

นิพนธ์ต้นฉบับ

การศึกษาอาการทางคลินิกของทารกและเด็กที่เข้ารับการรักษาทางการแพทย์ด้วยอาการทางเดินหายใจจากเชื้ออาร์เอสวี ภายหลังการรับภูมิคุ้มกันสำเร็จรูปเนอร์ซิวิแมบ

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บทคัดย่อ

ความเป็นมา: การติดเชื้อระบบทางเดินหายใจจากเชื้ออาร์เอสวีมักเป็นรุนแรงในเด็กอายุน้อยกว่า 5 ปี nirsevimab เป็นภูมิคุ้มกันสำเร็จรูปสำหรับป้องกันความรุนแรงของการติดเชื้อซึ่งมีฤทธิ์ยาวครอบคลุมทั้งฤดูกาลระบาด

วัตถุประสงค์: เพื่อทราบอุบัติการณ์ของการติดเชื้ออาร์เอสวีและการติดเชื้อระบบทางเดินหายใจอื่น ๆ และความรุนแรงของการติดเชื้ออาร์เอสวีรวมทั้งปัจจัยที่มีผลการติดเชื้ออาร์เอสวีในผู้ที่ได้รับภูมิคุ้มกันสำเร็จรูป

วิธีการศึกษา: การศึกษานี้เป็นการติดตามทารกอายุ ≤ 12 เดือนที่ได้รับ nirsevimab ในโรงพยาบาลจุฬาลงกรณ์ ระหว่างฤดูกาลระบาดของอาร์เอสวี (พฤษภาคมถึงพฤศจิกายน พ.ศ. 2568) โดยเก็บข้อมูลจากเวชระเบียนและโทรศัพท์สอบถามข้อมูลจากผู้ปกครอง

ผลการศึกษา: จากผู้เข้ารับการภูมิคุ้มกันสำเร็จรูปทั้งหมด 294 ราย มีอาสาสมัครที่เข้าเกณฑ์ทั้งหมด 180 ราย (ร้อยละ 61.2) มัธยฐานอายุของอาสาสมัครเป็น 6 เดือน (ค่าพิสัยระหว่างควอไทล์ 2-6 เดือน) เพศชายร้อยละ 51.7 ทารกคลอดครบกำหนดและไม่มีโรคประจำตัวร้อยละ 66.1 อาสาสมัครจำนวน 7 ราย (ร้อยละ 3.9) ติดเชื้อระบบทางเดินหายใจจากเชื้ออาร์เอสวี อัตราอุบัติการณ์ 7.8 ต่อ 1000 คน-เดือน (95%CI 3.2-15.9) อาสาสมัครต้องเข้ารับการรักษาตัวในโรงพยาบาล 1 คน อัตราอุบัติการณ์ 1.1 ต่อ 1000 คน-เดือน (95%CI 0.15-7.9) มัธยฐานเวลาในการติดเชื้อหลังจากได้ภูมิคุ้มกันสำเร็จรูป 13 สัปดาห์ (ค่าพิสัยระหว่างควอไทล์ 6-16 เดือน) การสัมผัสผู้ป่วยที่ติดเชื้ออาร์เอสวีเป็นปัจจัยเสี่ยงของการติดเชื้อหลังจากได้รับภูมิคุ้มกันสำเร็จรูปโดยมีอัตราส่วนความเสี่ยง 6.4 (95% CI 1.5–26.3; p value <0.05)

บทสรุป: การให้ภูมิคุ้มกันสำเร็จรูปเป็นวิธีป้องกันการเกิดการติดเชื้ออาร์เอสวีรุนแรงต้องเข้ารับการ
รักษาพยาบาลในโรงพยาบาลในเด็กอายุน้อยกว่า 1 ปี ปัจจัยเสี่ยงที่ทำให้เกิดการติดเชื้อหลังจากได้รับภูมิคุ้มกัน
สำเร็จรูปคือการสัมผัสผู้ป่วยติดเชื้ออาร์เอสวี

คำสำคัญ : Respiratory Syncytial Virus, Respiratory tract infection, Nirsevimab, Monoclonal antibodies,
Children

Clinical outcome of respiratory syncytial virus associated medically attended respiratory tract infection following nirsevimab administration among infants and children

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Abstract

Background: Respiratory syncytial virus (RSV) is a leading cause of morbidity and mortality among children under five years. In Thailand, the long-acting monoclonal antibody nirsevimab was approved in 2024 and implemented in 2025 as a passive immunization to reduce RSV-associated lower respiratory tract infections and related hospitalizations.

