Incidence of respiratory syncytial virus infections among children in rural Bangladesh: a prospective observational study (2021–2023)

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Summary

Background Respiratory syncytial virus (RSV) is a major cause of acute respiratory infection (ARI) in young children, but evidence on burden from low- and middle-income countries has largely been derived from hospital-based studies. This prospective, community-based study estimated the burden of RSV-associated ARI among children younger than two years of age in rural Bangladesh.

Methods This observational study was conducted in two unions of the Mirzapur sub-district, Tangail District, Bangladesh between August 2021 and June 2023. Village healthcare workers visited each household in the selected area weekly to identify ARI episodes among children younger than two years using the WHO definition. Following parental written consent, nurses collected nasopharyngeal swabs for RSV testing by RT-qPCR from children who were experiencing ARI episodes. RSV incidence and incidence rate ratios were estimated using Poisson regression.

Findings Overall, 3667 children contributed to 3008 child-years of follow-up. Out of 5907 ARI episodes recorded, 4586 specimens were collected and tested. 7.1% of the samples (324/4586) tested positive for RSV. RSV infections showed a peak in August–September 2021 and October 2022–February 2023 with 37.6% and 16.1% of samples testing positive, respectively, and near-zero detection during the remaining months. The overall RSV-ARI incidence was 107.7 per 1000 child-years (95% CI: 96.6–120.1). The incidence was highest during the first six months of life (164.5 per 1000 child-years), which was 2.2 times higher (incidence rate ratio [IRR] 2.2; 95% CI: 1.6–3.0) than in the second year of life. Preterm infants had a 50% higher risk of RSV-ARI (IRR 1.5; 95% CI: 1.2–2.0) than term infants. Cough was present in 95.7% and chest indrawing was observed in 9.8% of RSV infections.

Interpretation RSV-ARI imposes a substantial community burden among rural Bangladeshi children, especially in infancy. These findings support consideration of RSV-specific interventions, such as maternal immunisation or monoclonal antibodies for infants to address the disease burden.

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Research in context

Evidence before this study

To assess RSV-related disease burden in rural communities of low- and middle-income countries, we searched PubMed for articles on respiratory syncytial virus (RSV) incidence or burden among children using the terms "respiratory syncytial virus" OR "RSV" AND "incidence" OR "burden" AND "child", "pediatrics", "paediatrics", or "infant" AND "community" OR "rural". We excluded review articles and restricted results to studies published between Jan 1, 2001, and July 31, 2025. Our search identified 316 articles, of which 27 contained primary data on RSV burden in the community. Among these, 18 studies reported data from rural settings, among which four were conducted in South Asia. Across studies, case definitions varied, with suspected patients identified using terms such as acute respiratory illness and acute lower respiratory tract infection. Reported RSV incidence in rural communities ranged from 9.7 to 791 per 1000 person-years. Notably, only two studies reported RSV disease burden in rural Bangladesh. Of these, one study included children up to 5 years of age, while the other followed children only during the first two months of life.

Added value of this study

This study provides population-based estimates of RSV incidence among children with ARI in a rural community comprising two unions in Bangladesh. We followed 3667 children from enrolment to 23 months of age, a period when children are most susceptible to RSV infection. Children who were residents of the selected unions, younger than two years, irrespective of their age at first visit, were included to capture RSV-ARI episodes across the study area. Surveillance was conducted over a period of 23 months to account for seasonal variation in RSV disease burden. The overall incidence of RSV-ARI was 107.7 per 1000 child-years (95% CI: 96.6–120.1). Infants in their first six months of life were 2.2 times more likely to have an RSV infection, compared with children in their second year of life, with an incidence of 164.5 per 1000 child-years. Preterm infants had a 50% higher risk of RSV-ARI compared with term infants. No significant difference in RSV-ARI risk was observed between male and female children.

Implications of all the available evidence

We observed a substantial burden of RSV-ARI, with the highest incidence during the first six months of life, a period when maternally derived antibodies are most effective. Preterm infants, who comprised 17.3% of the cohort, were at increased risk of RSV-ARI, while no significant sex-based differences in incidence were observed. These findings underscore the need for prevention strategies that ensure equitable access for all children. Maternal vaccination could substantially prevent early-life RSV infection, but vaccination schedules may need to be optimised to maximise protection for preterm infants. In addition, monoclonal antibody prophylaxis could also be considered, particularly for preterm and other high-risk infants.

