Incidence of Respiratory Syncytial Virus Infection Among Young Children of Bandar Abbas, Southern Iran

Shahrokh Rajaei, Mohammad Bagher Rahmati, Shahram Zare and Ghassem Attarzadeh Yazdi

Abstract

Background: Respiratory syncytial virus (RSV) is a lower respiratory tract infection in infants and children younger than five years old. This disease is an important factor for hospitalization during the winter months.

Methods: To determine the percentage of RSV infection in infants younger than 60 months old in different seasons, the current study was performed during 12 months in 2014 in Bandar Abbas, southern Iran. Overall, 182 children aged less than five years with clinical symptoms of tachydyspnea, fever, cold/cough, sore throat, and aches (examined by one specialist pediatrician) were consecutively selected from inpatient or outdoor patients of the children’s hospital in Bandar Abbas, Iran. Children’s throat swabs were collected and RSV infection was detected by real time-polymerase chain reaction (RT-PCR).

Results: In total, 57.14% of all children were male and 42.86% were female. Respiratory syncytial virus infection was found in 46 out of 182 patients (25.3%). Among the 46 children with RSV infection, 22 patients (47.83%) were male and 24 patients (52.17%) were female with no significant difference between males and females. Most RSV infections were found in infants younger than 36 months old. There were significant differences between RSV positivity in winter and summer as 86.96% of positive RSV was during winter and 13.04% was during summer.

Conclusions: This study indicates that RSV is an important cause of respiratory tract infection in winter time in infants less than 36 months old in Bandar Abbas.

Keys: RSV, Bandar Abbas, Iran, Age, 2014

1. Background

Influenza virus type A, influenza virus type B, and respiratory syncytial virus (RSV) are major upper and lower respiratory tract diseases in young children and infants (1-3). These viruses have all been identified as important causes of severe lower respiratory tract disease, with significant morbidity and mortality, in elderly and immunocompromised patients (4, 5).

Human RSV genome is a linear negative-sense single-stranded RNA molecular of 15 222 nucleotides for the AI Starin (6), which was first isolated from chimpanzee and then in children with respiratory illness (7).

Respiratory syncytial virus (RSV) has two major subtypes, A and B, that often circulate concurrently, and it is one of the most common disease in infants (8-12). It infects the respiratory tract with risk of serious infection in infants aged one to four years old (13).

The symptoms of RSV infection are different. The symptoms range from tachypnea, dyspnea, hyperinflation, atelectasis, a mild common cold to cough, hypoxemia, to increasing respiratory rate (3, 14). One of the most common clinical RSV syndromes are bronchiolitis and pneumonia (14, 15). It has been reported that the epidemiology of RSV is from Western countries (16-19) to Asian countries (4, 9, 10). However, low information is still found in the Middle East (1, 2, 20) and specifically in IRAN.

On the other hand, it has been reported that fall and winter are more common seasons for RSV infection, specifically in infants (16, 17).

In tropical countries, RSV causes outbreaks in the hot rainy season from July to December (5, 21), yet there is low information in Iran and specifically no published reports on the seasonality and clinical characteristics of RSV infec-

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tion in Bandar Abbas, south of Iran [22].

2. Methods

In this study, in order to find the contribution of RSV in different ages and seasons, all outpatient and inpatient referrals to the hospital in Bandar Abbas, Iran, aged younger than five years old, during year 2014, with symptoms of respiratory infection, were selected and their information was recorded in a questionnaire. They were examined by a pediatrician and all clinical symptoms of tachyypnea, fever, cold/cough, sore throat, and aches were recorded and ethical permission for this research was obtained. These patients were selected for RSV infection (after taking permission from kid’s parents) and those that did not attend the follow-up were excluded from the research. The hospital of the current study was one of the largest children’s hospitals in Bandar Abbas, receiving patients from rural and urban areas. Gender was the first factor in this research and for this purpose, children were divided to two groups: Males and females, and distribution of RSV was compared between these two groups. To investigate the distribution of RSV in different seasons, the researchers divided all children to two seasons, cold season (from November to April) and warm season (from May to October). Age was the final factor that was examined and for this purpose all children were divided to four groups (group 1: Younger than 6 months, group 2: Ages 7 to 12 months, group 3: Ages 13 to 36 months, group 4: Ages 37 to 60 months).