Objectives: This study aimed to describe the clinical characteristics of children who developed symptomatic RSV infection after receiving nirsevimab, and to identify risk and protective factors associated with RSV infection among those who received the antibody.

Methods: This retrospective cohort study was conducted at King Chulalongkorn Memorial Hospital (KCMH). Children aged ≤ 12 months who received nirsevimab during the RSV season (May–November 2025) were included. Data were collected through a review of medical records and telephone interviews with parents.

Results: Of 294 infants who received nirsevimab, 180 (61.2%) were enrolled. The median age was 6 months (IQR 2–8), and 51.7% were male; 66.1% were healthy. Seven participants (3.9%) had confirmed RSV infection. The incidence rate of RSV-LRTI requiring hospitalization was 1.1 per 1000 person-months (95%CI 0.15–7.9), while the incidence rate of symptomatic RSV infection was 7.8 per 1000 person-months (95%CI 3.2–15.9). The median time from nirsevimab administration to infection was 13 weeks (IQR 6–16). RSV exposure was the only significant risk factor (RR 6.4, 95% CI 1.5–26.3; p value <0.05).

Conclusions: Nirsevimab appears to be an effective preventive strategy in both healthy and high-risk infants, with low hospitalization rates and predominantly mild breakthrough infections. RSV exposure remains the key risk factor, underscoring the importance of continued surveillance to optimize its use.

Keywords: Respiratory Syncytial Virus, Respiratory tract infection, Nirsevimab, Monoclonal antibodies, Children

Introduction

Respiratory syncytial virus (RSV) is a major cause of morbidity and mortality in children under five years, especially infants under six months, accounting for about 33 million lower respiratory tract infections, 3.6 million hospitalizations, and nearly 100,000 deaths annually, mainly in low- and middle-income countries.¹

In Thailand, RSV circulation usually occurs from June to November, peaking during the rainy season from August to October.²⁻³ A study at KCMH (2011–2016) found that 41% of children under five hospitalized with RSV developed severe lower respiratory tract infection, with a mortality rate of 0.3%.⁴ Another study from Ramathibodi Hospital (2014–2021) reported 1,370 RSV cases in children under two years, with over half hospitalized, 23% requiring intensive or intermediate care, and 1.5% mortality.⁵

Currently, two approved strategies are available to prevent RSV infection in children: maternal vaccination and monoclonal antibody administration for infants.

The US-Advisory Committee on Immunization Practices (US-ACIP) and the Centers for Disease Control and Prevention (US-CDC) recommend a single seasonal dose of the bivalent RSV prefusion F (RSVpreF) vaccine for pregnant individuals between 32 weeks 0 days and 36 weeks 6 days of gestation.⁶ Similarly, Thai guidelines advise RSVpreF vaccination during 24–36 weeks' gestation, with an optimal window at 28–32 weeks, particularly when the infant is expected to be under 6 months of age during the RSV season.⁷ Maternal RSVpreF vaccine showed efficacy against severe RSV-associated medically attend lower respiratory illness 82.4% and 70% within 90 days and 180 days after birth respectively.⁸ This vaccine provides protection for infants, demonstrating an effectiveness of 78.6% against RSV-associated lower respiratory tract disease (LRTD) hospitalizations within the first three months of life. While this protection remains strong at 71.3% through the first six months, the vaccine is particularly impactful against severe cases, maintaining 76.9% effectiveness against severe RSV-associated LRTD requiring hospitalization throughout that same six-month period.⁹

Palivizumab was the first monoclonal antibody approved for RSV prevention in infants and children at high risk for severe disease, such as those with prematurity, hemodynamically significant congenital heart disease (hsCHD), and bronchopulmonary dysplasia (BPD). Clinical studies have demonstrated that Palivizumab reduces hospitalization by 55%, specifically, it reduced hospitalization by 78% among children born prematurely without BPD and 39% in those with BPD.¹⁰ Despite these benefits, the therapy's impact is

limited by its restrictive eligibility, as it is only indicated for high-risk groups, leaving healthy full-term infants who remain at risk for severe RSV without similar protection.

