NORTHERN TERRITORY GOVERNMENT

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Editor's note:

Take a moment to learn more about the extensive work done by the Medical Entomology Unit at NT Health in the collecting and identifying of mosquitoes and, importantly, the recent transition to qPCR testing of mosquitoes to identify the presence of the flaviviruses, Murray Valley encephalitis virus, Kunjin virus and Japanese encephalitis virus in the Northern Territory. The qPCR testing has allowed for broader sampling and more timely and reliable species-specific results, to better inform control measures and alert the public of potential mosquito born disease risks.

The article on page 6 brings home a real-life scenario of breakthrough chickenpox in a 'vaccinated' family. A 2-dose schedule of a varicella-containing vaccine is recommended in Australia, however only 1 dose is funded by the National Immunisation Program, the NIP. Many families are unaware of the benefits of a 2nd dose and this article highlights that clinicians need to be aware of and to discuss the benefits of the recommended 2nd dose with parents and individuals.

The 'Fireworks-related injury survey Territory Day 2024' article on page 14 reports the highest number of injuries reported over the past 18 years in the 5-day period surrounding Territory Day 2024. Men, bystanders and visitors in the Northern Territory in 2024 were at particular risk of injuries and children made up 27% of cases.

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NORTHERN TERRITORY GOVERNMENT

Contents

Flavivirus surveillance in the NT using qPCR in 2024

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ABSTRACT

The Northern Territory sentinel chicken program has transitioned to qPCR testing of mosquitoes for flavivirus surveillance. In 2024, the new program has detected MVE virus activity on several occasions during the high-risk period for MVE, with several public health alerts issued to warn the public of the potential MVE risk. No human MVE cases were reported in the NT in 2024.

Key words: flavivirus surveillance program, mosquito qPCR testing, mosquito borne disease

BACKGROUND

For over 30 years, sentinel chickens have been the gold standard for flavivirus surveillance in Australia[1], with the program established in the Northern Territory (NT) in 1992 in liaison with the Department of Primary Industry, Tourism and Trade and volunteers. Chicken flocks were located in and around NT major centres, strategically placed close to known mosquito breeding sites, with chickens bled and bloods tested monthly for the flaviviruses Murray Valley encephalitis virus (MVEV) and Kunjin virus (KUNV). Positive test results triggered media alerts to warn the public of potential mosquito borne disease risks.

However, following the detection of Japanese encephalitis virus (JEV), another member of the flaviridae, in the NT in 2021, qPCR testing of mosquitoes was successfully trialled in 2022 and 2023, and adopted as the new testing method for the NTs flavivirus surveillance program in 2024. The change in testing method was triggered by MVEV, KUNV and JEV cross reactivity issues using serology[2], as well as delays in result availability associated with processing time, with qPCR testing known to have a high test specificity and sensitivity[3], enabling more accurate and timely results and subsequent public health warnings.

METHODS

In 2024, mosquitoes for qPCR testing were collected either as part of routine adult mosquito surveillance programs established in major NT centres where sentinel chicken flocks used to be present, or traps strategically set close to known vector mosquito breeding sites. Most mosquitoes were collected from traps set in and around Darwin, Nhulunbuy, Katherine, Tennant Creek and Alice Springs, but also included samples from Melville Island, an NT island off the norther coast where the first Japanese encephalitis (JE) case was notified in 2021. See map, in Figure below.

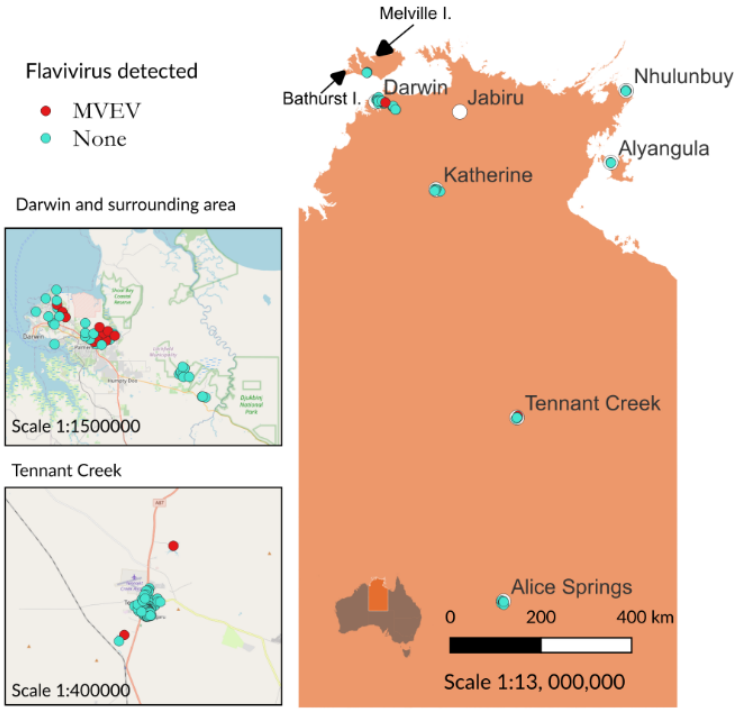

Figure. Map of the Northern Territory with towns listed, location of Melville Island and flavivirus detection sites

Mosquitoes collected were morphologically identified to species level at the Medical Entomology laboratory in Darwin, with up to 250 mosquitoes placed into 4 ml PE SPEX tubes, delivered fortnightly to the Berrimah Veterinary Laboratories for MVEV, JEV and KUNV testing using the qPCR test method. Mosquitoes processed and tested included species belonging to the *Culex* or *Aedes* genera, previously suspected to be competent vectors[4], or closely related species. The majority of tubes tested contained a single species to determine species capable of carrying the virus. When insufficient mosquito numbers were collected for single species tubes, mosquitoes were pooled across species for cost effective testing. The primary species targeted for testing included *Cx. annulirostris*, *Cx. gelidus*, *Cx. tritaeniorhynchus* and *Ae. normanensis*.

RESULTS

Between January and June 2024, a total of 341 mosquito samples, equating to 84,601 mosquitoes, were tested (Table 1), with a total of 13 samples testing positive for MVEV between February and May 2024 (Table 2 and see map in Figure). While 4 *Cx. annulirostris* samples tested positive in the Darwin region, the remaining positive samples were from Tennant Creek, with 6 *Cx. annulirostris* and 3 *Ae. normanensis* samples testing positive (Table 2). No samples tested positive to KUNV or JEV.

Table 1. Total number of mosquitoes and mosquito samples collected and tested for MVEV, JEV and KUNV by region - 1 January and 28 June 2024

Region	Total # samples tested	Total # of mosquitoes tested
Darwin	224	56,376
East Arnhem	14	2513
Big Rivers	12	2547
Barkly	88	22,533
Alice Springs	3	411
Totals	**341**	**84,601**

DISCUSSION

In the NT, the high-risk season for MVE and JEV is January to June, coinciding with high vector mosquito abundance. At the same time, virus hosts such as herons and egrets also form aggregations in wetlands adjacent to mosquito breeding sites, potentially increasing vector host interactions. In 2024, qPCR testing detected MVEV activity on 7 occasions throughout the high-risk season between February and May (Table 2). During the 2023 trail, MVEV and JEV activity was also detected on 11 separate occasions between January and April (unpublished data). These results indicate that qPCR testing of mosquitoes is a suitable tool for flavivirus surveillance, providing timely virus-specific results while eliminating previous issues with serological virus cross reaction, complicating differentiation between MVE, KUN and JE virus.

In addition, the average turn-around time from sample submission to qPCR test result availability was less than 2 weeks, a great improvement from turn-around times of several weeks using serology. Timely reporting combined with qPCR test specificity, enabled prompt public health warnings of a potential MVE risk issued by NT Health in 2024.

