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Contacts

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Australian Government Department of Health and Aged Care
GPO Box 9848, (MDP 6)
CANBERRA ACT 2601

www.health.gov.au/cdi

cdi.editor@health.gov.au

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Original article

Epidemiology of respiratory syncytial virus in Central Queensland, Australia

Emma Gale, Nicolas Smoll, Mahmudul Hassan Al Imam, Jacina Walker, Michael Kirk, Sunday Pam, Robert Menzies, Gulam Khandaker

Abstract

Respiratory syncytial virus (RSV) is the leading cause of bronchiolitis and pneumonia in infants. Little is known about the epidemiology, burden, and seasonality of RSV in subtropical regions of Australia like Central Queensland. This information is important to plan prevention strategies, including therapeutics, future vaccines, and health system preparedness.

We collected data on laboratory-confirmed RSV cases and admissions in Central Queensland for the period 1 July 2021 to 31 December 2022. From July 2021, RSV was listed as a nationally notifiable condition on laboratory-confirmed diagnosis.

During the study period, 1,142 laboratory-confirmed cases of RSV (50.0% female sex) were reported, with 169 cases (14.8%) requiring hospital admission, 12 of which (7.1%) required intensive care unit/high dependency unit admissions; two deaths occurred. Of cases requiring hospital admission, RSV was listed as the primary diagnosis in 113/169 cases (66.9%); 63/169 admitted cases (37.3%) had a major comorbidity. Of all cases, 55.4% were in children < 5 years of age (20.9% hospitalised); 35.7% in children < 2 years of age (24.3% hospitalised), and 19.1% in children < 12 months of age (27.5% hospitalised). Children under five years of age made up 78.1% of admissions, a rate of 9.0 admissions per 1,000 children over the 18-month study period, with an average age of 15.8 months (standard deviation, SD: 13.1 months) in this cohort. Indigenous children aged < 5 years were over-represented in cases (rate ratio, RR: 1.6; 95% confidence interval [95% CI]: 1.3–1.9) and admissions (RR: 1.6; 95% CI: 1.0–2.4). Antibiotics were prescribed to 48.5% of admitted cases under two years of age, despite documented bacterial infection in only 26.3% of these cases; antibiotic prescription was significantly higher in those who received a chest X-ray ($p < 0.001$). Of all cases, 33.5% occurred in July 2022 alone, with greater than 75.0% of cases occurring during June–August 2022.

RSV showed year-round activity with a distinctive winter peak in 2022; however, this season was likely affected by coronavirus disease 2019 (COVID-19) restrictions and behaviours. Ongoing surveillance is required to better understand the epidemiology and seasonality of RSV in Central Queensland.

Keywords: epidemiology; respiratory syncytial virus; seasonality; surveillance; Australia

Introduction

Respiratory syncytial virus (RSV) remains a primary cause of lower respiratory tract infection in infants and young children globally.[1,2] It contributes substantially to morbidity and mortality, particularly in those under six months of age.[1,3] Up to 70% of children have been infected with RSV by one year of age, and reinfection occurs across the lifetime with protective immunity incomplete and short-lived.[1,4] In 2019, RSV was responsible for 3.6 million hospital admissions worldwide in children under five.[3] Australia saw 63,814 admissions between 2006 and 2015 with a principal diagnosis code associated with RSV, 94.9% of which were in children under five and equating to a hospitalisation rate of 418 per 100,000 in this age group.[5] Modelling suggests that the true burden of RSV admissions may be 30-57% higher.[6] The annual cost of care in Australia for children under five hospitalised with RSV was estimated between AU$59 million and AU$121 million in the 2018 season alone,[7] highlighting the economic burden RSV has on the Australian health care system. RSV infection is also recognised as a potential cause of severe disease in older adults and adults with chronic cardiorespiratory or immunocompromising conditions although most available studies focus on children.[8–11]

The clinical presentation of RSV infection varies with age. It most commonly manifests as bronchiolitis in children under twelve months, although can be seen up to twenty-four months of age.[12–14] In older children and adults, it may present as an upper respiratory tract infection, viral pneumonia, viral-induced wheeze, acute exacerbation of asthma, or exacerbation of other underlying medical conditions.[12,13] Episodes of apnoea can be the only presenting symptoms in neonates.[1,13]

Since the treatment for RSV remains supportive, preventing severe disease in those at the highest risk is vital.[15–17] A number of promising RSV vaccines are under development, although none are licensed at this time.[11,18] Passive immunisation with the monoclonal antibody Palivizumab is currently recommended for infants and children with specific medical risk factors at high risk of severe infection, given as a course of five intramuscular injections at monthly intervals throughout the RSV season.[15] Indications for use include congenital heart disease, chronic lung disease, preterm birth, pulmonary hypertension, and immunodeficiencies.[1,15] This has been shown to reduce hospitalisation for RSV and may reduce the overall risk of infection in these cohorts.[1,15]