Introduction

Respiratory syncytial virus (RSV) is one of the leading causes of acute lower respiratory illness in children, particularly during the first two years of life.[1,2] Children in low-income and middle-income countries (LMICs) carry a disproportionately high burden of severe RSV-associated illness.[3] In 2019, an estimated 533 000 RSV-associated acute lower respiratory infection hospitalisations occurred globally, 93% of which were in LMICs.[1] In the same year, countries with low socio-demographic index recorded the highest age-standardised RSV mortality rate, estimated at 10.3 deaths per 100 000 population, compared with the global rate of 4.8 per 100 000. Among all regions, South Asia accounted for the highest number of RSV-related deaths.[4]

In Bangladesh, a country in South Asia, RSV poses a considerable health burden. A study in 2012 reported an incidence of 125 cases per 1000 child-years among children under 24 months of age in Dhaka, which is the capital of the country.[5] During the 2019 RSV season, about 20% of pediatric beds in a 650-bed tertiary-level hospital in Bangladesh were occupied by children with RSV infection, imposing substantial strain on hospital capacity and limiting the ability to manage other severe conditions.[6] In a multi-country community-based study, RSV was identified as the leading cause of neonatal infections in rural settings of South Asia.[7] However, data on the true community burden of RSV infection in Bangladesh's rural areas remain scarce, particularly in areas with limited laboratory and healthcare resources.

Several high-income countries have begun to deploy passive immunisation (e.g., monoclonal antibodies and maternal vaccines) against RSV. To guide evidence-based policy and targeting of interventions in Bangladesh, population-based data on burden from rural communities are essential. This study therefore aims to determine RSV-associated acute respiratory infection (RSV-ARI) incidence, and risk factors among children younger than two years in rural Bangladesh.

Methods

This prospective, community-based study was conducted over 23 months (August 2021–June 2023) in two unions, Bhatgram and Mirzapur Sadar, of the Mirzapur sub-district, Tangail District, Bangladesh. Children of permanent residents younger than 24 months were enrolled through the Mirzapur Health and Demographic Surveillance System (MHDSS), a population-based platform that has been operational since 2007 to continuously monitor the population and health dynamics in that area (Supplementary Fig. S1).[8] Permanent residency was defined as the parents having resided in the study area for more than three months and for in-migrants, it is defined as intending to remain for at least three months.

In 2022, the two study unions together had 55 186 residents, yielding a population density of about 1872 people per square kilometre, with a birth rate of 15.5 per 1000 population and a crude death rate of 6.9 per 1000 population. Children residing in these unions were enrolled at first visit throughout the study period and were followed until their second birthday, outmigration, death, or the end of the study period, whichever occurred first.

The World Health Organisation (WHO) definition for acute respiratory infection (ARI) was used for suspected ARI identification.[9] A child was considered to have ARI if they presented with acute illness characterised by the sudden onset of symptoms, and evidence of respiratory infection, indicated by the presence of at least one of the following signs: shortness of breath, cough, sore throat or coryza. Fever was defined as a body temperature greater than or equal to 99.5 °F. Shortness of breath was assessed using age-specific respiratory rate thresholds of greater than or equal to 60, 50 and 40 breaths per minute for infants of 0–59 days of age, children between 2 and 12 months of age, and for children between 12 and 23 months of age respectively. Local village health workers (VHWs) were trained by physicians to conduct weekly home visits and identify ARI based on the definition.

The study area was divided into 19 clusters, each consisting of approximately 250 households, with one VHW assigned to each cluster. Approximately 50 households were visited by a VHW per day, ensuring that all households in their area were visited once every week. During the household visits, VHWs approached caregivers of study-eligible children and invited them to participate in the study. If the caregiver agreed and provided written informed consent, the child was enrolled in the study. During each VHW visit, caregivers (primarily mothers) were asked whether the child under follow-up had developed any signs of respiratory illness such as fever, cough, breathing difficulties, coryza, or sore throat since the last visit. For children with suspected fever, body temperature was measured using a digital thermometer by VHWs. For children with breathing difficulties, respiratory rate was counted by observing the number of chest movements in 1 min. Information was recorded using a digital data collection questionnaire that automatically identified the ARI episodes using the provided information. When a child with ARI was identified through the system, an automated electronic alert was sent to the sample collection team. Nasopharyngeal swab samples were collected by trained nurses following standard procedures described below.

A two-member sample collection team (one nurse and one porter) visited the household to collect nasopharyngeal samples from children with ARI. After obtaining written informed consent from the child's parent or guardian for sample collection, a nasopharyngeal swab was collected by the nurse using a FLOQSwab (Copan Diagnostics, Brescia, Italy). The swab was inserted into the nasopharynx, rotated 2–3 times in both directions, then placed in 1 mL Skim Milk–Tryptone–Glucose–Glycerol (STGG) medium. The STGG medium was prepared in the laboratory and contained 2% skim milk, 3% tryptone soy broth, 0.5% glucose, and 20% glycerol. Specimens were kept at 4–8 °C in a cool box and transported daily to the central laboratory of the Child Health Research Foundation, Bangladesh, for RSV testing. To avoid oversampling, children who had met the inclusion criteria and been swabbed were not eligible for repeat collection for 14 days after their initial sample.