More recently, long-acting monoclonal antibodies, including nirsevimab and clesrovimab, have been approved for all infants. Following its first approval in Europe in 2022,¹¹ nirsevimab has been administered to more than 11 million infants across over 45 countries.¹² Clinical studies have shown that nirsevimab reduced RSV-related hospitalizations to 0.3% (incidence rate 1 per 1000 person-months) vs 1.7% (incidence rate 3 per 1000 person-months) with standard care, showing 82.7% efficacy up to 180 days, with mostly mild-to-moderate adverse events and no safety concerns up to 1 year after dosing.¹³ Findings from real-world effectiveness systematic reviews and meta-analyses indicate that nirsevimab was associated with a lower odds of RSV-related outcomes, with a pooled effectiveness of 83% against RSV-related hospitalization, 81% against ICU admission, and 75% against LRTI in infants aged 0–12 months, although it does not significantly impact the length of hospital stay.¹⁴

Following the 2025 Thailand RSV prevention guidelines,¹⁵ nirsevimab was implemented as an additional preventive immunization for infants aged ≤ 12 months, and high-risk children aged 12–24 months, such as those with congenital heart disease or bronchopulmonary dysplasia, during the first RSV season (typically June to October, although this period may be adjusted based on annual RSV epidemiology).

Beyond identified high-risk groups, several specific factors increase the likelihood of severe RSV infection. A systematic literature review¹⁶ highlighted eight factors that were significantly associated with RSV-associated acute lower respiratory infection in children under five years: prematurity, low birth weight, male sex, having siblings, maternal smoking, a history of atopy, lack of breastfeeding, and household crowding.

Despite available global data on nirsevimab, evidence in Thai children remains limited. This study is the first to determine the incidence of symptomatic RSV infection, describe the clinical characteristics of children who develop symptomatic RSV after receiving nirsevimab. This finding may provide evidence to inform the optimal use of nirsevimab within the Thai healthcare context.

Objectives

This study aimed to describe the clinical characteristics of children who developed symptomatic RSV infection after receiving nirsevimab, and to identify risk and protective factors associated with RSV infection among those who received the antibody.

Methods

Study design and participants

This retrospective cohort study was conducted at KCMH, a tertiary care hospital in Bangkok, Thailand. This study aimed to determine the incidence of symptomatic RSV disease and overall respiratory tract infections among infants who received nirsevimab, identify factors associated with symptomatic RSV infection, and further characterize the clinical outcomes of RSV infection in this population.

Study population included children $\leq$ 12 months old who received nirsevimab at KCMH during RSV season in Thailand (between May and November 2025). Eligible participants were enrolled after approval was obtained from the Institutional Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University. (IRB No. 0965/68).

Procedure and data collection

After nirsevimab was first introduced at KCMH in May 2025, it was administered to infants and children under 2 years of age during the RSV season. Pediatricians informed parents that follow-up phone calls would be conducted as part of standard practice to assess clinical status and monitor for adverse events after nirsevimab administration. Following Institutional Review Board (IRB) approval, parents were contacted and provided with information about the study. For those who provided consent, data were collected through review of electronic medical records and one-time telephone follow-up at the end of RSV season.

Demographic data included age, sex, underlying disease, history of prematurity and timing of nirsevimab administration. Infants with high-risk RSV exposure was defined as having a history of RSV exposure, nursery attendance of participants, the presence of children under 5 years of age in the household. Risk and protective factors for symptomatic RSV infection included household smoking and exclusive breastfeeding status before the introduction of complementary foods.

Clinical data, including the occurrence, timing, results of nasopharyngeal swab testing, and definitive diagnoses of respiratory tract infections during May to December 2025 were collected for all participants.