RSV spreads via contact with infected respiratory droplets with viral viability and epidemics influenced by climate and seasonal factors.[17,19] Transmission may be altered by the meteorological conditions and human behaviours in response to weather that can vary across cultures. RSV seasonality is well-defined in temperate regions with annual epidemics occurring over the cooler, winter season and frequently showing a biennial cycle.[1,4,20–23] This is driven by the low temperatures enhancing virus survival, increased crowding indoors, and growing evidence for low population vitamin D levels affecting immunity.[19,24,25] Tropical and subtropical areas may see peak activity associated with the rainy seasons, however, there is great variability across sites, latitudes, and hemispheres.[2,4,22–24]

Other social and environmental factors place infants and children at increased risk of both infection and hospitalisation for RSV. These include being of male sex, timing of birth in relation to RSV season, parental smoking, ethnicity, having older siblings, being of lower socioeconomic status, living in over-crowded conditions, and attending childcare,[19,25–27] while breastfeeding is a protective factor.[27,28]

Understanding the local epidemiology, burden, management, and seasonality of RSV in the subtropical region of Central Queensland is important to inform local prevention, treatment, and control strategies. This includes informing the timing of RSV prophylaxis for at-risk individuals, and potentially for RSV vaccinations and therapeutics in the future.[2] We aimed to define the epidemiology and seasonality of RSV in Central Queensland by utilising routinely collected notifiable disease surveillance data and admission data.

Methods

Population and setting

The population of the Central Queensland hospital and health service (HHS) region is estimated at 230,000 people, spread over a large geographical area of 117,800 square kilometres.[29,30] Approximately 7.2% of the population identify as Aboriginal and Torres Strait Islander people, of whom 12.4% are aged under five years.[30]

Central Queensland Hospital and Health Service is responsible for the operation of 12 public hospitals and provides services for Aboriginal and Torres Strait Islander health, maternity, cancer care, mental health, alcohol and other drugs, oral health, GP referrals, and outreach specialists.[31]

Central Queensland has a subtropical climate with hot, wet summers and warm, dry winters with an average annual temperature of 21 °C.[29] Rainfall varies across the region annually and seasonally, but is greatest in the summer months of December to February.

Data collection

This is a retrospective study of laboratory-confirmed RSV cases and admissions over an eighteen-month period from 1 July 2021 to 31 December 2022. RSV was listed as a nationally notifiable condition on pathological diagnosis from July 2021, with all positive Queensland samples required to be reported to the state Notifiable Conditions Surveillance (NOCS) database from this date.[32]

Data for confirmed RSV cases with a postcode listed in the Central Queensland Hospital and Health Service region was extracted from the statewide NOCS database. RSV admission data from the two major public acute care services, Rockhampton, and Gladstone Hospitals, were retrieved from Queensland Hospital Admitted Patient Data Collection (QHAPDC) using selected *International Classification of Diseases, Tenth Revision* (ICD-10) diagnostic codes. RSV-specific codes included for extraction were J12.1 (respiratory syncytial virus pneumonia), J21.0 (acute bronchiolitis due to RSV), J20.5 (acute bronchitis due to RSV) and B97.4 (RSV as the cause of disease classified elsewhere). Other non-RSV bronchiolitis diagnostic codes included were J21.9 (unspecified bronchiolitis), J21.8 (bronchiolitis due to other specified organisms), and J21.1 (bronchiolitis due to human metapneumovirus) to capture any misclassified paediatric admissions.

NOCS data and admission data were merged manually using Medicare numbers, dates of birth and first and last names to find those with a laboratory-confirmed diagnosis of RSV. Admissions linked to a confirmed RSV notification within fourteen days either side of admission were included for analysis. Patient encounters with a re-admission for the same illness within 48 hours of discharge were merged. Clinical data for confirmed RSV admissions were gathered from emergency department notes and discharge summaries available on the Viewer data system. This included the collection of details such as the documented presence of concurrent infections with other respiratory diseases (e.g., COVID-19, rhinovirus, adenovirus, influenza A, and human metapneumovirus). Clinical data were limited by the quality of the documentation and a lack of access to inpatient notes.

Population data for 2021 was obtained from the Australian Bureau of Statistics to calculate infection rates.[33] This was used as a proxy for 2022 population data. Climate data were obtained from the Australian Government Bureau of Meteorology Rockhampton Aero station.[34] Where rainfall was recorded as a multi-day total, this total was averaged out across the relevant days.