Nasopharyngeal specimens (140 μL) were processed for viral RNA extraction using the Quick-DNA/RNA Viral Magbead (Zymo Research, Orange, California, USA) according to the manufacturer's protocol. From each extraction, 7 μL of extracted RNA underwent RT-qPCR which was performed using the AgPath-IDTM One-Step RT-qPCR kit (Thermo Fisher Scientific, Waltham, Massachusetts, USA) and previously published RSV-specific primers and probe (forward primer: 5′-GGCAAATATGGAAACATACGTGAA-3′, reverse primer: 5′-TCTTTTTCTAGGACATTGTAYTGAACAG-3′, probe: 5′-CTGTGTATGTGGAGCCTTCGTGAAG CT-3' (labeled at the 5′ end with FAM and quenched at the 3′ end with Black Hole Quencher-1)). Reactions were run on an Applied Biosystems 7500 Fast Dx qPCR system (Thermo Fisher Scientific, Waltham, Massachusetts, USA). Cycling conditions were 50 °C for 10 min, 95 °C for 1 min, and 40 cycles of 95 °C for 10 s, and 60 °C for 1 min. Specimens were considered RSV-positive if they produced a true sigmoidal amplification curve with a cycle threshold (Ct) value < 35.

Statistical analysis

Participants were stratified into different age groups (0–5 months, 6–11 months, and 12–23 months). RSV-ARI incidence was calculated using Poisson regression models, with each child's follow-up time as the exposure. The association between risk factors and RSV-ARI was calculated using Poisson regression

models where child age group was considered as a time-varying exposure, with children moving into the next age group during follow-up. Characteristics of children with and without RSV infection were compared using the chi-square test or *t*-test, as appropriate; missing values were not imputed. Person-time was computed as the difference between each child's first and last home-visit dates (or date of death, where applicable), expressed in child-years. Unique ARI episodes were defined as those separated by greater than 14 days. Child age at infection was calculated from the date of birth. Preterm birth status (<37 weeks' gestation) was ascertained from last menstrual period data collected every 16 weeks in the MHDSS. Socioeconomic status (SES) was derived via principal component analysis of household asset variables. In addition to durable goods, other household assets, such as drinking water sources, sanitation facilities, cooking materials and construction materials for walls, roofs, and floors were taken into consideration for generating the asset score. Households were ranked by their first-component scores and categorized into quintiles (from lowest to highest). Analyses were conducted in Stata version 14.0 (StataCorp, College Station, Texas, USA) and R version 4.2.2 (R Foundation for Statistical Computing, Vienna, Austria). Statistical significance was set at a two-sided p-value < 0.05.

Ethics statement

We obtained ethical clearance for this study from the Ethical Review Board of Bangladesh Shishu Hospital and Institute, Bangladesh (IRB No. BICH-ERC-08-02-2021) and from the Institutional Review Board of the International Vaccine Institute (IVI IRB), South Korea (IRB No. 2021-021). Written informed consent was obtained from caregivers for enrollment prior to study participation. In addition to verbal explanation by a VHW, an information sheet written in the local language (Bangla), detailing the study objectives, procedures, and potential benefits and risks, was provided to the caregivers, who were given adequate time to read the document and make an informed decision. In cases where the caregivers were unable to read, the information sheet was read aloud by the VHW. Additional written informed consent was obtained prior to collection of nasopharyngeal samples. Participation in this study was entirely voluntary. Children enrolled in the study received free medical consultations for any illness through the outpatient department of Kumudini Women's Medical College Hospital, similar to the other under-five children in the study area.

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis or interpretation, writing of the report, or decision to submit this manuscript for publication.

Results

Between August 2021 and June 2023, 3668 children younger than 24 months of age were approached for enrollment based on the list of eligible children identified through the MHDSS database. 3667 were successfully enrolled, and one child died before the enrollment process was completed (Fig. 1). Among the enrolled children, follow-up was not completed for 405 children as they out-migrated from the study area. The mean follow-up duration was 344 days for those who out-migrated, compared with 417 days for those who completed the follow-up. The demographic and socioeconomic characteristics of children in both groups were comparable (Supplementary Table S1). Over the 23-month surveillance period, VHWs completed 143 918 weekly household visits; enrolled children were present during 136 935 (95.2%) visits. 6992 episodes of illness (for any reason) were recorded, of which 5907 episodes (among 2093 children) met the WHO ARI case definition.