While MVEV was detected in mosquitoes from the Darwin and Barkly regions, no human MVE cases were notified in 2024. This is interesting, as suspected vector mosquito numbers in the Barkly region between late February and April were extreme, due to record rainfall between January and March. This contrasts with the MVE outbreak in 2023, when 8 confirmed human MVE cases were reported concurrent with MVE virus detected in mosquitoes (unpublished data). While the consensus is that high rainfall and vector abundance increases the risk of MVE or JEV outbreaks, MVE and JE virus ecology and virus hosts and their interactions remain poorly understood.

Table 2. Mosquitoes testing positive for MVEV - 1 January to 28 June 2024

Location	Region	Date sample collected	Mosquito species	Total # of samples positive	Total # of mosquitoes in sample
Tennant Creek (urban)	Barkly	27/2/2024*	*Cx. annulirostris*	1	250
Tennant Creek (sewage treatment plant)	Barkly	27/02/2024	*Cx. annulirostris*	1	250
Tennant Creek (Mary Ann Dam)	Barkly	6/03/2024	*Cx. annulirostris, Ae. normanensis*	3	750
Litchfield Shire (Holtze & Howard Springs)	Darwin	12/03/2024	*Cx, annulirostris*, mixed species#	2	323
Tennant Creek (sewage treatment plant)	Barkly	4/04/2024	*Cx. annulirostris, Ae. normanensis*	4	1000
Darwin (Karama)	Darwin	9/05/2024	*Cx. annulirostris*	1	250
Darwin (Karama/Palm Creek/Longwood Av)	Darwin	9/5/2024**	*Cx. annulirostris*	1	250
Totals				**13**	**3073**

**sample consisted of Cx. annulirostris collected on 24th and 27th February 2024 from two separate urban traps/locations*

*** sample consisted of Cx. annulirostris collected on 8th and 9th May 2024 from 3 separate traps/locations*

#sample consisted of Cx. annulirostris, Cx. gelidus, Cx. bitaeniorhynchus, Cx. tritaeniorhynchus, Cx. sp 32, Ae. normanensis and Ae. vigilax

While mosquito qPCR testing provides a suitable tool for flavivirus surveillance, the program has potential limits, as it requires sourcing mosquitoes for testing. Obtaining material from regional areas, with limited mosquito surveillance is challenging due to human resource limitations, while exotic focused programs utilise adult mosquito traps ill-suited to collect high number of endemic *Culex* or or *Aedes* mosquitoes.

In addition, the ephemeral nature of inland mosquito populations, such as in the Barkly and Alice Springs regions can complicate disease risk assessment as it limits qPCR testing of these mosquito populations. In these circumstances flaviviruses could remain undetected despite being present at high levels in the environment.

In summary, since January 2024, flavivirus surveillance within the NT has transitioned to qPCR testing of mosquitoes, supplanting sentinel chickens, with. qPCR testing proven effective in detecting flavivirus in mosquitoes during the high-risk period for MVE, KUN and JE, enabling timely public health warnings.

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A cluster of varicella zoster virus infection in a vaccinated family in Alice Springs, Northern Territory, August to October 2023

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Key words

Chickenpox; varicella; *varicella zoster virus*; chickenpox vaccine; varicella vaccine; shingles; herpes zoster; Alice Springs; Northern Territory; cluster; family cluster

Abstract

Varicella zoster virus (VZV) can cause varicella or 'chickenpox', a typically mild disease characterised by an itchy vesicular rash with malaise and fever. Immunocompromised people, neonates, and pregnant women are at an increased risk of complications such as pneumonia, encephalitis, haemorrhagic conditions, and bacterial infections. After a primary infection of chickenpox, the virus may remain latent in the spinal column and later in life re-activate as herpes zoster or 'shingles', which causes a painful vesicular rash.

In late 2023 a household cluster of VZV infection was detected in Alice Springs, Northern Territory. An initial case of shingles in an adult led to breakthrough cases of chickenpox in 3 young people who had each received 1 dose of a varicella-containing vaccine. The disease burden impacted negatively on this household's activities of daily living.

One dose of a varicella-containing vaccine is funded through the Australian National Immunisation Program (NIP). A 2nd dose is recommended, although not funded. This household cluster highlights the importance of recommending the 2nd, unfunded, dose of varicella-containing vaccine to parents and guardians to reduce the risk of breakthrough chickenpox.

Background

Varicella zoster virus (VZV), also known as *human herpesvirus 3*, is a highly contagious virus that can spread quickly from person to person through infected droplets.[1,2] The primary infection results in varicella or 'chickenpox', a typically mild disease characterised by an itchy vesicular rash, along with malaise and fever.[1,2] However, complications of chickenpox can include pneumonia, encephalitis, haemorrhagic conditions, and bacterial infections.[1] Immunocompromised people, neonates, and pregnant women are at an increased risk of these complications due to weakened, underdeveloped or altered immune systems.[1] Chickenpox infection can be easily transmitted from person to person through contact with the rash, or inhalation of particles of fluid from the vesicular skin lesions or infected respiratory secretions.[1] The incubation period may range from 10 to 21 days.[1]

After a primary infection of chickenpox, the virus may remain latent in the spinal column, where later reactivation can lead to herpes zoster or 'shingles'. Shingles is characterised by a painful vesicular rash that may also be itchy, usually localised over a single dermatome on 1 side of the body.[1] Many cases of shingles are mild, but some are debilitating and have long term consequences including ongoing severe pain and vision loss when the dermatome affected includes the distribution

of the trigeminal nerve.[1] A person with shingles can transmit VZV to others through direct contact with the fluid from the vesicular skin lesions, or through inhalation of viral particles from these lesions. If the exposed person is not immune, they may develop a primary infection of chickenpox.[1]

Transmission of VZV from unvaccinated infected people with chickenpox is one of the most readily transmissible communicable diseases with attack rates reported from 60-100% in those susceptible.[1] Transmission from cases of shingles is lower, reported to be around 20%.[1]

In Australia, the National Immunisation Program (NIP) has funded 1 dose of a varicella-containing vaccine since 2005 to prevent chickenpox.[2] This 1st dose is recommended to be given at age 18 months of age, usually in combination with the 2nd dose of a measles, mumps and rubella vaccine.[2] Additionally, young people aged 14-19 years who have not previously had a varicella-containing vaccine or do not have evidence of immunity to varicella are eligible for 2 doses via the NIP due to a reduced immune response at an older age.[2] The Australian Immunisation Handbook recommends a 2nd dose of a varicella-containing vaccine for those children who received the 1st dose at <14 years of age,[2] but this is not funded on the NIP. Parents/guardians and clinicians may therefore not be aware of this recommendation.

Monovalent varicella-containing vaccines are approximately 80-85% protective against infection with varicella, and 95-98% protective against experiencing severe disease.[3] Combination vaccines containing varicella, measles, mumps and rubella have been found to have similar effectiveness to that of individual vaccines.[2,3] Breakthrough chickenpox infection occurs when a person becomes infected with VZV greater than 42 days after 1 or 2 doses of a varicella containing vaccine.[1,2] This is typically a mild infection, with either low or no fever and often less than 50 skin lesions.[1] The duration of illness is also usually shorter.[1]

Those who have received 1 dose of a varicella-containing vaccine are more likely to experience a breakthrough infection than those who have received 2 doses,[4] with some studies finding a 3-fold increase in breakthrough infection after 1 dose compared to 2 doses.[5] There is limited information about breakthrough infection after 2 varicella-containing vaccines, but it appears to occur less frequently and with milder symptoms.[2,3]

Rarely, breakthrough shingles infection can follow varicella vaccination. This occurs when the live virus introduced by the vaccination replicates in the skin and becomes latent in the dorsal root ganglia, with reactivation likely to be in the same dermatome as the original vaccination site and confirmed to be due to the VZV vaccine strain.[1,6] Although this article does not focus on shingles prevention, it is important to note that the NIP provides vaccines to specific population groups to help prevent severe cases of shingles[7] (footnote 1)

In late 2023, a household cluster of VZV infection was detected in a family in Alice Springs. We describe the investigation and response.