Data analysis

Data analyses were performed using Statistical Package for the Social Sciences (SPSS) version 28.0.1.1 and Microsoft Excel Version 2202 for figure generation. In addition to descriptive statistics, the relative risk was calculated using relevant Central Queensland population data (see Appendix A, Table A.1) as the denominator, a difference in means was calculated using an independent t-test, between-group proportions were compared using the chi-squared test with Yates' continuity correction for 2 × 2 tables, and Fisher's exact test for smaller samples where expected counts were less than five in 80% of cells. A p value of < 0.05 was taken as significant.

Results

During the period 1 July 2021 – 31 December 2022, there were 1,142 laboratory-confirmed RSV cases (50.0% female sex) notified in CQ; 169 of these cases (14.8%) required hospital admission (Table 1). Of those admitted, 12 (7.1%) required intensive care or high dependency unit admissions, and there were two in-hospital deaths within four weeks of admission for RSV in patients > 5 years of age with major comorbidities, equating to a case fatality rate of 0.2% for the region.

A total of 633 cases (55.4%) were children under five years of age, 132 of whom (20.9%) required hospitalisation. This equated to a hospitalisation rate of 9.0 admissions per 1,000 children in this age group, with an average age of 15.8 months (SD: 13.1 months) (Table 1). The proportion of hospitalisation was greatest in infants aged between one and three months, with 43.9% of cases in this age group (18/41) requiring admission (Table 2). Among Aboriginal and Torres Strait Islander children under five years of age, the risk of infection was 1.6 times as high as among non-Indigenous children in the same age group (95% CI: 1.3–1.9); the risk of hospital admission was similarly 1.6 times as high (95% CI: 1.0–2.4) among Aboriginal and Torres Strait Islander children under five years of age as among non-Indigenous children in this age group (Table 3).

Clinical features of admitted patients

RSV was listed as the primary diagnosis in 113/169 admitted patients (66.9%) and was documented as hospital-acquired in two patients (1.2%). Compared to patients under two years of age, admitted patients between two and five years of age were more likely to have one or more major comorbidities ($p = 0.035$) (Table 4). Cough was the most commonly documented symptom in both age groups, with dyspnoea or increased work of breathing significantly more common in those under two years of age ($p = 0.047$) and malaise or lethargy significantly more common in those over two years old ($p = 0.031$). Twenty-five patients across all age groups (14.8%) were documented as also positive for one or more respiratory viruses alongside RSV, including COVID-19, rhinovirus, adenovirus, influenza A, and human metapneumovirus. The average length of hospital stay (LOS) with RSV was 3.4 days overall (95% CI: 2.8–3.9 days). Among those with a major comorbidity, the average LOS was significantly higher at 4.5 days ($p = 0.011$).

In admitted children less than two years of age, respiratory support was required via low-flow oxygen in 27/99 cases (27.3%) and/or non-invasive ventilation in 30/99 cases (30.3%) (Table 5). Hydration support was needed via nasogastric tube in 39 (39.4%) and/or intravenous therapy in 14 (14.1%). Bacterial pneumonia or another bacterial infection was documented in 26/99 admitted children under two years of age (26.3%), yet antibiotics were prescribed to 48/99 admitted children in this age group (48.5%), either during admission or prior in the community. Chest X-ray (CXR) was performed in 52/99 patients in this age group (52.5%); the proportion on whom CXR was performed was significantly higher among patients who received antibiotics ($p < 0.001$) (Table 5).

Seasonal trend of RSV

Over the eighteen-month period, 856/1,142 cases (75.0%) occurred during June–August 2022, with 382/1,142 cases (33.5%) in July 2022 alone (Figure 1). This peak in incidence coincided with the lowest minimum and maximum temperatures of the year; however, there was no clear pattern seen with rainfall (Figure 2). The monthly rate of infection reached a peak in July 2022 for all ages, at 1.6 infections per 1,000 population. RSV admissions echoed this with 121/169 admissions (71.6%) occurring in the period June–August 2022, and 61 admissions (36.1%) in July alone.

Table 1: Demographic characteristics of notified RSV cases and admissions

Category	Characteristic	Cases		Infection rate		Hospital admissions		Admission rate	
		n	%	Cases/ 1,000	95% CI[a]	n	%	Admissions/ 1,000	95% CI[a]
Sex	Female	571	50.0	5.0	4.6–5.4	74	43.8	0.7	0.5–0.8
	Male	571	50.0	4.9	4.5–5.3	95	56.2	0.8	0.6–1.0
Age (years)	< 5	633	55.4	43.3	39.9–46.6	132	78.1	9.0	7.5–10.6
	5–19	167	14.6	3.4	2.9–4.0	5	3.0	0.1	0.0–0.2
	20–64	230	20.1	1.7	1.5–2.0	7	4.1	0.1	0.0–0.1
	65+	112	9.8	3.2	2.6–3.8	25	14.8	0.7	0.4–1.0
Identified status	Aboriginal and/ or Torres Strait Islander	181	15.8	11.0	9.4–12.6	30	17.8	1.8	1.2–2.5
	non-Indigenous, or not recorded	961	84.2	4.5	4.2–4.8	139	82.2	0.6	0.5–0.8
Total		**1,142**	**100.0**	**4.9**	**4.7–5.2**	**169**	**100.00**	**0.7**	**0.6–0.8**

a 95% CI: 95% confidence interval.