Children’s throat swabs were collected and placed in 3 mL of Universal Transport Medium (UTM) (Copan, Brescia, Italy). Throat swabs were used in studies using RT-PCR. Statistical analyses were done using the SPSS computer software. P < 0.05 was considered significant.

A paired samples t-test was used to compare two related means. The data were analyzed by t-test and SPSS and all data with P < 0.05 were considered significant.

3. Results

This research was performed on 182 children and results showed that 57.14% of total children were male and 42.86% female with no significant difference between males and females in total children (Table 1). On the other hand, the data showed that on average 25.3% of all children had positive RSV results. Furthermore, 47.83% of total positive RSV samples were male yet this ratio was 52.17% in females with no significant difference between males and females in positive RSV (Table 1 and Figure 1).

Table 1. Distribution of Positive and Negative RSV According to Gender

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR Negative</td>
<td>82</td>
<td>54</td>
<td>136</td>
</tr>
<tr>
<td>Within PCR, %</td>
<td>60.29</td>
<td>39.71</td>
<td>100</td>
</tr>
<tr>
<td>Within gender, %</td>
<td>78.8</td>
<td>69.2</td>
<td>74.7</td>
</tr>
<tr>
<td>PCR Positive</td>
<td>22</td>
<td>24</td>
<td>46</td>
</tr>
<tr>
<td>Within PCR, %</td>
<td>47.83</td>
<td>52.17</td>
<td>100</td>
</tr>
<tr>
<td>Within gender, %</td>
<td>21.2</td>
<td>30.8</td>
<td>25.3</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>78</td>
<td>182</td>
</tr>
<tr>
<td>Within PCR, %</td>
<td>57.14</td>
<td>42.86</td>
<td>100</td>
</tr>
<tr>
<td>Within gender, %</td>
<td>100.0</td>
<td>100.0</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 1. Distribution of positive RSV infection in males and females

To find the distribution of RSV in different age groups, the researchers divided all males and females to four groups:

Group 1: Age of less than 6 months,
Group 2: Between 6 and 12 months,
Group 3: Between 12 and 36 months and finally,
Group 4: More than 36 up to 60 months.

The data showed that higher percentage of RSV positives was in group 2 (6 to 12 months old) with 36.96% and lower percentage in group 4 (more 36 to 60 months old) with 4.35% (Table 2). The data showed that there was a significant different between group 4 with all other groups yet there was no significant difference between groups 1, 2, and 3 (Figure 2).

According to seasons, the data showed that 29.85% of
Table 2. Distribution (Frequency in Percent) of Positive RSV by Infants Age Between One and Sixty Months (X Axis)

<table>
<thead>
<tr>
<th>Age</th>
<th>≤ 6</th>
<th>6 - 12</th>
<th>12 - 36</th>
<th>&gt; 36</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PCR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>49</td>
<td>21</td>
<td>43</td>
<td>23</td>
<td>136</td>
</tr>
<tr>
<td>Within PCR, %</td>
<td>36.03</td>
<td>15.44</td>
<td>31.62</td>
<td>16.91</td>
<td>100</td>
</tr>
<tr>
<td>Within age, %</td>
<td>76.56</td>
<td>63.64</td>
<td>71.67</td>
<td>92.00</td>
<td>74.73</td>
</tr>
<tr>
<td>Positive</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>15</td>
<td>12</td>
<td>17</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>Within PCR, %</td>
<td>32.61</td>
<td>26.09</td>
<td>36.96</td>
<td>4.35</td>
<td>100</td>
</tr>
<tr>
<td>Within age, %</td>
<td>23.44</td>
<td>36.36</td>
<td>28.33</td>
<td>8.00</td>
<td>25.27</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>64</td>
<td>33</td>
<td>60</td>
<td>25</td>
<td>182</td>
</tr>
<tr>
<td>Within PCR</td>
<td>35.16</td>
<td>18.13</td>
<td>32.97</td>
<td>13.74</td>
<td>100.0</td>
</tr>
<tr>
<td>Within age</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Figure 2. Distribution (frequency in percent) of positive RSV in infants age from one to 60 months (x axis).

total children had positive RSV test results in winter time whereas this percentage was 12.5% in summer (Table 3).