Methods

A cluster case was defined as any person from Family X notified with shingles or chickenpox[8,9] with onset date between 26 August and 25 November 2023, using case definitions from the NT Centre for Disease Control (CDC) 'Notifiable diseases public health management guide', 3rd edition[10] (see Table 1 and note the 4th edition has since been released[11]). The outbreak end date was defined as 2 maximum incubation periods (21 days x 2 = 42 days) after the date the final case's last lesions dried.

[1] Free shingles vaccination is available on the NIP to those ≥65 years and others determined to be at an increased risk of severe illness and complications. It is available for purchase to others. See https://www.health.gov.au/topics/immunisation/vaccines/shingles-herpes-zoster-immunisation-service for more information

Laboratory pathology results were received at the Alice Springs CDC from 2 pathology laboratories. Any case reported directly to the Alice Springs CDC from a diagnosing clinician without a pathology specimen collected was deemed notifiable with a public health response to commence if the patient met the case definition (Table 1).

Each case or their legal guardian/parent was interviewed by a CDC public health nurse to determine exposure of high-risk contacts during the infectious period, and for disease progression. Where the case was notified by a primary care provider, information about disease presentation and high risk contacts were also sought directly from the notifying clinician. Vaccination histories were obtained from the Australian Immunisation Register (AIR) and NT Immunisation Register and cases or their parent/guardian were asked if the case or their household contacts recalled a previous history of chickenpox infection.

Table 1. Shingles and chickenpox case definitions from the Northern Territory Centre for Disease Control *Notifiable diseases public health management guide* (3rd edition)[10]

Disease	Shingles (herpes zoster)	Chickenpox (varicella)
Confirmed	Requires laboratory definitive evidence and clinical evidence	A confirmed case requires either: 1. Laboratory definitive evidence AND clinical evidence OR 2. Clinical evidence AND epidemiological evidence
Probable	Requires clinical evidence only	A probable case requires clinical evidence only
Laboratory definitive evidence	1. Isolation of varicella-zoster virus from a skin or lesion swab OR 2. Detection of varicella-zoster virus from a skin or lesion swab by nucleic acid testing from a skin or lesion swab OR 3. Detection of varicella-zoster virus antigen from a skin or lesion swab by direct fluorescent antibody from a skin or lesion swab.	1. Isolation of varicella-zoster virus from a skin or lesion swab. If the case received varicella vaccine between 5 and 42 days prior to the onset of rash the virus must be confirmed to be a wild type strain. OR 2. Detection of varicella-zoster virus from a skin or lesion swab by nucleic acid testing. If the case received varicella vaccine between 5 and 42 days prior to the onset of rash the virus must be confirmed to be a wild type strain. OR 3. Detection of varicella-zoster virus antigen from a skin or lesion swab by direct fluorescent antibody. If the case received varicella vaccine between 5 and 42 days prior to the onset of rash the virus must be confirmed to be a wild type strain. OR 4. IgG seroconversion or a significant increase in antibody level, such as a fourfold or greater rise in titre to varicella-zoster virus (VZV) EXCEPT if the case has received a VZV-containing vaccine 8 days to 8 weeks prior to convalescent specimen collection. (NOTE: paired sera must be tested in parallel)

Clinical evidence	A vesicular skin rash with a dermatomal distribution that may be associated with pain in skin areas supplied by sensory nerves of dorsal root ganglia	Acute onset of a diffuse maculopapular rash developing into vesicles within 24–48 hours and forming crusts (or crusting over) within 5 days
Epidemiological evidence	N/A	An epidemiological link is established when there is: 1. Contact between 2 people involving a plausible mode of transmission at a time when 1 of them is likely to be infectious AND the other has illness 10 to 21 days after contact AND 2. At least 1 case in the chain of epidemiologically-linked cases is laboratory confirmed.

During case interviews education on prevention of ongoing transmission was provided. For shingles this included practicing good hand hygiene and general cleanliness principles, keeping the rash covered/preventing others from having contact with the rash, avoiding exposure to high risk contacts (including immunocompromised or pregnant people and young babies), and remaining isolated at home if this was not possible.[11] For chickenpox this included good hand and respiratory hygiene, increased general cleaning, remaining isolated at home until the blisters had dried and the case was fully recovered, and avoiding contact or sharing of items such as towels with others.[12] Cases or their legal guardian/parent were advised to seek medical advice if symptoms worsened.

Cases were notified to the Northern Territory Notifiable Disease System and descriptive epidemiology completed using Microsoft Excel.

Public health response was undertaken as per the NT CDC's *Notifiable diseases public health management guide* (3rd edition).[10] Ethics approval to publish this case study was provided by the Human Research Ethics Committee of the Northern Territory Department of Health and Menzies School of Health Research (reference number 2024-4955). Informed consent for publication was also provided by the affected family.

Results

There were 4 cases of varicella zoster virus infections notified in this Family X cluster; 1 case (index case) had shingles and 3 contacts had chickenpox. All cases were diagnosed in either Alice Springs Hospital emergency department or at their usual General Practitioner (GP) clinic, where they also received education and infection control advice. No cases were hospitalised and none died. Findings are summarised in the Table 2.

Case 1 (Index)

A 45-49 year old adult (Index case) developed a right occipital headache on 27 August 2023 and a rash on the posterior neck and head 2 days later. Subsequent presentation to the Alice Springs Hospital emergency department on the date of rash onset led to diagnosis of a non-specific facial rash of unknown aetiology. Re-presentation 2 days later led to a diagnosis of shingles based on the findings of a vesicular rash in the distribution of the right C2 dermatome and antiviral treatment was commenced. The case had not previously received a shingles vaccine, and prior history of chickenpox infection or vaccination was unknown. No high-risk contacts were identified and the case was provided with routine education. The Index case lived with 4 young people, all aged 5-19 years of age (Table 2).

Table 2. Summary of index case and case contacts' findings in Alice Springs household cluster of varicella zoster virus (VZV) infections

Case number, Contact status and VZV infection	Age range in years	Symptom onset date	Diagnosis laboratory confirmed	Previous varicella-containing vaccine and history of chickenpox	Age in months at 1st dose of varicella-containing vaccine
Case 1 (Index) **Shingles**	45-49	27 August 2023	No	No varicella-containing vaccine Unknown history of chickenpox infection	N/A
Case 2 (Contact) **Chickenpox**	15-19	16 September 2023	Yes	1 dose of Varilix®* No previous chickenpox infection	18 months
Case 3 (Contact) **Chickenpox**	10-14	18 September 2023	No	1 dose of Varilix®* No previous chickenpox infection	19 months
Case 4 (Contact) **Chickenpox**	5-9	9 October 2023	Yes	1 dose of Priorix-tetra®^ No previous chickenpox infection	21 months
Not a case **(Contact only)** **No VZV infection**	15-19	N/A	N/A	1 dose of Varilix®* No previous chickenpox infection	23 months

*monovalent varicella vaccine
^combination varicella vaccine

Case 1 (Index)

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Case 2 (Contact)

On 16 September 2023, 20 days after onset of rash in Case 1 (Index), Case 2 in the 15 to 19 year age range developed a rash and was diagnosed with chickenpox on presentation to the Alice Springs Hospital emergency department and notified to the Alice Springs CDC. Multiple pustular lesions at various stages were present over the trunk, face and arms. A swab of the lesions later returned a positive result for VZV. A mildly sore throat, mild cough, and low grade

temperature were also noted. No treatment was documented. This case had been vaccinated with a monovalent varicella vaccine (Varilrix®) at 18 months of age. Education was provided to the case and no high-risk contacts were identified.