Nasopharyngeal swabs were obtained for 4586 (77.6%) of the 5907 ARI episodes, from 1886 children. Details on reasons for unsuccessful sample collection are provided in Fig. 1. The duration between onset of illness and sample collection ranged between 1 and 12

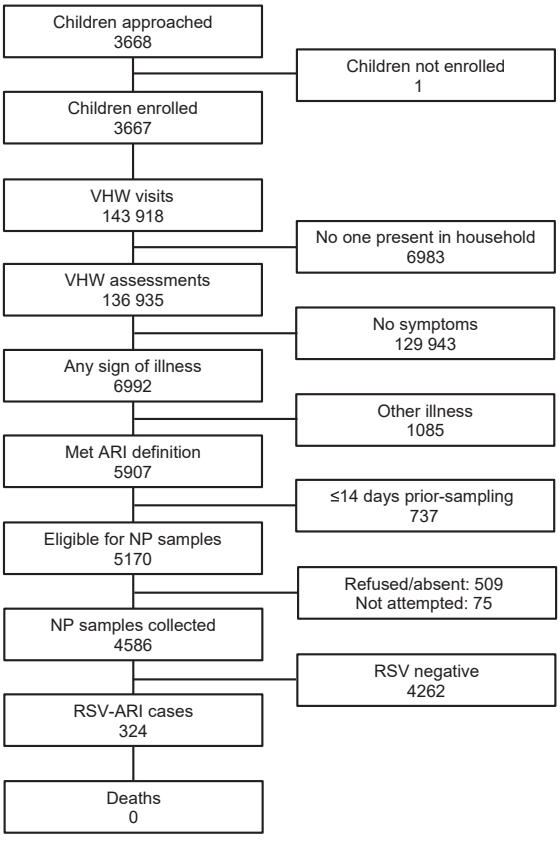

Fig. 1: Study flow diagram of the community-based RSV-ARI surveillance in Mirzapur, Bangladesh.

days with a median of 4 days (Supplementary Fig. S2a), and 99.8% of the samples were collected within 72 h of case notification (Supplementary Fig. S2b). RSV was detected by RT-qPCR in 324 samples (7.1%, 324/4586), representing 316 children. Eight children had two distinct RSV episodes, with an average interval of 289 days (range 21–522) between first and second occurrence (Supplementary Table S2). No RSV-positive child died during the study period.

The demographic and socio-economic characteristics of enrolled children are summarized in Table 1. Of the 3667 enrolled children, 1875 (51.1%) were male and 1792 (48.9%) were female. 30.1% were enrolled within their first two months of life, 49.0% by five months, and 70.6% by 12 months; the remaining 29.4% were enrolled between 12 and 24 months of age. Overall, 17.3% of the enrolled children were born preterm (<37 weeks' gestation).

The 3667 enrolled children contributed a total of 3008 child-years. The overall incidence of RSV-ARI was 107.7 per 1000 child-years (95% CI: 96.6–120.1). RSV-ARI incidence was highest in the first six months of life at 164.5 per 1000 child-years (95% CI: 134.2–201.6) compared with other age groups (Fig. 2), with the highest rates observed in the first two months (Supplementary Table S3). Incidence declined to 150.1 (95% CI: 126.2–180.0) at 6–11 months, and 67.1 (95% CI: 55.6–80.8) at 12–23 months. Children younger than 6 months had a 2.2 times higher risk of RSV–ARI (IRR 2.2, 95% CI: 1.6–3.0) than children in their second year of life. Children between 6 and 11 months also had an increased risk of RSV–ARI (IRR 2.0, 95% CI: 1.5–2.7) (Fig. 2, Supplementary Table S4).

Preterm infants had an RSV-ARI incidence of 167.8 per 1000 child-years (95% CI: 133.4–211.1), which was 1.5 times higher (IRR 1.5, 95% CI: 1.1–2.0) than in term infants (108.7 per 1000 child-years, 95% CI: 95.0–124.4). No significant difference in RSV-ARI incidence was observed by sex (IRR 1.1, 95% CI: 0.9–1.5); place of delivery, maternal age at delivery, household size, maternal occupation, maternal education, and socio-economic status were not significantly associated with RSV-ARI among children (Fig. 2).

RSV-ARI infections exhibited clear peaks (Fig. 3). In August–September 2021, 37.6% (92/245) of swabs were RSV-positive; a second peak spanned from October 2022 to February 2023, with 16.1% (196/1218) positivity. During the remaining months, RSV detection fell to near zero.

Among the 324 RSV-positive episodes, cough was present in almost all individuals (95.7%, 310/324), followed by breathing difficulties (32.7%, 106/324), fever (26.2%, 85/324), and fast breathing (26.1%, 83/324) (Table 2). Chest indrawing, a marker of more severe lower respiratory involvement occurred in 9.8% (31/324) of RSV patients vs. 2.3% (91/4262) of RSV-negative ARI episodes.