Table 2: Notified RSV cases and hospital admissions among children < 5 years of age

Age	Cases	Hospital admissions	
	n	n	%[a]
< 1 month	18	6	33.3
1–2 months	41	18	43.9
3–5 months	230	10	16.4
6–11 months	181	26	26.5
Total aged under one year	**61**	**60**	**27.5**
12–23 months	98	39	20.5
Total aged under two years	**218**	**99**	**24.3**
2–4 years	190	33	14.7
Total aged under five years	**633**	**132**	**20.9**

a Percentage of cases in indicated age group who were hospitalised.

Table 3: Notified cases and admissions by identified status in children < 5 years of age

Identified status	Cases		Infection rate		Hospital admissions		Admission rate	
	n	%	Cases/ 1,000	95% CI[a]	n	%	Admissions/ 1,000	95% CI[a]
Aboriginal and/or Torres Strait Islander	128	20.2	62.7	51.8–73.5	27	20.5	13.2	8.2–18.2
Neither Aboriginal and/or Torres Strait Islander, or not recorded	505	79.8	40.1	36.6–43.6	105	79.5	8.3	6.7–9.9
Total	**633**	**100.0**	**43.3**	**39.9–46.6**	**169**	**78.1**	**9.0**	**7.5–10.6**

a 95% CI: 95% confidence interval.

Table 4: Clinical details of admitted patients with RSV infection

Category	Clinical characteristic	Aged < 2 years N = 99		Aged 2–5 years N = 33		*p* value[a]
		n	%	n	%	
Major comorbidities listed	Any major comorbidity	19	19.2	13	39.4	**0.035**
	Respiratory (excluding asthma)	7	7.1	2	6.1	1.000
	Asthma	0	0.0	5	15.2	**< 0.001**
	Cardiac	3	3.0	3	9.1	0.165
	Preterm infant (< 37 weeks)	10	10.1	4	12.1	0.749
	Neurological/genetic	4	4.0	4	12.1	0.107
	Gastrointestinal/genitourinary	1	1.0	2	6.1	0.154
Symptoms	Cough	90	90.9	32	97.0	0.449
	Dyspnoea or increased work of breathing	86	86.9	23	69.7	**0.047**
	Fever	69	69.9	29	87.9	0.082
	Coryza	68	68.7	24	72.7	0.827
	Decreased oral intake	70	70.7	22	66.7	0.827
	Wheeze	38	38.4	11	33.3	0.755
	Vomiting	27	27.3	15	45.5	0.084
	Malaise or lethargy	26	26.3	16	48.5	**0.031**
	Irritability	19	19.2	7	21.2	1.000
	Diarrhoea	9	9.1	5	15.2	0.338
	Sore throat	1	1.0	2	6.1	0.154
	Apnoea	4	4.0	0	0.0	0.527
	Syncope or atonic episode	1	1.0	0	0.0	1.000
	Seizure	1	1.0	0	0.0	1.000
	Headache	0	0.0	1	3.0	0.250
	Rash	1	1.0	0	0.0	1.000
Investigation and treatment	Chest X-ray	52	52.5	23	69.7	0.128
	Bronchodilators	38	38.4	19	57.6	0.085
	Corticosteroids	33	33.3	16	48.5	0.176
	Nasogastric fluids	39	39.4	4	12.1	**0.007**
	Intravenous fluids	14	14.1	12	36.4	**0.010**
	Antibiotics	48	48.5	19	57.6	0.482
	Low-flow oxygen	27	27.3	11	33.3	0.657
	Non-invasive ventilation	30	30.3	4	12.1	0.066
Associated diagnoses and complications	Bacterial pneumonia	16	16.2	8	24.2	0.434
	Other bacterial co-infection	10	10.1	0	0.0	0.066
	Other viral pathogens	16	16.2	4	12.1	0.779
Outcomes	ICU/HDU admission[b]	9	9.1	1	3.0	0.450
	Transfer to tertiary centre	3	3.0	1	3.0	1.000
	In-hospital death	0	0.0	0	0.0	—

a *p* values less than 0.05 (shown in bold) are assessed as significant.

b ICU: intensive care unit; HDU: high dependency unit.