Case 3 (Contact)

Case 3 in the 10 to 14 year age range developed symptoms on 18 September 2023, 22 days after onset of rash in Case 1 and 2 days after the rash onset of Case 2 and was diagnosed at their usual GP clinic. A swab was not taken but the treating doctor notified the diagnosis of chickenpox to the Alice Springs CDC based on typical clinical features, which alone would have met the probable surveillance case definition for chickenpox.[10] However, the epidemiological link to laboratory confirmed cases meant Case 3 fulfilled the criteria for notification as a confirmed case of chickenpox.[10] The treating doctor and parent/guardian both reported that this case had mild symptoms, including a rash with limited skin lesions noted, fever, and malaise, although further specific symptoms were not documented. This case had been vaccinated with a monovalent varicella vaccine (Varilrix®) at 19 months of age. The interview including provision of education for this case occurred with the parent/guardian at the same time as for Case 2. No high-risk contacts were identified.

Case 4 (Contact)

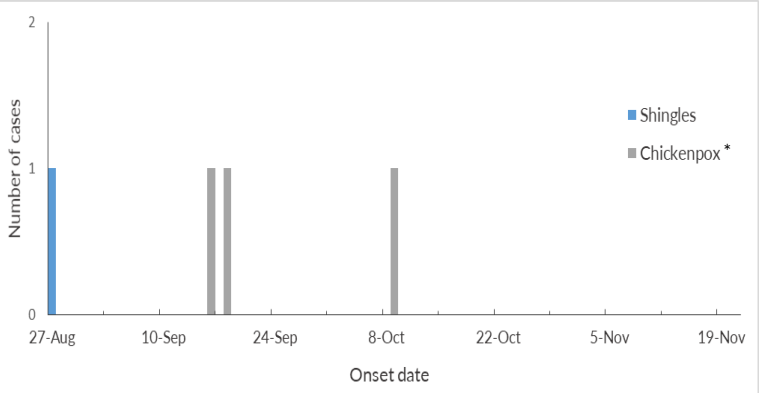
The final VZV infection, Case 4, in the 5 to 9 year age range developed symptoms of a mild rash, general malaise, fatigue and headaches on 9 October 2023, 34 days after onset of the rash in the index case, 23 days after rash onset in case 2 and 21 days after rash onset in Case 3. This case had been diagnosed with influenza approximately 14 days before the rash onset, and the symptoms of malaise and fatigue had begun during that influenza-like illness before the fever and rash that developed 10 days later. Diagnosis of chickenpox was made at the family's usual GP clinic, where a swab of the lesions was also taken. Ongoing symptoms were described to be mild but not specified i.e. the number of skin lesions was not reported. This case had received a combination varicella vaccine (Priorix-tetra®) at 21 months of age. No high-risk contacts were reported. The parent/guardian was able to outline recommended infection control actions during an interview with a CDC public health nurse.

Not a case (Contact only)

The final family member, in the 15 to 19 year age range, had also received 1 dose of varicella-containing vaccine (Varilix®), but did not exhibit chickenpox symptoms at any time through to the 42 days after lesions of Case 4 had dried and they were considered no longer infectious.

The household reported that this situation had a profound impact on their family. Multiple members fell ill, leading to disruptions in daily routines, with weeks away from work and school given the isolation requirements and an increased caregiving burden on the parent/guardian.

Figure. Epidemiological curve of family cluster of varicella zoster virus infections (Shingles and Chickenpox*), Alice Springs, Northern Territory, 2023, by onset date



*all chickenpox cases meeting definition for breakthrough chickenpox

Discussion

This cluster of cases of varicella-zoster virus infections (see Figure) presents a real-world scenario of breakthrough chickenpox infection. It highlights the impact on daily life and loss of economic and productive activity that can occur with days away from work and school due to

personal illness, infection control requirements and caregiving responsibilities.

The symptoms experienced by the chickenpox cases were likely milder due to their prior vaccination with a varicella-containing vaccine. Previous studies indicate a person's risk of developing chickenpox after exposure to shingles could have been decreased if a 2nd varicella-containing vaccine had been received.[5] Contact case 4 was more likely a case infected from chickenpox cases 2 or 3 and again the risk of developing chickenpox would be decrease with a 2nd varicella-containing vaccine on board. [4,5]

While 2 doses of varicella-containing vaccine are recommended in Australia, many parents and legal guardians may only be aware of the single funded vaccine. This highlights the need for increased awareness among parents/legal guardians and healthcare providers and policymakers should consider the addition of a 2nd funded dose to the NIP.

Conclusion

Only 1 dose of a varicella-containing vaccine is funded on the NIP for children <14 years old, yet 2 doses of a varicella-containing vaccine are known to provide increased protection against breakthrough chickenpox infection. In this case, breakthrough VZV infections in 3 of the 4 household members caused significant disruption to the household. A 2nd varicella-containing vaccine may have prevented this scenario.[5]

Recommendations:

- Clinicians should discuss the recommendation for a 2nd varicella-containing vaccine with the parents/guardians of young people receiving an initial vaccine for chickenpox prevention or to any non-immune person requesting vaccination and explain the risk and benefits of vaccination.
- Policy makers should consider the health and economic benefits of adding a 2nd dose of varicella-containing vaccine to the NIP.
- Where supported by clinical evidence, a diagnosis of chickenpox should be considered even if the patient has a vaccination history of receiving 1 dose of a varicella-containing vaccine.

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Fireworks-related injury survey Territory Day 2024

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Abstract

In the Northern Territory (NT), the general public is permitted to purchase fireworks for personal use on 1 July, Territory Day. A significant number of individuals sustain firework-related injuries (FWRIs) each year.

The Centre for Disease Control NT conducted a survey from 30 June to 5 July, 2024, to assess FWRIs presenting to NT emergency departments and primary health care facilities.

A total of 41 FWRIs were recorded during this 5-day period with 56% of these injuries occurring in males and 44% in females, and 27% (11 cases) involving children under 18 years. Many injuries were significant, with 52% of injuries classified as moderate or severe and 7% requiring hospitalization.

This study highlights the ongoing public health issue related to firework use during Territory Day celebrations, with the particular risk of significant injury to children. These findings underscore the continued need to consider this activity and highlights the need for enhanced public awareness and safety measures to reduce the risk of firework-related harm in the Territory.

Background

Territory Day is celebrated annually on 1 July across the Northern Territory. The occasion marks the day on which the Northern Territory (NT) formed a self-government in 1978, with a legislative assembly taking over from the Commonwealth to administer the state-like functions of government.[1] 'Cracker Night', as it is colloquially known, is commemorated with celebrations including community events featuring fireworks displays. The general public is also permitted personal purchase of fireworks from 9am to 9pm on the day and lighting of approved fireworks by consumers from 6pm to 11pm is legal. Possessing fireworks after midday of 2 July onward is illegal.

Each year a number of Territorians sustain firework-related injuries (FWRIs) who present to health facilities and hospitals for medical care, raising concerns about the hazards posed to the community with unfettered use of fireworks by non-professionals on the night.

Common injuries include minor burns and blunt trauma, although more serious injuries do occur, including eye injuries, major burns requiring intensive care and blast injuries resulting in limb amputations.