Discussion

In this 23-month prospective, community-based study conducted in rural Bangladesh, 3667 children were followed to estimate the burden of RSV-ARI. The study was conducted in the context of the recent licensure of a maternal RSV vaccine and monoclonal antibodies, both of which hold promise for reducing RSV-associated illness at the community level.[10–12] Overall, 7.1% of children with ARI tested positive for RSV, corresponding to an RSV-ARI incidence rate of 107.7 episodes per 1000 child-years. Two distinct peaks in RSV activity, August–September 2021 and October 2022–February 2023, accounted for the majority of patients observed in this study.

Our overall RSV-ARI incidence aligns closely with previous findings from urban populations in Bangladesh. A study among children younger than 2 years in urban Dhaka reported an RSV incidence of 125 episodes per 1000 child-years,[5] while another study reported an incidence of 11.24 per 100 person-years in urban Dhaka, Bangladesh.[13] Similarly, a substantial RSV burden was reported in Bangladesh's hospital-based studies.[6,14] Compared with other South Asian settings, the incidence observed in this study is lower than the 213 per 1000 child-years reported among infants in rural Nepal.[15] This difference may be attributed to the highly seasonal nature of RSV,[16] as well as variation in observation periods and study populations.[17] The Nepal study followed children only through the first six months of life, a period when susceptibility to RSV is highest.[18,19] In our cohort, we also observed the highest incidence of RSV-ARI during the first six months of life (164.5 episodes per 1000 child-years). Conversely, our incidence rate exceeds those from a remote tribal Indian population, where children between 0 and 2 years experienced 20.9 RSV LRTI episodes per 1000 child-years.[20] Heterogeneity in study design, surveillance intensity, and case definitions must be considered when comparing findings across regions.

Taken together, our study findings suggest that RSV prevention strategies including maternal immunisation and immunoprophylaxis using monoclonal antibodies for high-risk populations are likely to have comparable effectiveness across both rural and urban settings in Bangladesh. Notably, RSV-ARI incidence peaked at 164.5 per 1000 child-years in the first six months of life,[7] a window ideally covered by maternal antibody transfer.[10,12,21] In our cohort, 17.3% of children were born preterm, similar to the national rate of 16.2%.[22] Preterm infants faced a 1.5-fold higher RSV-ARI risk (IRR 1.5; 95% CI: 1.2–2.0). The markedly elevated risk in preterm infants is consistent with global literature,[2] including studies from South Asia.[15] Preterm children are at increased risk of severe RSV illness due to reduced transplacental transfer of maternal antibodies and immature lung development.[21]

Characteristics	Overall	%	RSV+	%	RSV-	%	*p*-value
Children	3667		316		3351		
Child-years contributed	3008		352		2656		
Gestational age (n = 2785 available)	2785		276		2509		<0.001
Preterm (32 to <37)	483	17.3	69	25.0	414	16.5	
Term (≥37)	2302	82.7	207	75.0	2095	83.5	
Age at enrollment							
<28 days	637	17.4	71	22.5	566	16.9	0.012
≥28 to <59 days	467	12.7	54	17.1	413	12.3	0.015
≥59 days to <5 months	694	18.9	75	23.7	619	18.5	0.022
≥5 months to <12 months	791	21.6	79	25.0	712	21.2	0.121
≥12 months to <24 months	1078	29.4	37	11.8	1041	31.1	<0.001
Sex							
Male	1875	51.1	172	54.4	1703	50.8	0.219
Female	1792	48.9	144	45.6	1648	49.2	
Maternal characteristics							
Median mother's age (IQR) at childbirth (n = 3446 available)	25 [20–30]		25 [20–30]		25 [20–30]		0.799
Homemaker (n = 3446)	2909	84.4	266	86.4	2643	84.2	0.324
Completion of primary education (n = 3446)	3114	91.2	277	90.0	2867	91.4	0.397
Delivery place (n = 2785 available)	2785		276		2509		0.671
Facility delivery	2471	88.7	247	89.5	2224	88.6	
Home delivery	314	11.3	29	10.5	285	11.4	
Demographic characteristics							
Socioeconomic status (n = 3106 available)	3106		278		2828		
Lowest	635	20.4	63	22.7	572	20.2	0.337
Lower	618	19.9	65	23.4	553	19.6	0.127
Middle	614	19.8	47	16.9	567	20.0	0.209
Higher	622	20.0	60	21.6	562	19.9	0.497
Highest	617	19.9	43	15.5	574	20.3	0.054
Source of drinking water (n = 3128 available)	3128		281		2847		
Piped water	9	0.3	0	0.0	9	0.3	0.345
Well water	3001	95.9	275	97.9	2726	95.7	0.087
Surface water	1	0.03	1	0.4	0	0.0	0.002
Filtered water	115	3.7	5	1.8	110	3.9	0.077
Other	2	0.1	0	0.0	2	0.1	0.657
Received at least one vaccine from EPI program (n = 3502 available)	3436	98.1	307	99.4	3129	98.0	0.094
Illness history							
Number of household visits	136 935		16 357		120 578		
Number of visits per child	55 [37–68]		63 [47–74]		53 [36–67]		<0.001
Number of visits with any illness sign	6992	5.1	1636	10.0	5356	4.4	<0.001
Number of visits with ARI signs	5907	84.5	1482	90.6	4425	82.6	<0.001
Number of ARI episodes per child	4 [2–8]		7 [4–12]		3 [2–6]		<0.001