Table 5: Associations of treatments, complications and outcomes with the use of chest X-ray (CXR) in children aged less than two years (n = 99)

Clinical characteristics	Total	CXR[a]	No CXR[a]	*p* value[b]
Bronchodilators	38	22	16	0.524
Corticosteroids	33	21	12	0.176
Hydration (IVT/NGT)[c]	48	26	22	0.908
Antibiotics	48	37	11	**< 0.001**
Low-flow oxygen	27	16	11	0.551
NIV[d]	30	19	11	0.230
ICU/HDU[e]	9	8	1	0.052
Pneumonia	16	16	0	**< 0.001**
Comorbidities	19	13	6	0.198

a CXR: number of cases with the identified clinical characteristic for which chest X-ray was performed; No CXR: the number of such cases for which chest X-ray was not performed.

b *p* values less than 0.05 (underlined) are assessed as significant.

c IVT: intravenous therapy; NGT: nasogastric tube.

d NIV: non-invasive ventilation.

e ICU: intensive care unit; HDU: high dependency unit.

Figure 1: RSV cases and admissions over the study period

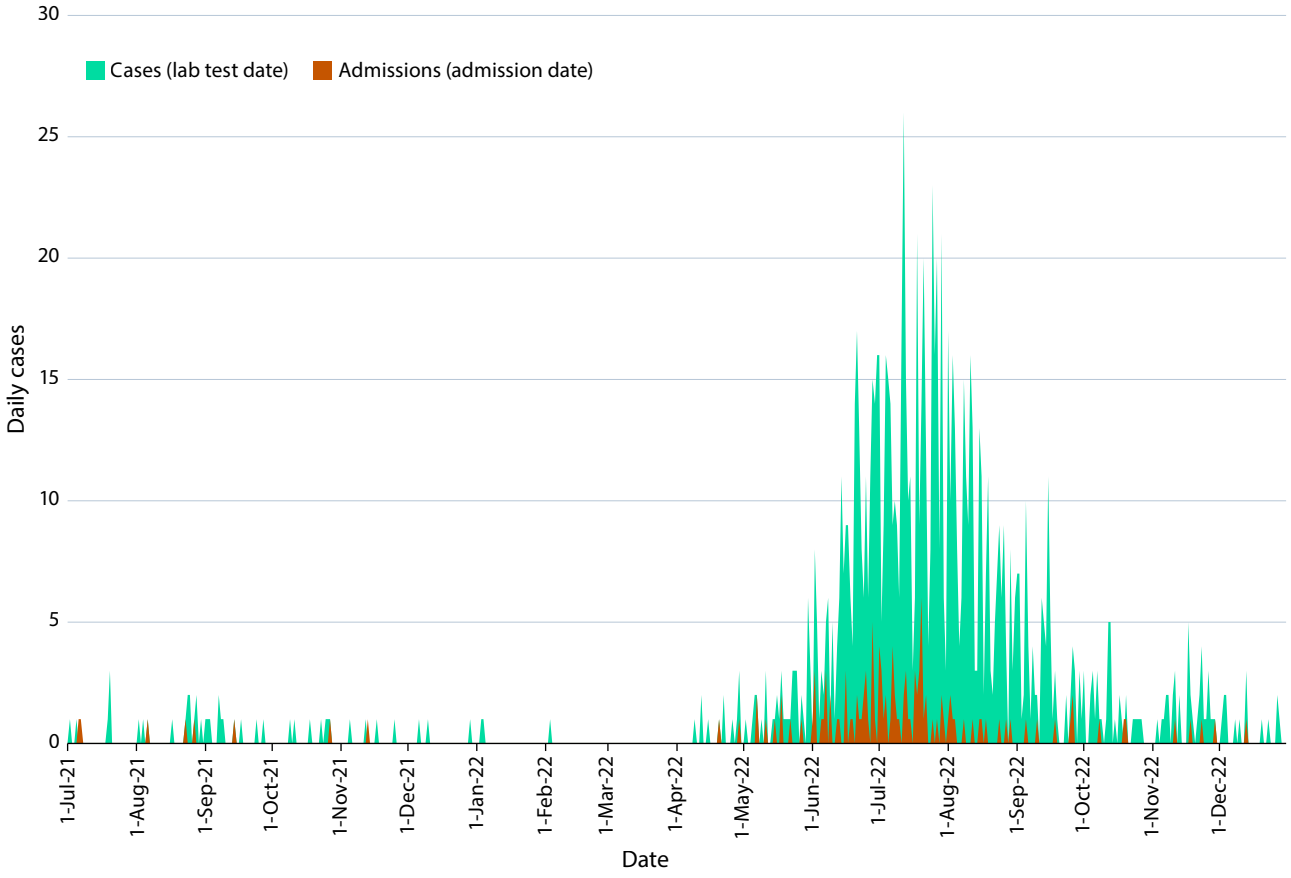
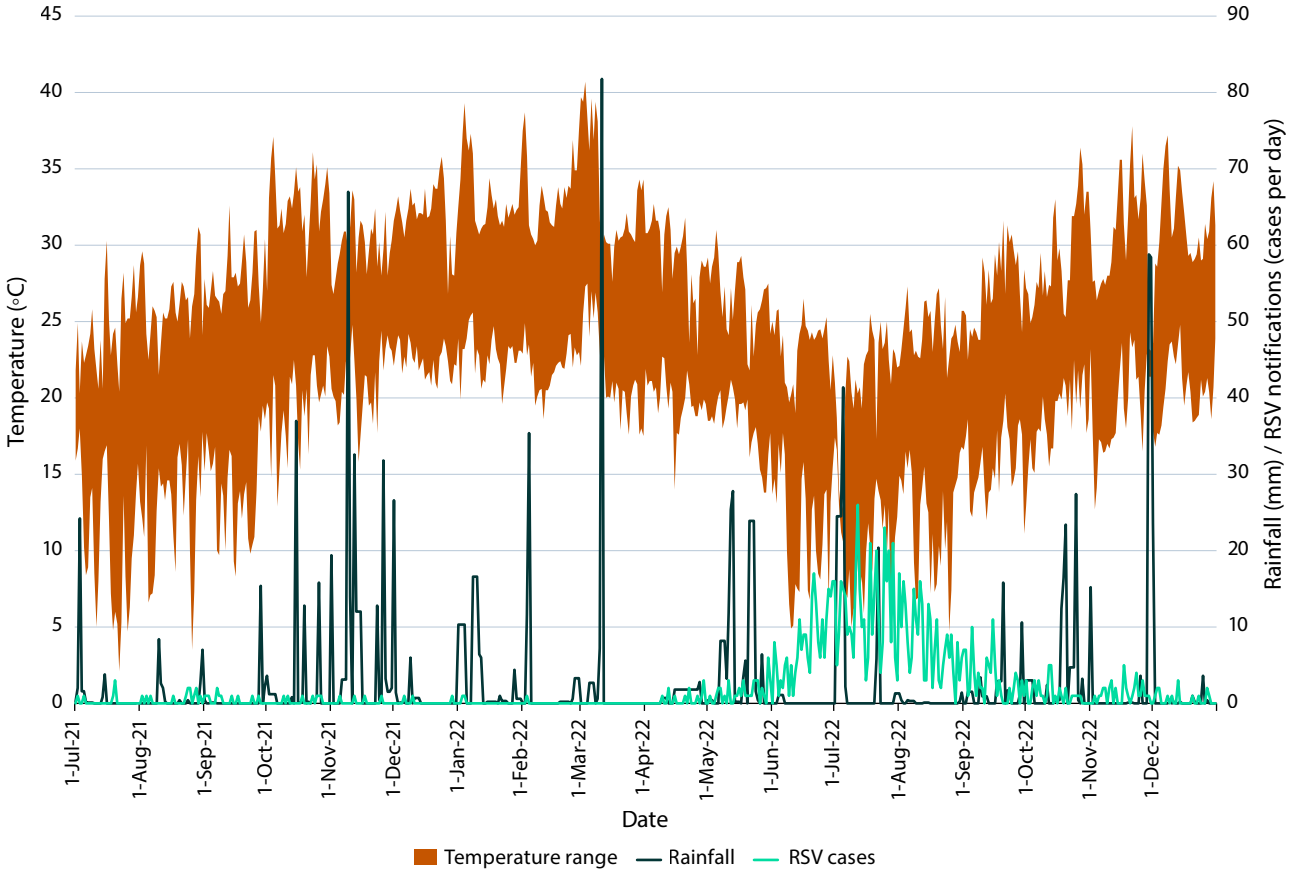