The NT Centre of Disease Control (CDC) has conducted an annual survey collecting information on FWRIs presenting to emergency departments and primary health care clinics in the NT since 1998. This information is used to inform public health messaging to help Territorians enjoy Territory day safely. Emergency department or healthcare facility presentations of injuries sustained from fireworks related to Territory Day numbered 22 in 2023, 16 in 2022, 29 in 2021, 18 in 2019 and 38 in 2018. Territory Day celebrations were not held in 2020 due to COVID-19 restrictions and therefore a survey was not undertaken.

Aim

To describe the baseline characteristics and the number, nature and severity of injuries sustained by people in the NT presenting to health services related to Territory Day fireworks celebrations in 2024.

Methods

The firework injury survey period occurred over 5 days, from 12:01am Sunday 30 June, to 11:59pm Thursday, 4 July, 2024. Data collected included date of injury, age of patient, gender, site and type and severity of injury, admission, location where injury was sustained, whether the patient was a bystander and NT resident status. Survey sites included Royal Darwin and Palmerston Regional Hospitals, Alice Springs Hospital, Katherine District Hospital, Gove District Hospital, Tennant Creek Hospital, Palmerston GP Super Clinic and Australian Defence Force Joint Health Unit Clinics. Triage nurses and doctors at the survey sites collected case histories of people presenting with injuries sustained due to fireworks.

Descriptive statistical analysis was conducted on Microsoft Excel 2016.

Injury severity definitions were classified as:

Mild: Requiring only 1 review by a health practitioner

Moderate: Requiring 2 or more reviews

Severe: Admitted to hospital for dressings, grafts or other medical intervention

Results

Time and location of presentations

A total of 41 FWRIs were recorded during the study period with 25 (61%) occurring in public places including beaches, streets and parks, and 12 (29%) occurring on private property (4 cases did not have locations described). The majority of FWRIs presentations were to the Royal Darwin Hospital and Palmerston Regional Hospital (58%). Figure 1 shows that most (80%) of presentations were on Territory Day.

Injuries by age group, gender, bystander and NT resident status

As shown in Figure 2 males accounted for 23 injuries (56%) and females 18 (44%) with 11 injuries (27%) sustained by children under 18 years with 3 of these children aged 5-years and younger. Bystanders accounted 23 (56%) of the injuries and 10 (24%) of the 41 people who sustained injuries were visitors to the Territory.

Figure 1. Fireworks-related injuries by date during the study period surrounding Territory Day 2024

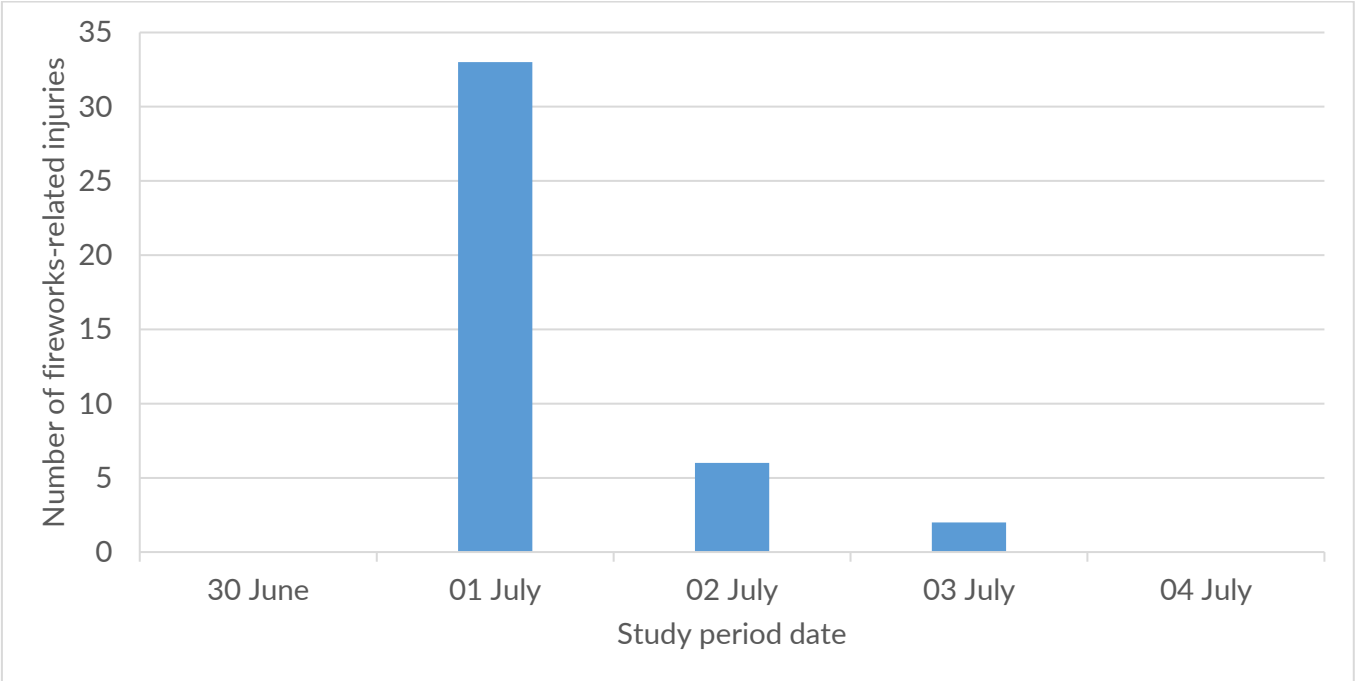
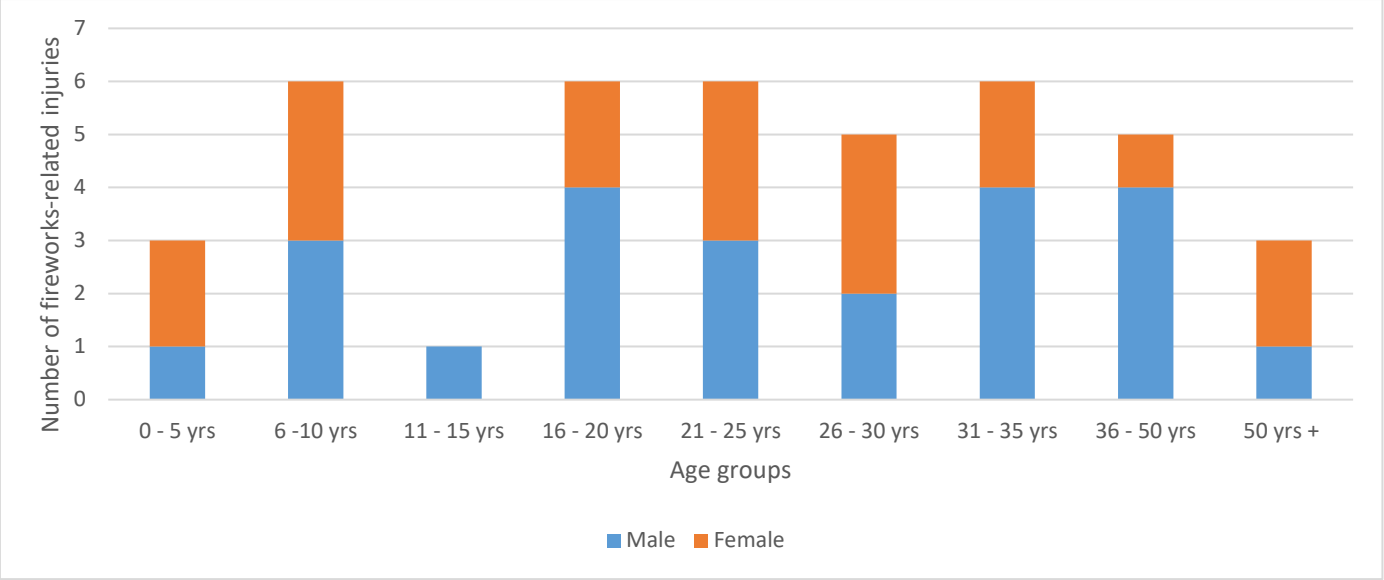