Table 1: **Characteristics of the study participants by RSV infection status.**

At present, maternal RSV vaccination is recommended during the third trimester. Consequently, preterm babies who are more susceptible to RSV infection may receive less protection as transplacental antibody transfer increases late in pregnancy. Optimising the timing of maternal RSV vaccination is required to protect preterm children, the most vulnerable group for RSV infection. Vaccinating mothers earlier in pregnancy may provide better protection against RSV for preterm children, however, this strategy needs careful consideration, as earlier immunisation may result in waning immunity by the time a term child is born.[23] Alternatively, passive immunoprophylaxis with monoclonal antibodies (e.g., nirsevimab) should be considered a priority intervention for this high-risk group to ensure robust protection across the full birth spectrum.[24,25] Furthermore, modeling studies have projected that newer long-acting monoclonal antibodies such as nirsevimab could confer broad, season-long protection for all infants, potentially yielding a much broader impact on RSV burden in our population than maternal vaccination alone.[6]

Consistent with previous studies that have reported seasonal variation in RSV infection,[18] our data show

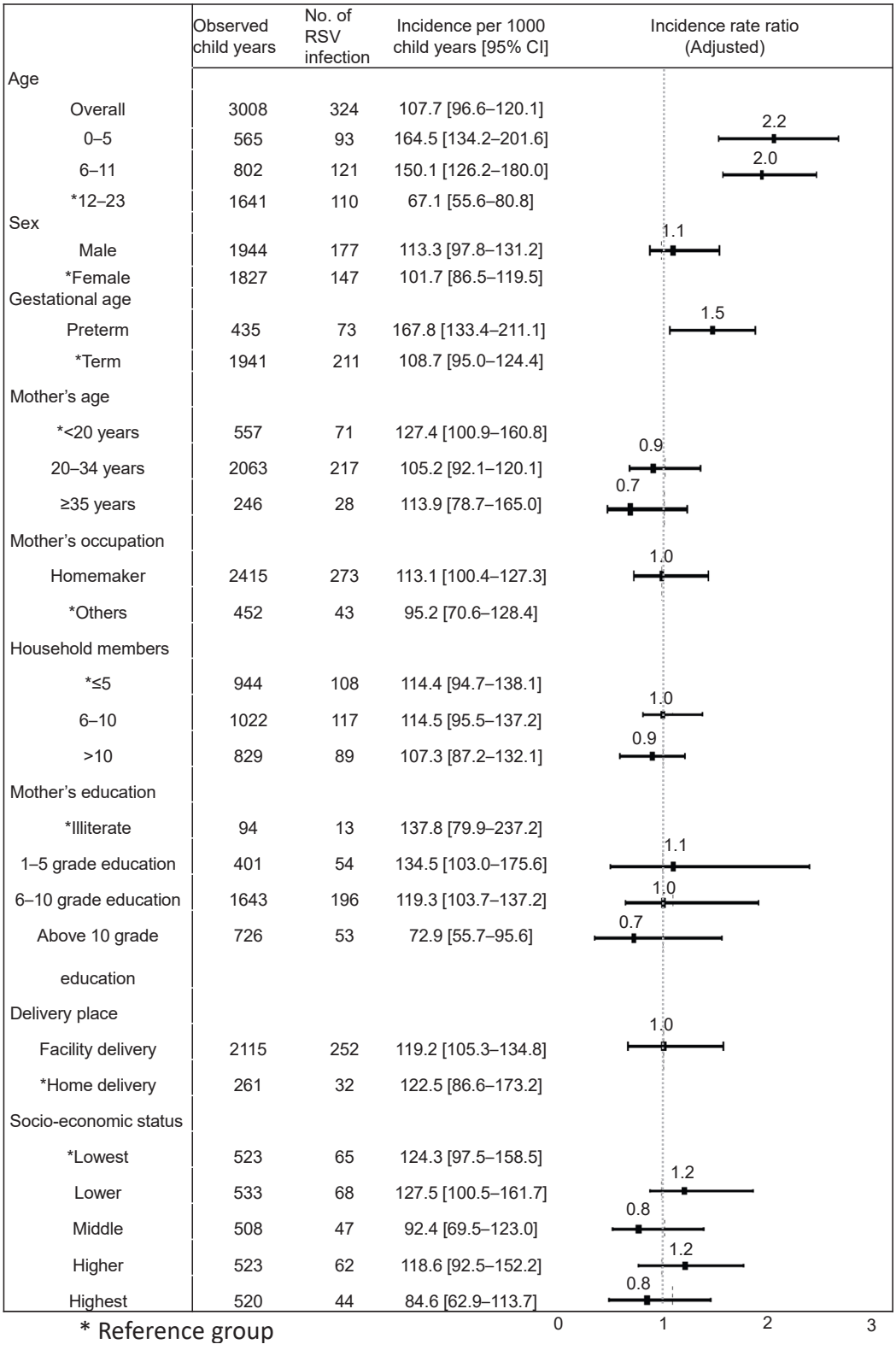

Fig. 2: Incidence of RSV-ARI and incidence rate ratios according to child age, sex, gestational age, and selected demographic and household characteristics in rural Bangladesh.

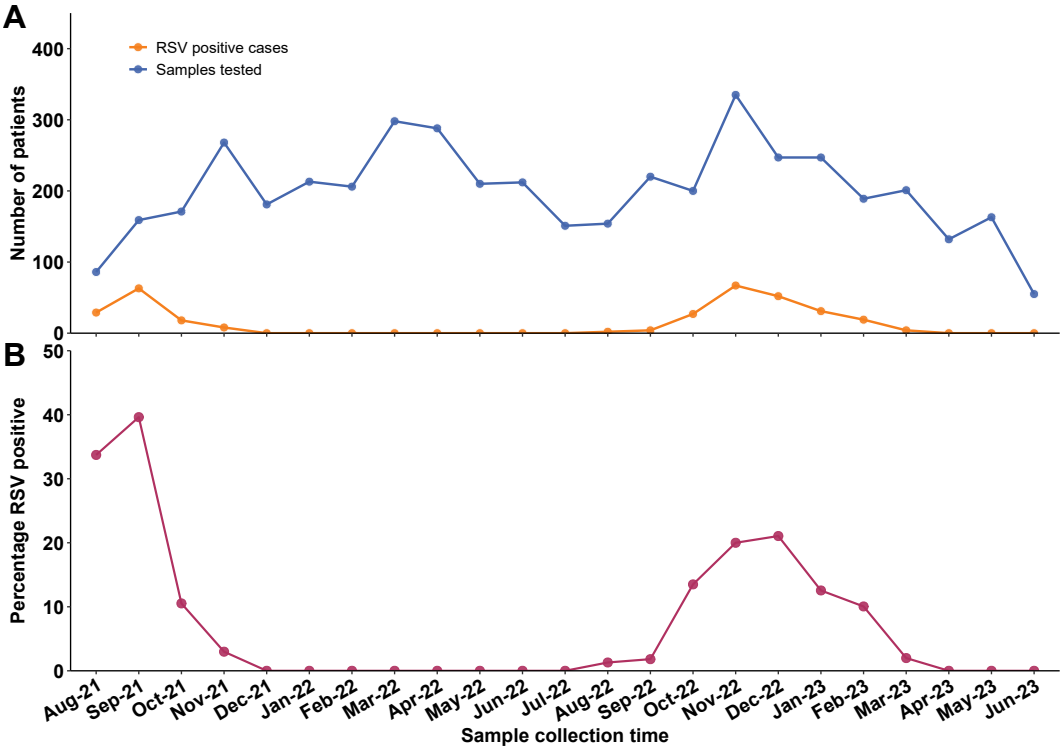

Fig. 3: Monthly RSV detection in nasopharyngeal samples from children in rural Bangladesh. (A) Number of nasopharyngeal samples tested and RSV cases detected in each calendar month. (B) Percentage of RSV-positive cases in nasopharyngeal samples in each calendar month.

that RSV incidence varied by month. During the study period, RSV detection peaked in August to September 2021 and again from October 2022 to February 2023. Unlike countries in temperate regions where RSV seasons are well defined, equatorial countries such as Bangladesh experience varied RSV peaks, sometimes in winter, summer, or even twice a year.[26,27] These patterns highlight the importance of generating local epidemiological evidence to inform policy decisions on RSV prevention strategies.