Among those who developed RSV infection, additional details on disease severity, antibiotic use, and clinical outcomes were recorded. In this study, respiratory tract infection was defined as a medically attended event, with all cases diagnosed and confirmed by healthcare professionals.

Statistical methods and analysis

All statistical analyses were performed using STATA software version 19SE (Texas, USA). For demographic and clinical data, categorical data were presented as frequencies and percentages; continuous data were presented as medians with interquartile ranges (IQRs). The incidence of symptomatic RSV infection was expressed per 1000 person-months. Univariate analysis was conducted to evaluate associated factors for symptomatic RSV infection (p value <0.05).

Results

Demographic data

Two hundred and ninety-four children received nirsevimab at KCMH during May to November 2025, 30% of them received in June. The monthly distribution of nirsevimab administration is illustrated in Figure 1. Overall, 70 children (23.8%) were born during the 2025 RSV season. 180 (61.2%) of nirsevimab recipients were enrolled in this study.

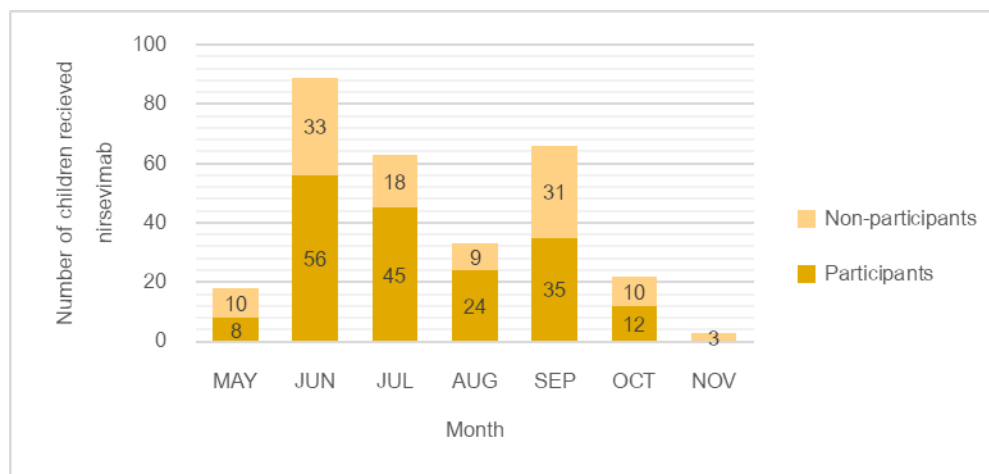


Figure 1. Number of participants received nirsevimab in each month

Baseline characteristics of participants are shown in Table 1; The median age was 6 months (IQR 2–8), and 51.7% were male. Two-thirds of them were healthy (66.1%), and 24.4% had a history of prematurity without sequelae. Seven participants (9.4%) had comorbidities including prematurity with BPD (1.1%), congenital heart disease (CHD) (4.4%), and other conditions (3.9%), such as cerebral anomalies. One hundred and two participants (56.7%) were breastfed until the end of the RSV season. Twenty-two cases (12.2%) were exposed to household smoking.

Among the 180 participants, 55 (30.6%) were classified as having high-risk exposure to RSV. Of these, only 19 infants had documented exposure to individuals with confirmed RSV infection. The last RSV exposure infant in our cohort occurred in December 2025.

Table 1. Baseline characteristics

Characteristics	N=180
Age (median, IQR) (months)	6 (2-8)
Male n (%)	93 (51)
Term n (%)	131 (72.8)
Pre-existing disease n (%)	
• Healthy	119 (66.1)
• Prematurity	44 (24.4)
• Prematurity with bronchopulmonary dysplasia	2 (1.1)
• Congenital heart disease	8 (4.4)
• Other disease	7 (3.9)
High-risk exposure to RSV	55 (30.6)
• Exposure to individuals with RSV infection	19 (10.5)
• Nursery attendance	14 (7.8)
• The presence of children under 5 years of age in the household	36 (20)
Breastfeeding sustained through the end of the RSV season	102 (56.7)
Household smoking	22 (12.2)

Respiratory tract infection during RSV season

During the RSV season, a total of 58 respiratory tract infection episodes were reported from 50 of 180 participants (27.8%), with 41 episodes (70.7%) occurring between October and December. RSV testing was performed in 43 episodes (74.1%), while 15 respiratory tract infection episodes (25.9%) did not undergo swab testing. Of the 58 episodes, 7 (12.1%) were confirmed RSV infections, and 16 (27.5%) were attributed to other viral pathogens. An additional 20 episodes (34.5%) had negative swab results. The distribution of respiratory tract infection episodes was shown in Figure 2.