Figure 2. Fireworks-related injuries by age group and gender surrounding Territory Day 2024



Characteristics of fireworks-related injuries by severity, type and anatomical site

Of the 41 total FWRIs 21 (51%) were moderate or severe injuries with 3 (7%) of the cases hospitalised. The type of the injuries included 24 (59%) burn cases and 4 (10%) blunt trauma and 6 (15%) eye injuries. The burns cases included a child aged 6 months with facial burns who required hospital admission to ICU. There was 1 fracture and 1 penetrating hand injury sustained. The anatomical sites most often injured by fireworks were hands (29%), eyes (15%) and feet (15%). There were 3 groin injuries sustained by men. These findings are shown in the Table below.

Table. Characteristics of fireworks-related injuries by severity, type and anatomical site surrounding Territory Day 2024

Injury Characteristics		**Number (%)**
Injury Severity	Mild	20 (49)
	Moderate	14 (34) } 21 (51%)
	Severe	7 (17) }
Type of Injury	Burn	24 (59)
	Abrasions/Lacerations	2 (5)
	Blunt trauma	4 (10)
	Fracture	1 (2)
	Penetrating	1 (2)
	Unknown	9 (22)
Anatomical site	Head and neck	4 (10)
	Eye	6 (15)
	Hand	12 (29)
	Arm	2 (5)
	Trunk and back	3 (7)
	Legs	5 (12)
	Feet	6 (15)
	Groin*	3 (7)
Total fireworks-related injuries		**41 (100)**

+Some injuries occurred in multiple anatomical sites

*Groin includes perineum, buttock and scrotal injuries

Discussion

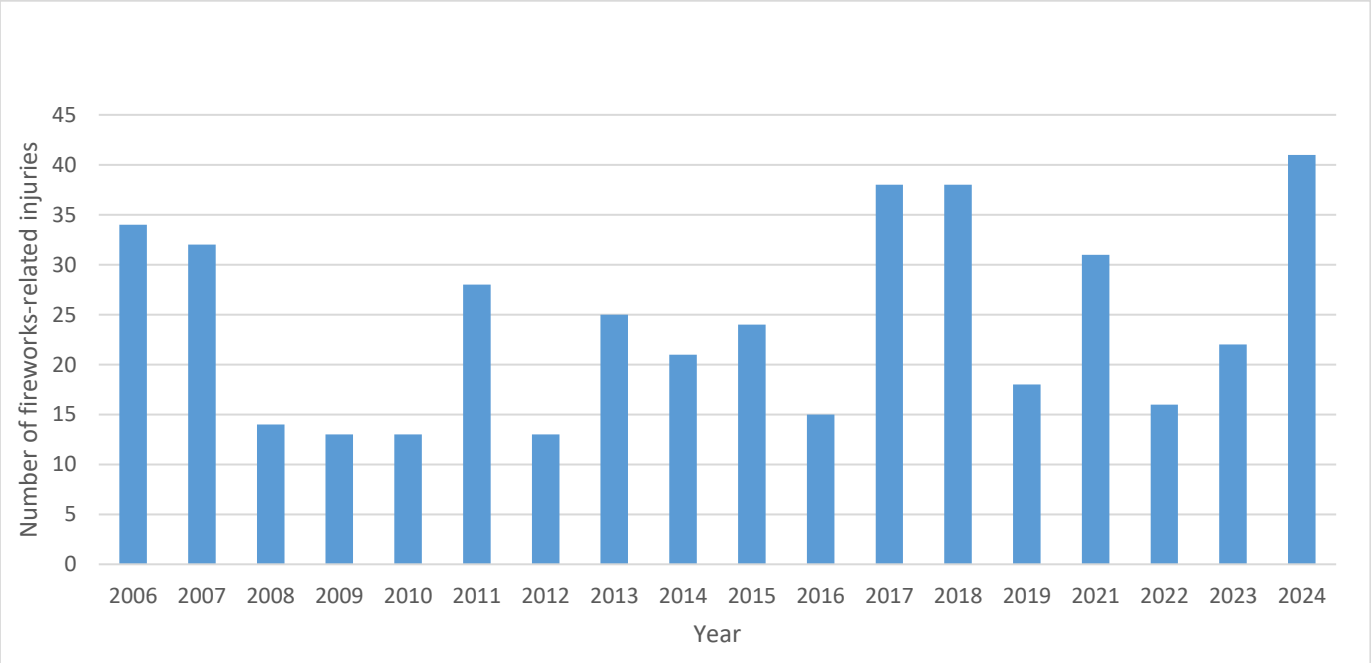
The 2024 Territory Day celebrations had the highest number of firework-related injuries (FWRIs) recorded via surveys conducted in the last 18 years with 41 injuries recorded during the 5-day study period (Figure 3).

A study examining burns injuries that were fireworks-related from 2010 to 2023 across Australia and New Zealand (ANZ) reported that cases in the NT accounted for 34% of the total injuries in the 14 year study period in ANZ,[2] reflecting a concerning burden of disease for the jurisdiction, given the NT's relative small population of 233,000.[3]

Men and bystanders made up the majority of those injured which is in line with trends found in the literature from Australia and abroad.[2] Hands were the most commonly injured, and have been reported in multiple international studies as the sites of the body most commonly affected due to the requisite manual handling of fireworks during firework ignition.[2,4] Groin (perineum, scrotal or buttock) injuries were reported on 3 occasions, all involving men, suggesting mishandling of fireworks. Eye injuries, accounting for 15% of all FWRIs are well documented as a cause for concern as fireworks cause vision-threatening injures impacting on lifelong quality of life.[5]

Injuries caused by fireworks are a global issue. International studies have demonstrated that spikes in FWRIs occur on festival days such as Diwali, Halloween and Guy Fawkes Day[4,6] in line with this study and national figures showing half of NT fireworks burns occur during public holidays.[2] The Unites States (US) Consumer Product Safety Commission (CPSC) reported an average of 10,000 emergency department-treated injuries and 8 deaths annually, related to fireworks between 2008 and 2023. Most injuries occurred over a month period during June - July in relation to the US national celebration of Independence on 4 July. In 2023 the rate of FWRIs was 2.9 per 100,000 individuals.[7] In contrast, taking the population of the NT at 233,000,[3] the 41 injuries recorded for Territory Day celebrations in 2024 equates to 17.6 injuries per 100,000 population.

Figure 3. Centre for Disease Control Annual Fireworks Survey Data – Number of firework-related injuries in the Northern Territory by year, 2006 - 2024



The NT government and associated stake holders, including NT Health, the RDH Burns Unit, NT Police, Fire & Emergency Services, Bushfires NT and St Johns Ambulance Media,[8,9] release harm minimisation and safety messaging in the lead up to Territory Day. Messaging centres on harm reduction strategies including safe and responsible use of fireworks and safe disposal of fireworks and burn first aid messaging.

This study found that bystanders accounted for the majority of injuries (56%), highlighting the dangers posed by fireworks when used by non-professionals. It underscores the need for targeted messaging about the risks of fireworks, not only for those actively lighting them, but also for those observing these displays. The messages also need to be targeted to travellers to the Territory, who may not be familiar with fireworks safety and regulations, as a quarter of injuries involved visitors to the Territory.