Figure 2: Temperature and rainfall over the study period



Discussion

We utilised the Queensland NOCS database to retrospectively review the epidemiology of RSV infections in the Central Queensland region over an eighteen-month period. Children under five years of age saw the biggest burden of cases and admissions in Central Queensland, at 9.0 cases per 1,000 population over the study period. This compares with global infection rate estimates, for this age group, of 5.3 per 1,000 per year from Li et al.[2] and 4.7 per 1,000 per year from Stein et al.[35] in their systematic reviews. Globally, children under six months have a higher burden of severe disease and hospitalisation than older children and adults,[2,9] as seen in Central Queensland. While the in-hospital case fatality rate for children under five has previously been estimated at 0.1% in high-income countries and 1.4% in low-income countries,[3] there were no in-hospital case fatalities observed in this age cohort in Central Queensland.

Aboriginal and Torres Strait Islander people were over-represented in both cases and hospitalisations in Central Queensland. This increased burden has been described in other Australian epidemiological studies,[5,36–38] with Dede et al.[38] finding that Central Australian Aboriginal and Torres Strait Islander children under two were admitted at a rate of 29.6 per 1,000 versus 10.9 per 1,000 in non-Indigenous peers ($p < 0.001$). Indigenous peoples across the world overall suffer from more frequent and severe respiratory infections due to a combination of complex historical, social, and environmental factors.[39] This includes but is not limited to greater household crowding and poorer housing conditions, socioeconomic disadvantage, and difficulty accessing accessible and culturally appropriate healthcare.[39,40] This disparity highlights a need for ongoing targeted preventive efforts and clinical vigilance to recognise those at risk of severe disease early.

For uncomplicated RSV bronchiolitis, the mainstay of treatment is supportive with observation, hydration, and respiratory support.[17] We observed a potential overuse of antibiotics and CXR in children under two admitted with RSV infection in Central Queensland, reinforcing the clinical challenge that RSV presentations can pose. The use of CXR in simple bronchiolitis is not recommended, as it may result in unnecessary antibiotic use, since findings of patchy hyperinflation and atelectasis can be misinterpreted as consolidation.[14,16] Lim et al.[41] reviewed the management of bronchiolitis in a regional Queensland hospital and also saw multiple non-evidence-based investigations and interventions performed on children presenting with bronchiolitis, while Oakley et al.[42] linked the use of CXR to a nine-fold increase in antibiotic use in unspecified bronchiolitis in their Australasian study. Unnecessary antibiotic use can potentially cause harm through adverse reactions and can contribute to the emerging public health threat of antibiotic resistance.[43,44] In a ten-year Israeli study, Obolski et al.[43] estimated unnecessary antibiotic use in 33.4% of cases among children under two admitted with RSV without a bacterial infection (95% CI: 30.5–36.4%).

It is important to note that clinical settings within Central Queensland can be challenging, as children may present to rural health services without paediatric specialists on site. These findings regarding the use of CXR and antibiotics highlight a potential opportunity to review local practices and to upskill clinicians within primary care and hospital settings in the region as also highlighted by Lim et al.[41] As an example strategy, Kalil et al.[45] showed a reduction in unnecessary antibiotic use from 47% to 32% for RSV bronchiolitis following the implementation of antimicrobial stewardship in a Canadian paediatric hospital. A review of local access to point of care (POC) RSV tests may be warranted, as these can provide real-time results in more isolated settings. POC RSV testing also allows for the implementation of appropriate infection control measures and reconsideration of further potentially invasive tests and antibiotic prescription.[46–49]

Since dosing with monoclonal antibodies is recommended in the few months before the onset of, and during, the RSV season in settings with well-defined circulation,[50] understanding the local seasonality can inform future clinical practice. Despite our data showing a clear winter peak in 2022, this was not seen in the latter half of 2021. More data on seasonality is needed and our ongoing surveillance will help to inform this.

Saravanos et al.[5] described clear RSV peaks during autumn and winter across all Australian jurisdictions, except the Northern Territory, in a ten-year review of RSV admissions. A latitudinal gradient in the timing of RSV epidemics for both the northern and southern hemispheres has been described with epidemics starting in January (summer) in southern hemisphere tropical equatorial areas moving,

to June (winter) in more southern areas of higher latitudes.[2,20] Prior site-specific Queensland studies appear to follow this trend. Paynter et al.[19] saw the highest activity in the northern city of Cairns in early autumn (March), while Townsville located south of Cairns saw this later in mid-autumn (March–April). Further south of Townsville, Morley et al.[51] saw year-round detection of RSV with peaks in mid-to-late autumn (April–May) in the Gold Coast region. As the Central Queensland region lies latitudinally between the Townsville and Gold Coast regions, an autumn peak may be anticipated.

The patterns observed in Central Queensland over the study period may be influenced by changes in population mobility, health-seeking, and social behaviours in response to the COVID-19 pandemic. Delayed RSV seasons were documented elsewhere within Australia during 2020–2021, with a notably absent winter season followed by an unusual spike in cases in spring and summer.[52–54] Similar patterns were seen overseas with large and delayed RSV epidemics.[55–57] It is likely that Central Queensland also experienced a delayed season during this time. These late and large spikes were hypothesised to be the result of a larger cohort of RSV-naïve children being exposed to RSV for the first time when pandemic measures were eased.[57]