Among the 58 episodes, 13 episodes (22.4%) resulted in hospitalization due to respiratory tract infection following nirsevimab administration, corresponding to an incidence rate of 14.4 episodes per 1000 person-months (95%CI 8.4-24.7).

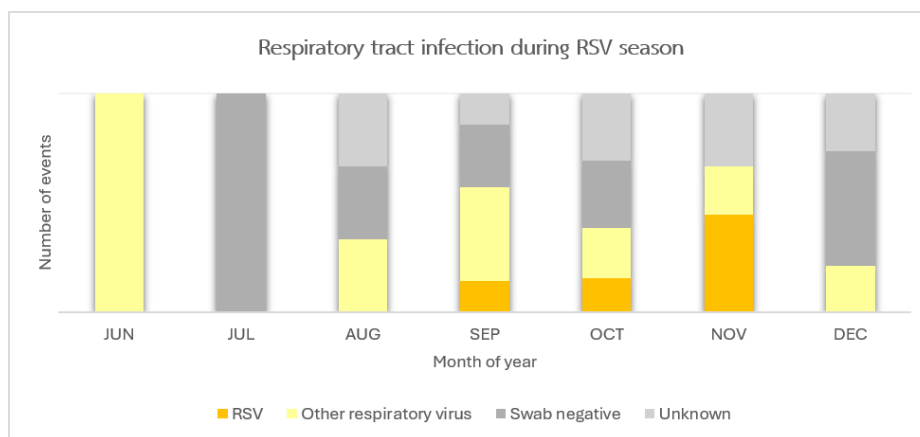


Figure 2. Respiratory tract infection during RSV season

RSV infection

Seven of 180 participants (3.9%) were confirmed to have RSV infection, occurring in September (1 case), October (2 cases), and November (4 cases). Among these, one case was RSV-related lower respiratory tract infection (LRTI) requiring hospitalization, while the remaining six cases were upper respiratory tract infections. The incidence rate of RSV-LRTI requiring hospitalization was 1.1 per 1000 person-months (95%CI 0.15-7.9), while the incidence rate of symptomatic RSV infection was 7.8 per 1000 person-months (95%CI 3.2-15.9). All cases of RSV infection received a 100 mg dose of nirsevimab. The median age at the time of nirsevimab administration was 7 months (IQR 3–8). The median time from nirsevimab administration to RSV infection was 13 weeks (IQR 6–16). Among participants with RSV infection, three (42.9%) had high-

risk exposure. One attended a nursery and had contact with a classmate diagnosed with RSV infection, another had household exposure from a parent with RSV infection, and the third had contact with a sibling with RSV infection. Two participants had history of household smoking. Characteristics of all cases of symptomatic RSV infection were shown in Table 2. All of them recovered from RSV infection.

Of 180 infants, 163 were term and preterm without comorbidities, whereas 17 had conditions such as bronchopulmonary dysplasia and congenital heart disease. The incidence rate of symptomatic RSV infection in the first group was 7.3 per 1000 person-months (95%CI 2.7-16.0) with 6 infected participants. In those with underlying conditions, The incidence rate was 11.8 per 1000 person-months (95%CI 0.3-65.6), with one affected participant.