Although hospital-based studies have suggested higher RSV severity and care-seeking among male children, we observed no significant sex-specific difference in community-based RSV-ARI incidence (male: 113.3 vs. female: 101.7 per 1000 child-years).[28] In Bangladesh, in-hospital data showed sex-based disparities in pneumonia severity and mortality, despite equivalent treatment access. These differences may partly reflect differential care seeking behaviours, with male children receiving greater attention from caregivers, as well as biological factors such as relatively smaller airway diameters in male infants compared with female infants.[29,30] Our population-based surveillance indicates that in the community, both male and female infants are equally susceptible to RSV infection, reinforcing the need for prevention strategies that reach all children irrespective of sex.

Although RSV symptoms overlap with those of other viral infections,[31] chest indrawing was found to be a

Clinical sign	Overall (%) n = 4586	RSV positive (%) n = 324	RSV negative (%) n = 4262	*p*-value
Cough	3889 (84.8)	310 (95.7)	3579 (83.9)	<0.001
Chest indrawing[a]	122 (2.9)	31 (9.8)	91 (2.3)	<0.001
Difficulty breathing	956 (20.9)	106 (32.7)	850 (19.9)	<0.001
Fast breathing[a]	485 (11.4)	83 (26.1)	402 (10.3)	<0.001
Fever	731 (15.9)	85 (26.2)	646 (15.2)	<0.001
Sore throat	22 (0.5)	3 (0.9)	19 (0.5)	0.228

[a]Chest indrawing and fast breathing was available for 4236 cases.

Table 2: **Clinical characteristics of children with RSV-ARI in rural Bangladesh.**

prominent clinical sign associated with RSV infection in our study. Previous reports also suggested that chest indrawing was consistently associated with RSV infection.[32] This symptom is not currently included in the WHO case definition for RSV-ARI.[9] Given its strong association with RSV and its feasibility for detection by trained community health workers,[33] further research is needed to evaluate whether its inclusion in community-based RSV surveillance protocols would increase surveillance sensitivity.

Our study offers several distinctive strengths. First, by embedding surveillance within a rural health and demographic surveillance system where diagnostic capacity is limited and RSV testing is not routinely available, we were able to generate population-level estimates of RSV burden in this setting, complementing prior work that followed a small cohort of 252 children and reported only pneumonia patients.[34] Second, our weekly household visits by trained village health workers, coupled with a mobile specimen-collection team of nurses and porters, minimized barriers to care and ensured timely capture of symptomatic ARI and high-quality respiratory sampling directly at home. Third, resident children younger than two years, regardless of their age at first visit were eligible for enrollment, allowing the capture of most eligible RSV-ARI episodes across the study area over the 23-month study period.

Nevertheless, our findings should be interpreted considering limitations. We were unable to collect specimens for approximately 10% of identified ARI episodes, mainly due to caregiver refusal or child absence, which may have led to some underestimation of RSV incidence. Weekly surveillance, while intensive, may have missed very brief illnesses occurring between visits. Secondary RSV infections occurring within 14 days might not have been detected because of the study sampling strategy. In addition, in some cases a longer interval between illness onset and sample collection might have reduced RSV detection.[35] The longstanding presence and health-education activities of our VHWs could have influenced caregiver behaviour and care-seeking, potentially affecting reporting of RSV infections in these communities. Finally, this study was conducted during the COVID-19 pandemic, and findings might differ from those observed in the pre- or post-pandemic periods.

In summary, our community-based surveillance highlights a high burden of RSV infections among children with ARI in rural Bangladesh, with incidence peaking in the first six months of life and disproportionately affecting preterm infants. The most critical priority is the implementation of effective prevention strategies. Policymakers should consider implementing maternal RSV vaccination to protect all newborns and deploying monoclonal antibody prophylaxis for the high-risk infants. Future evidence is needed to optimise the timing of maternal immunisation which could maximise protection in preterm infants.

Contributors

MSI was responsible for data validation and analysis of the study, and drafting the initial manuscript. NK contributed to data management, analysis, and drafting the manuscript. SH contributed to study coordination, training, and data analysis. MSI, NK and SH accessed and verified data. MSH was involved in coordinating the field implementation of the study and sample collection. SI, HR, and HS were involved in sample processing and testing. ABJ and SJM were involved in coordination, and trained the doctors and nurses, assisted in the implementation of the study, and contributed to manuscript editing. YH participated in data analysis, preparation of figures, and manuscript editing. SKS and SS contributed to conceptualization, funding acquisition, study design, implementation, monitoring, data analysis, drafting the initial manuscript, and preparation of figures. FM, JI, JYP, AH, DRK contributed to conceptualization, funding acquisition, study design and monitoring of the project. All authors reviewed the manuscript and agreed on the contents.

Data sharing statement

The study's de-identified dataset is available from the corresponding author upon reasonable request.

Editor note

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Statement on AI use

During the preparation of this work, the authors used ChatGPT to check grammar, spelling and improve readability of the manuscript. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of interests

The authors have declared no conflict of interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lansea.2026.100769.

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