Despite our best effort, there are several limitations to this observational study. This study reflects early data, using only the first eighteen months of information collected since mandatory reporting of RSV. Population denominators were limited by the age brackets available through the Australian Bureau of Statistics outlined in Appendix A. The true burden of RSV is likely to be underestimated, as testing for RSV is not routine for the general population experiencing mild symptoms, with higher rates of testing often seen in children, in older adults, and in those presenting to hospital. Access to testing and testing practice was likely influenced by the COVID-19 pandemic, with more people potentially seeking testing for respiratory symptoms over this time. Admission data was only obtained from the two major public hospitals in Central Queensland. Data for patients admitted to smaller peripheral or private hospitals in the region has not been captured and may affect population admission rates for adults. The admission rates for the adult population are likely underestimated due to this. Gladstone and Rockhampton hospitals are the only two CQ hospitals that provide paediatric inpatient services, so we are confident that children within the catchment area would be admitted to these services. However, patients requiring transfer directly from emergency departments or smaller rural hospitals directly to tertiary centres outside the Central Queensland region would not have been captured in this data. Therefore, we cannot completely rule out the chance of a selection bias in our study. Clinical data is based on documentation from emergency notes and discharge summaries, so it is limited by the quality and completion of the documentation. Concurrent infections were measured only through documentation (not laboratory results), so the results displayed here are likely an under-estimation.

Conclusions

Young children see the greatest burden of RSV disease, particularly those identifying as Aboriginal and Torres Strait Islander. Children admitted to hospital with RSV may receive unnecessary investigations and treatments, highlighting potential to review practice, to upskill clinicians, and to offer better access to point of care RSV testing.

The RSV season followed a distinctive winter peak in 2022; however, RSV transmission was likely affected by the COVID-19 pandemic. Ongoing surveillance is required to better understand the epidemiology and seasonality of RSV in Central Queensland.

Ethics approval

This project was approved by the Central Queensland Human Research Ethics Committee (HREC/2022/QCQ/84099).

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Author details

Dr Emma Gale,[1]

Dr Nicolas Smoll,[2]

Dr Mahmudul Hassan Al Imam,[1,3]

Ms Jacina Walker,[1]

Dr Michael Kirk,[4]

Dr Sunday Pam,[5,6]

Dr Robert Menzies,[7]

Prof. Gulam Khandaker[1,8,9]

1. Central Queensland Public Health Unit, Central Queensland Hospital and Health Service, Rockhampton, QLD 4700, Australia.
2. Sunshine Coast Public Health Unit, Sunshine Coast Hospital and Health Service, Maroochydore, QLD 4558, Australia
3. School of Health, Medical and Applied Sciences, Central Queensland University, Rockhampton, QLD 4701, Australia.
4. Rockhampton Business Unit, Central Queensland Hospital and Health Service, Rockhampton, QLD 4701, Australia.
5. University of Queensland Rural Clinical School, Rockhampton, Queensland.
6. Department of Paediatrics, Central Queensland Hospital and Health Service, Rockhampton, QLD 4701, Australia.
7. Research Division, Sanofi, Macquarie Park, NSW 2193, Australia.
8. Research Division, Central Queensland University, Rockhampton, QLD 4701, Australia.
9. Discipline of Child and Adolescent Health, Sydney Medical School, The University of Sydney, Camperdown NSW 2006, Australia.

Corresponding author

Prof Gulam Khandaker

Central Queensland Public Health Unit, Community Health Building, 82-86 Bolsover Street, Rockhampton, QLD 4700, Australia

Email: Gulam.Khandaker@health.qld.gov.au

Telephone: +61 7 4920 6948.

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Appendix A

Table A.1: CQ population data by region and age categories from the Australian Bureau of Statistics[33]

	Age group (years)																		
Region	**0–4**	**5–9**	**10–14**	**15–19**	**20–24**	**25–29**	**30–34**	**35–39**	**40–44**	**45–49**	**50–54**	**55–59**	**60–64**	**65–69**	**70–74**	**75–79**	**80–84**	**85+**	**Total**
Banana	974	1,105	1,060	824	844	875	1,014	1,036	925	921	909	986	892	710	560	448	331	249	14,663
Central Highlands	2,100	2,356	2,235	1,687	1,842	2,176	2,157	2,302	1,895	1,881	1,768	1,790	1,496	977	723	487	268	171	28,311
Gladstone	4,193	4,802	5,017	4,049	3,257	3,889	4,176	4,374	4,079	4,575	4,559	4,577	4,142	3,134	2,508	1,487	870	616	64,304
Livingstone	2,043	2,463	2,858	2,442	1,834	2,086	2,202	2,456	2,421	2,575	2,688	3,017	2,962	2,582	2,140	1,484	913	715	39,881
Rockhampton	5,185	5,798	6,078	5,440	5,331	5,762	5,680	5,636	4,869	4,960	4,841	5,044	4,880	4,014	3,402	2,455	1,825	1,704	82,904
Woorabinda	132	134	106	98	77	88	79	66	42	52	48	32	24	36	19	8	0	0	1,041
Total	**14,627**	**16,658**	**17,354**	**14,540**	**13,185**	**14,876**	**15,308**	**15,870**	**14,231**	**14,964**	**14,813**	**15,446**	**14,396**	**11,453**	**9,352**	**6,369**	**4,207**	**3,455**	**231,104**