Of concern, just over half (51%) of the 41 presentations were classified as moderate to severe with 7 cases hospitalised and 3 of those hospitalised were children. Of the 11 FWRIs in those under 18 years, 7 were bystanders and 4 acquired injuries from setting off fireworks themselves, reinforcing that children who both actively and passively partake in the fireworks on Territory Day are at risk. Education aimed at school-aged children remains a priority. While it is only legal for adults over the age of 18 years to purchase fireworks, the Territory Government only gives a recommendation that all children should have supervision, and children under the age of 12 years should not use fireworks.[10]

Some NT government sanctions to protect the public and the environment include banning of personal use of fireworks on Territory Day at specific 'community events' includes at the Darwin Waterfront and Mindil Beach areas where the professional displays are viewed.[1] Fines have increased steadily over the years, from $1,200 in 2017 to $1,850 issued on-the-spot for sale and possession of fireworks after midday on Tuesday, 2 July 2024.[5] Fines and criminal charges can also be made if fireworks are used in a manner that could damage property or harm people or animals.[9] Increases in fines in recent years do not appear to have had an effect on the number of injuries recorded, as evidenced by the upward trend in the total number of fireworks-related injuries from 2006 to 2024, as shown in Figure 3.

In 2003 the public sales period of fireworks for Territory Day was reduced to 2 days, which had no impact on FWRIs recorded in the NT CDC survey. The sales period was further limited to the 1 July only in 2008. At the same time the legal age to buy fireworks was raised from 16 to 18 years. FWRI dropped significantly from 31 in 2007 to 14 in 2008, to 13 in 2009 and 2010. However, any lasting effect after 2010 appears to have dissipated with higher rates recorded since that time. Similar combined strategies of restrictions on times when fireworks can be used and sold and raising the minimum age of fireworks purchase have been shown to be moderate effect in Europe.[11]

Legislation of fireworks bans has been shown to reduce fireworks related injuries in Australia and internationally.[11,12] Public use of fireworks is banned in all states and Territories other than the NT and Tasmania. In Tasmanian, on May 24 'Cracker Night', personal fireworks permits must be obtained for an individual to hold a fireworks display.[13] Fireworks were accessible in the ACT however a total ban was put in place in 2009 and subsequently the number of fireworks-related offences reported to the police significant reduced.[11] With national figures showing half of NT fireworks burns occurring during public holidays including Territory Day[2] when the usual fireworks restrictions are lifted, legislative bans could have meaningful impact. In the NT while there have been calls for a total fireworks ban, the call has been opposed and a harm-reduction strategy supported. The 2 measures, 1) a restriction on times when fireworks could be used

and sold and 2) raising the minimum age from 16 to 18 years for fireworks purchase in 2008 had a modest and non-sustained effect in the NT[14] according to trends demonstrated in the CDC FWRIs Survey as pictured in Figure 3. Licencing is another strategy that has not yet been tested in the NT that has had effect in Europe.[11] Reducing bystander injuries by implementing further fireworks-free areas and implementing public health education campaigns on a broader scale seem necessary but many areas will still put bystanders at risk.

Limitations

There were a number of limitations to this study that should be taken into account when interpreting the findings. The survey only collects data related to patients presenting to specific emergency departments and primary health clinics in the NT in a 5-day time period. Minor injuries that would not prompt emergency department presentation were not captured. For these reasons, total numbers of injuries related to Territory Day fireworks may have been underestimated. Later stage complications were not recorded.

Conclusion

This report captures data reflecting FWRIs in association with Territory Day celebrations in 2024 and past years and highlights the hazards posed by personal use of fireworks in the Northern Territory. Rates of FWRIs increased over the recent 5-year period in the Territory, with 41 FWRIs recorded this year. Men, bystanders, and visitors to the NT are at particular risk of FWRIs and children make up a substantial (27%) proportion. Relying on harm reduction messaging and strategies to protect particularly the vulnerable or potentially unaware such as children, visitors and bystanders is a very challenging undertaking and to date has not resulted in reduction in injury numbers.

Acknowledgements

I would like to thank specifically the Burns Unit, RDH Margaret Brennan, Nurse Unit Manager and Dave Jacinto, Clinical Nurse Consultant, as well as Emergency Department staff of RDH, PRH, GDH, ASH, TCH, KDH. In addition, the staff at Palmerston GP Super Clinic and Robertson Barracks Health Centre. I would also like to thank the CDC staff of Dr Pasqualina Coffey and Associate Professor Vicki Krause for guiding me throughout the FWRI survey process.

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COVID-19 Epidemiological Situation Report – 30 September 2024

NORTHERN TERRITORY GOVERNMENT

Centre for Disease Control

NT HEALTH

COVID-19 surveillance update

Reporting period: 2 July to 30 September 2024

Summary

There were 515 confirmed cases (PCR positive) of COVID-19 notified in the 3 month reporting period (2 July 2024 to 30 September 2024); a 50% decrease in case numbers compared to the previous 3 month reporting period (1,024 cases). There have been 2,271 confirmed cases (PCR positive) of COVID-19 notified this year.

Please note, probable cases (RAT positive) of COVID-19 are no longer notified or included in this surveillance report.

Table 1: Confirmed cases (PCR positive) of COVID-19 notified in the 3 month reporting period and year-to-date

	3 month reporting period		Year-to-date	
Cases notified	515		2,271	
Aboriginal status	**Cases**	**Proportion**	**Cases**	**Proportion**
Aboriginal	144	28%	790	35%
Non-Aboriginal	366	71%	1,461	64%
Unknown	5	1%	20	1%
Age group	**Cases**	**Proportion**	**Cases**	**Proportion**
0-9	76	15%	320	14%
10-19	24	5%	97	4%
20-59	246	48%	1,200	53%
60-69	65	13%	276	12%
≥70	104	20%	378	17%

Health district	Cases	Rate per 100,000 population	Cases
Alice Springs Rural	15	479	107
Alice Springs Urban	49	714	260
Barkly	14	901	57
Darwin Rural	35	916	152
Darwin Urban	307	803	1,256
East Arnhem	17	440	141
Interstate	38		136
Katherine	37	735	155
Overseas	3		6
Unknown			1

Table 2: COVID-19 hospitalisations^* in the reporting period, previous 3 month period and year-to-date

Reporting period	Previous 3 month period	Ratio	Year-to-date
144	253	0.6	561

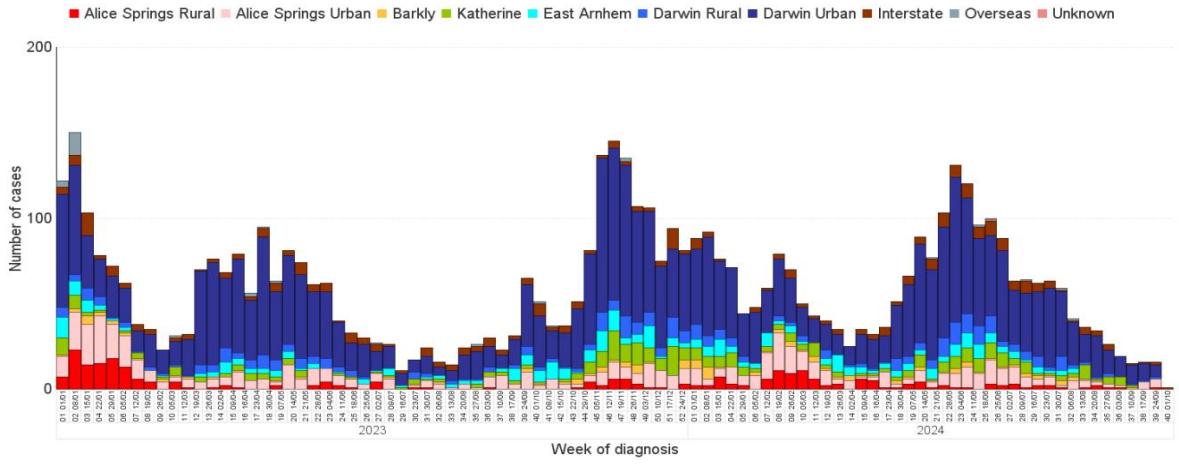
^ Hospitalisation status is recorded as at the time of notification entry.

