (RSV) is the single most important cause of lower respiratory tract infection during infancy and early childhood worldwide including Thailand. The magnitude as well as the intensity of both infection and host response to the RSV infection determine the severity of disease. To determine the presence of anti-RSV IgG in children of different age groups, 124 serum samples were randomly collected from healthy children aged 6 months to 5 years. All of them were assayed for anti-RSV IgG using a commercial ELISA kit. The mean prevalence rate was found to be 68.91%. The prevalence increased with age: from 6 to 11 months, 11.76%; from 12 to 17 months, 41.67%; from 18 to 23 months, 60.87%; from 24 to 29 months, 88.24%; from 30 to 35 months, 78.57%; from 36 to 41 months, 94.44% and from 42 to 60 months, 100%. The amount of anti-RSV IgG among the groups was significantly different ( $p = 0.006$ ). No sexual preponderance was found. RSV infection commonly occurred in children aged 12 to 29 months. All children older than 5 years had experienced a RSV infection.

rainy season and early winter season.<sup>5</sup> RSV infection triggers the normal host immune response including humoral and cell-mediated immunity,<sup>6</sup> thus the determination of anti-RSV IgG reveals the prevalence of RSV infection in a population. In this study, the seroprevalence of RSV infection in Thai children aged 6 months to 5 years was determined.

## MATERIALS AND METHODS

One hundred and twenty-

four sera were selected from our sera bank. Those sera were obtained from healthy children aged between 6 months to 5 years who attended the Well Baby Clinic at Bhumibol Adulyadej Hospital, Bangkok, Thailand. All of these samples were collected from children whose parents signed an informed-consent giving permission to use their chil-

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dren's sera for any purpose in the research area. They were all residents in the central part of Thailand, mostly from the Don Muang area of Bangkok, or the nearby province of Pathumthani. All sera were tested for the presence of anti-RSV IgG by an enzyme linked immunosorbent assay (ELISA) kit (Genzyme Virotech GmbH, Germany). In brief, the antibody specific to RSV in the diluted serum (1:101) will bind to RSV antigen immobilized in an ELISA well. The immune complexes were then detected by goat anti-human IgG conjugated with horseradish peroxidase. The enzymatic reaction was developed by adding the substrate tetramethylbenzidine (TMB) and terminated by adding sulphuric acid solution. The result was then read by spectrophotometer at 450 nm. The antibody concentration was calculated as antibody (Ab) index value according to the recommendation of the test kit manufacturer. The reaction was positive when the Ab index value was greater than 11 and negative when the index value was below 9. There was a grey zone of unclassified cases between 9 and 11. The data were presented as mean, range, percentage and frequency of the samples. A comparison of the

antibody indices between the groups was done using ANOVA, whereas the correlation between age and Ab index value was determined by Pearson correlation testing. Statistical significance was set at a  $p < 0.05$ .

## RESULTS

Out of the 124 children, 73 were boys and 51 were girls. Five serum samples fell into the antibody grey zone. Thus, in the analysis of the data we considered only the 119 samples with positive or negative results. Overall prevalence of anti-RSV IgG in those 119 children aged 6 months to 5 years ( $X \pm SD = 26 \pm 13.62$  months) was 68.91% (82/119, Table 1). Among the 82 seropositive cases, 50 were boys (60.98%) and 32 were girls (39.02%). The RSV seropositive rate was not statistically different between genders ( $p = 0.469$ , i.e. boys 70.42% [50/71]; girls 66.67% [32/48]).