On the other hand, in positive RSV, the data showed that there is a significant difference between winter and summer time (P < 0.001) with high risk of RSV infection in winter compared with summer (86.96% in winter and 13.04% in summer) (Figure 3).

4. Discussion

In conclusion, RSV has a worldwide distribution and it is one of the major causes of childhood respiratory morbidity and hospitalization with serious lower respiratory tract illness (23).

It has been reported that in cold countries, RSV has hospitalization rate in infants ranging between 5.2% and 16.8% (24). However, RSV activity is being continuous throughout the year in warm countries (5). The current study found that RSV infection occurred during the whole year in Bandar Abbas with high risk in winter time (30.8%) and low infection in summer time (21.8%). These results suggest that cold temperature can influence the activity of the virus in winter (Figure 1).
The results showed that average percentage of RSV infection in Bandar Abbas is 25.3%, which is higher than other warm countries and results from specific situation in Bandar Abbas and is related to low resistance of infants in Bandar Abbas in response to RSV infection. This is probably related to Bandar weather and low health care.

This study found that there is no significant different between males and females in RSV infection and this result was the same as a research done in queen Margaret London (25).

On the other hand, as so many researches showed that RSV is a very common respiratory tract disease in children under five years old, the current research found the max infection was in under 36 months and specifically between 12 and 36 months (Figure 2). In the current study, 95.65% of all RSV infections occurred under 36 months. Results of the current study showed that with increased age of patients, the rate of RSV infection was reduced in Bandar Abbas and it is suggested to perform vaccination at young age in Bandar Abbas.

Bandar Abbas has warm and humid weather and the data demonstrated that RSV infections were found in the coldest months. This result is consistent with other reports from temperate regions indicating that RSV infection has a peak during winter (3, 9, 21, 26). In Zarqa, which is located north-east of Amman, RSV epidemics occur during winter and spring and disappear in summer (24). Therefore, it could be concluded that cold weather may increase RSV activity.

The current research found high percentage of RSV infection in both males and females in winter compared to summer. In areas where temperatures remained cold throughout the year, RSV activity became almost continuous. These data led to the conclusion that community activity of RSV is substantial when both ambient temperatures and absolute humidity are very high, perhaps reflecting greater stability of RSV in aerosols; transmission of RSV in cooler climates is inversely related to temperature, possibly as a result of increased stability of the virus in secretions in the colder environment; UVB radiation may inactivate the virus in the environment or influence susceptibility to RSV by altering host resistance. Therefore, RSV has a worldwide distribution and can cause serious lower respiratory tract illness in cold seasons.

Furthermore, there is mounting interest in the hypothesis that RSV infection in children younger than 36 months is an important risk factor in winter for upper and lower respiratory tract diseases in Bandar Abbas.

Therefore, treatment of children hospitalized with RSV disease is primarily supportive, with administration of supplemental oxygen and fluid replacement therapy and it is suggested to perform RSV vaccination in early childhood in Bandar Abbas.

Supplementary Material

Supplementary material(s) is available here [To read supplementary materials, please refer to the journal website and open PDF/HTML].

Acknowledgments

The authors acknowledge the kind efforts of the Children’s Hospital, Bandar Abbas and Mrs Templeton.

Footnotes

Conflict of Interests: The authors declare no conflict of interest.

Ethical Considerations: This research was approved by the Ethics Committee of Hormozgan University of Medical Sciences (code: HUMS.REC.1394.173).

Funding/Support: This work was supported by Hormozgan University of Medical Sciences, Hormozgan, Iran.

References