Table 2. Characteristics of symptomatic RSV infection

Month of Nirsevimab administration	BW (kg)	Age (mo)	Underlying disease	Breast feeding	Household Smoking	High-risk exposure to RSV	Month of RSV infection	Time from nirsevimab administration to RSV infection (wk)
RSV LRTI								
July	11	8	BPD	yes	no	no	November	15
RSV URI								
July	5	1	no	no	no	yes	September	6
June	11	11	no	yes	no	yes	October	17
September	7.2	7	no	no	yes	no	October	6
June	9	7	no	no	no	no	November	16
August	7.5	4	no	yes	yes	no	November	13
September	6.4	3	no	no	no	yes	November	7

Abbreviations: BPD, Bronchopulmonary dysplasia; URI, upper respiratory tract infection; LRTI, lower respiratory tract infection

RSV lower respiratory tract infection

One participant was hospitalized due to RSV pneumonia. The patient was a male infant born at 30 weeks' gestation with underlying bronchopulmonary dysplasia requiring home oxygen therapy. He received nirsevimab in July and subsequently developed a breakthrough RSV infection in November, 15 weeks after administration. This patient did not have high-risk exposure to RSV, was not exposed to household smoking, and was breastfed until the time of infection. During hospitalization, he required oxygen support at his baseline level and did not need intensive care. However, a secondary bacterial infection occurred, requiring a total of 7 days of antibiotic treatment with 14 days of hospital stay.

RSV upper respiratory tract infection

The remaining six cases of symptomatic RSV infection, diagnosed between September and November, included five term infants and one infant born at 32 weeks' gestation without residual complications of prematurity. All experienced mild respiratory symptoms. Half had high-risk exposure to RSV through contact with a laboratory-confirmed case. Two participants (33%) were exposed to household smoking, and two were breastfed until the time of infection. All participants with RSV-related upper respiratory tract infections fully recovered. One patient required antibiotic treatment prescribed by a physician, although the parents were unable to recall the specific antibiotic used.

Other respiratory virus infection

Among 51 non-RSV respiratory tract infection episodes, 36 underwent rapid antigen or PCR testing. Viral pathogens were identified in 16 episodes (31.4%): influenza (9 episodes, 17.6%), COVID-19 (4 episodes, 7.8%), human metapneumovirus (2 episodes, 3.9%), and adenovirus (1 episode, 2.0%). Overall, 76.5% of non-RSV respiratory tract infection episodes were mild and did not require hospitalization. Among the 15 participants who did not undergo swab testing, one with congenital heart disease required hospitalization for secretion clearance, while the remaining 14 had mild symptoms and did not require hospital admission.

Risk and protective factors of RSV infection

Risk and protective factors are shown in Table 3. Exposure to RSV-infected patients was identified as a significant risk factor for RSV infection with a risk ratio (RR) of 6.4 (95% CI 1.5-26.3; p value <0.05). However, gender, prematurity status, and the presence of siblings were not identified as risk factors. Additionally, while breastfeeding appeared to suggest a protective effect with RR of 0.57, this result was not statistically significant (95% CI 0.1–2.5; p value 0.45)

Table 3. Risk and protective factors of RSV infection

Factors associated with RSV infection	RR (95% CI)	p value
Male (n=131)	5.6 (0.7-45.7)	0.07
Pre-existing disease or history of prematurity (n=61)	0.8 (0.2-3.9)	0.8
Preterm (n=46)	1.1 (0.2-5.3)	0.9
Underlying disease (n=17)	1.5 (0.2-11.8)	0.70
High risk RSV exposure		
- RSV exposure (n=19)	6.4 (1.5-26.3)	0.0046
- Daycare attendance (n=14)	2.0 (0.3-15.3)	0.51
- Sibling < 5 years in family (n=36)	1.6 (0.3-7.9)	0.56
Household smoking (n=22)	2.9 (0.6-13.9)	0.18
Breastfeeding sustained through the end of the RSV season (n=102)	0.6 (0.1-2.5)	0.45

Discussion

Nirsevimab is recognized as a preventive strategy against RSV infection in both healthy and high-risk infants. Although data on its efficacy and real-world effectiveness are available, there were previously no data from Thailand, as it was first launched and approved in 2025. However, nirsevimab has not yet been included in the Thai national immunization program, and socioeconomic differences may influence access to and receipt of nirsevimab.