The 119 samples were divided into 7 groups according to age. The prevalence of RSV infection increased with age: 6-11 months, 11.76%; 12-17 months, 41.67%; 18-23 months, 60.87%; 24-29 months, 88.24%; 30-35 months, 78.57%; 36-

41 months, 94.44% and 42 to 60 months, 100% (Table 1). The Ab index values slightly increased with age and were significantly different among the 7 groups ( $p = 0.006$ ). This significant difference was particularly observed between the group of 18-23 months and the group of 42-60 months ( $17.33 \pm 4.68$  vs  $24.62 \pm 6.41$ ,  $p = 0.015$ ). The mean Ab index value among anti-RSV IgG seronegative samples was  $5.28 \pm 1.28$ . From our data, RSV infection started with 6 months and happened up to 3 years of age. Additionally, the correlation between RSV infection and age groups was  $R^2 = 0.955$ . This means that the prevalence of RSV infection at a certain age could be predicted with an accuracy of 95.5%.

## DISCUSSION

Respiratory viral infections have a major impact on health. The most common acute respiratory illnesses experienced by healthy adults and children are mainly caused by both DNA and RNA viruses. Many viruses associate with acute respiratory infections and cause severe respiratory symptoms especially in infants and young children such as

**Table 1** Comparison of the antibody (Ab) index value among different age groups

| Age group (months)<br>( $X \pm SD$ ) | Boys:girls<br>(Total) | Anti-RSV IgG     |                         |
|--------------------------------------|-----------------------|------------------|-------------------------|
|                                      |                       | No. positive (%) | Ab index ( $X \pm SD$ ) |
| 6-11 (7.94 $\pm$ 1.48)               | 9:8 (17)              | 2 (11.76%)       | 13.83 $\pm$ 3.41        |
| 12-17 (13.83 $\pm$ 1.70)             | 8:4 (12)              | 5 (41.67%)       | 18.29 $\pm$ 4.41        |
| 18-23 (19.65 $\pm$ 1.90)             | 14:9 (23)             | 14 (60.87%)      | 17.33 $\pm$ 4.68*       |
| 24-29 (25.53 $\pm$ 1.38)             | 9:8 (17)              | 15 (88.24%)      | 20.45 $\pm$ 5.58        |
| 30-35 (32.0 $\pm$ 0.96)              | 7:7 (14)              | 11 (78.57%)      | 23.99 $\pm$ 6.63        |
| 36-41 (37.33 $\pm$ 1.19)             | 9:9 (18)              | 17 (94.44%)      | 21.82 $\pm$ 6.01        |
| 42-60 (49.78 $\pm$ 5.53)             | 15:3 (18)             | 18 (100%)        | 24.62 $\pm$ 6.41*       |
| Total (26.92 $\pm$ 13.62)            | 71:48 (119)           | 82 (68.91%)      | 21.30 $\pm$ 6.28        |

\* $p < 0.015$



parainfluenza viruses, adenovirus, influenza viruses and RSV. A number of studies reported that anti-RSV IgG levels play an important role in disease protection, especially maternal antibodies which are believed to be essential in preventing or reducing the severity of the infection.<sup>7-8</sup>

This study indicates that RSV is a common respiratory virus in Thailand which can infect children very early in life. Primary infection possibly occurs after the maternal antibodies decline. Cox *et al.*<sup>9</sup> reported that the mean life span of maternal antibody titers was 3.3 months. Queir *et al.*<sup>10</sup> demonstrated that RSV infection started at less than 3 months of age. Kaneko *et al.*<sup>11</sup> studied the incidence of lower respiratory tract infection caused by RSV and found that the highest incidence was during the first five months post partum. According to our study though, the highest rate of RSV infection occurs between 12 and 17 months of age because the seroprevalence of anti-RSV IgG in this age group (41.67%) was 3.5 times greater than that in the group aged 6-11 months (11.76%, Table 1).

It seems that RSV infection in Thailand occurred later than in Japan. However, it was clear that the prevalence of RSV infection increased with age until 3 years of age and declined thereafter with a very good correlation ( $R^2 = 0.955$ ). By the age of 5 years, 100% of the Thai children had experienced RSV infection.

Information on the seroprevalence of anti-RSV IgG is useful not only for predicting the time of infection but also for estimating the proper time for vaccination of the forth coming RSV vaccines.

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