Our findings indicate that the incidence rate of RSV-LRTI requiring hospitalization was 1.1 per 1000 person-months (95%CI 0.15-7.9), while the incidence rate of symptomatic RSV infection was 7.8 per 1000 person-months (95%CI 3.2-15.9) among infants receiving nirsevimab. RSV exposure was identified as a significant risk factor for breakthrough infection.

Seven participants experienced breakthrough RSV infection following nirsevimab administration, with cases occurring in September (1 case), October (2 cases), and November (4 cases). According to the 2025 Thailand RSV prevention guidelines,¹⁵ nirsevimab is recommended from June to October, corresponding to the peak RSV season based on historical data. However, in 2025, RSV infections persisted into November, with most cases (57%) occurring during this month. The median time from nirsevimab administration to RSV infection was 13 weeks (IQR 6–16). Data from previous studies¹⁷ show that nirsevimab has a half-life of approximately 71 days. A single dose provides high and sustained levels of pre-F antibodies, remaining above baseline up to day 361. However, although nirsevimab provides strong protection through sustained antibody levels during this period, it does not confer complete immunity; therefore, effective prevention should combine medical prophylaxis with strategies to minimize RSV exposure, as direct contact with infected individuals remains an important risk factor for breakthrough infection.

In our study, the incidence rate of symptomatic RSV infection among healthy term and preterm infants was 7.3 per 1000 person-months (95%CI 2.7-16.0). In comparison, the HARMONIE trial—which evaluated nirsevimab in infants ≥ 29 weeks' gestation—reported RSV-associated LRTI hospitalization rates of 1 per 1000 person-months in the nirsevimab group and 3 per 1000 person-months in the standard care group. This represents a vaccine efficacy of 82.7% (95% CI, 67.8–91.5; p value <0.001), highlighting a significant reduction in severe outcomes compared to infants receiving no prophylaxis. Moreover, the HARMONIE trial reported that hospitalizations due to all-cause lower respiratory tract infection occurred less frequently in the nirsevimab group (4 per 1000 person-months) compared to the standard care group (6 per 1000 person-months) within 180 days after randomization, corresponding to an efficacy of 41.9% (95% CI 23.1–56.3; p value <0.0001). In our study, the incidence rate of all respiratory tract infections was 14.4 episodes per 1,000 person-months (95% CI 8.4–24.7). The relatively high rate might be explained by data collection during the RSV season, when other respiratory viruses were also circulating in the community.

In the IMPact-RSV trial,¹⁰ a randomized, double-blind, placebo-controlled study of palivizumab in infants with bronchopulmonary dysplasia (BPD), the incidence of RSV-related hospitalization at 150 days post-randomization was 7.9% in the palivizumab group compared to 12.8% in the placebo group. This representing a 39% reduction (95% CI, 20–58; p-value 0.038). In comparison, our study demonstrated an RSV hospitalization incidence rate of 11.8 per 1000 person-months (95%CI 0.3-65.6) among infants with underlying conditions, including BPD.

A systematic literature review¹⁶ highlighted eight factors that were significantly associated with RSV-associated acute lower respiratory infection (ALRI) in children under five years: prematurity, low birth weight, male sex, having siblings, maternal smoking, a history of atopy, lack of breastfeeding, and household crowding.

RSV exposure was the only factor significantly associated with an increased risk of infection in this study. Although breastfeeding showed a potential protective effect (RR 0.57, 95% CI 0.1–2.5; p value 0.45), this was not statistically significant. These findings suggest that, even with nirsevimab administration, preventive measures to reduce RSV exposure remain important.

A principal strength of this study is that it is the first study of RSV infections following RSV monoclonal antibody use in Thailand. The limitations of our study include the absence of a comparison group receiving standard care and the relatively small number of participants who received nirsevimab, as it is not included in the Thai national immunization program. Additionally, 15 respiratory episodes did not undergo swab testing, potentially leading to an underestimation of RSV cases

Conclusion

Nirsevimab is an effective preventive strategy against RSV in both healthy and high-risk infants, associated with low hospitalization rates and predominantly mild breakthrough infections. As RSV exposure was identified as the primary risk factor, preventive strategies should combine medical interventions with measures to reduce exposure.

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