Table 3: COVID-19 deaths* in the reporting period, previous 3 month period and year-to-date

Reporting period	Previous 3 month period	Ratio	Year-to-date
5	2	2.5	12

* COVID-19 hospitalisations and deaths include only confirmed cases (PCR positive)

Figure 1: Confirmed cases (PCR positive) of COVID-19 by health district and week of diagnosis, since 1 January 2023



Media and health alerts issued July to September 2024

A public health alert was issued for influenza in August 2024 and mpox (monkeypox) in September 2024 by the NT Centre for Disease Control (CDC). Below are excerpts from these alerts, noting some may no longer be active at the time of publishing this issue and the full mpox alert is available on the following page. Current and previous health alerts can be viewed at the NT Health website.

Influenza

There has been a marked increase in influenza notifications in the Top End in the past 2 weeks with 197 cases notified which is a 34% increase compared to the previous fortnight. Most notifications have come from the Darwin region, particularly in urban areas. It is expected that cases will increase across other NT regions in the coming weeks.

Read the full alert issued 9 August 2024

Mpox (Monkeypox)

Mpox has been declared as a Public Health Emergency of International Concern (PHEIC) by the World Health Organization on 14 August 2024. This is in response to an upsurge in cases of mpox and emergence of clade Ib mpox in the Democratic Republic of the Congo (DRC), which then spread to neighbouring countries including the Central African Republic (CAR), Burundi, Uganda and Rwanda.

There is early evidence that this emerging clade of mpox may cause more severe disease and may be more transmissible, but further information is being collected.

The National Rapid Assessment Team (RAT) has determined the risk in Australia is currently low to moderate from mpox.

Read the full alert issued 10 September 2024

NORTHERN TERRITORY GOVERNMENT

Centre for Disease Control
NT HEALTH

Issued: 10th September 2024

Mpox declared as Public Health Emergency of International Concern (PHEIC) by WHO

What is mpox?

- Mpox is a zoonotic disease caused by an orthopoxvirus, which can cause a rash or other lesions, swollen lymph nodes, fever, headaches, muscle aches, and fatigue. When present, rashes and lesions often being in the genito-anal areas, but can also involve the face, body, hands, feet, and inside the mouth. Presentations can be varied, and can include proctitis without rash/lesions, rashes without prodrome, or even just a single lesion.
- Symptoms of mpox may closely resemble other diseases such as syphilis, herpes, chicken-pox, scabies, molloscum, or other skin infections.
- Mpox is spread through close contact with sores, through body fluids, or from contaminated objects. This may occur during sexual activities, but can also occur through other types of physical contact, or by droplet exposure in specific contexts e.g. shaking out contaminated bed linens.
- Generally mpox resolves on its own, but for some people, such as immunocompromised people, it can cause severe disease and deaths have been recorded overseas.

Current situation

- Mpox has been declared as a Public Health Emergency of International Concern (PHEIC) by the World Health Organization on 14th August. This is in response to an upsurge in cases of mpox and emergence of clade Ib mpox in the Democratic Republic of the Congo (DRC), which then spread to neighbouring countries including the Central African Republic (CAR), Burundi, Uganda and Rwanda.
- There is early evidence that this emerging clade of mpox may cause more severe disease and may be more transmissible, but further information is being collected.
- Single cases of clade Ib mpox have been detected in Sweden and Thailand, in travellers returning from central Africa. **NO cases of clade Ib mpox have been detected in Australia to-date**.
- Since 2022, mpox which has been circulating in Australia has been clade IIb mpox. There have been 445 cases of mpox in 2024 in Australia to-date, mostly occurring in NSW, Victoria, and QLD. There has been a single case detected in NT in a returned traveller (acquired overseas).
- The National Rapid Assessment Team (RAT) has determined the risk in Australia is currently **low** to moderate from mpox.

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CDCSurveillance.DARWIN@nt.gov.au

- NT Health and partners are closely monitoring the situation nationally, and working on preparation to ensure mpox is quickly detected and managed in the NT.

Prevention

- Vaccines are available to help protect against mpox.
- JYNNEOS® is the preferred vaccine for use in Australia, based on its safety profile and ease to administer.
- Recommended groups for mpox vaccination include:
  - Gay, bisexual, and other men who have sex with men
  - Sex workers
  - People living with HIV
  - Laboratory workers who work with orthopoxviruses
  - Healthcare workers (depending on risk of exposure)

- **Vaccines can be easily accessed from Clinic 34 sexual health clinics across the NT.** Vaccines may be requested by primary and remote health clinics for eligible clients who cannot access Clinic 34 – please contact the local Clinic 34 service or CDC unit to discuss.
- More information about vaccines can be found here: Mpox vaccines and Mpox - AIH

What to do if you suspect mpox

- Ensure you and your staff use appropriate PPE, including gown, gloves, surgical/N95 mask, and eye protection for the assessment and treatment of clients with suspected mpox. For information about mpox infection prevention and control, see Mpox IPC for Clinicians.
- Make sure to take a comprehensive travel and exposure history from the client.
- Take PCR swabs from at least 2 lesions (if 2 are visible).
- Call ahead to the laboratory to let them know if you are sending samples for mpox testing.
- **Contact your local CDC unit to notify the suspected case.**
- More information on the diagnosis, testing, and management of mpox has been compiled by the Australasian Society for HIV, Viral Hepatitis, and Sexual Health Medicine (ASHM) here: mpox (monkeypox) | ASHM Health

Further information

Visit: Mpox | NT Health
mpox (monkeypox) | ASHM Health

Contact

CDC Darwin	Ph 8922 8044	Fax 8922 8310	cdcsurveilliance.darwin@nt.gov.au
CDC Alice Springs	Ph 8951 7540	Fax 8951 7900	cdc.alicesprings@nt.gov.au
CDC Katherine	Ph 8973 9049	Fax 8973 9048	cdc.katherine@nt.gov.au
CDC Tennant Creek	Ph 8962 4259	Fax 8962 4420	cdc.barkly@nt.gov.au
CDC Nhulunbuy	Ph 8987 0357	Fax 8987 0500	cdcgove.doh@nt.gov.au

Issued by: Director, Centre for Disease Control, Public Health Division, NT Health

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Northern Territory disease notifications by onset date and district – 1 April to 30 June, 2nd quarter (2023 vs. 2024)

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		N T	
	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023
Acute Post Strep GN	4	3	1	0	1	5	0	2	2	1	8	11
Adv Vacc Reaction	0	1	0	1	0	10	0	0	0	0	0	12
Amoebiasis	0	0	0	0	1	0	1	0	0	0	2	0
Barmah Forest	1	1	1	0	2	1	0	1	0	0	4	3
Campylobacteriosis	8	8	3	0	51	57	2	0	4	7	68	72
Chickenpox	0	4	0	0	6	11	1	0	1	3	8	18
Chlamydia	240	243	25	33	266	330	33	58	69	72	633	736
Chlamydial conj	0	0	0	0	1	0	0	0	0	0	1	0
COVID-19	137	107	16	3	742	652	63	12	67	9	1,025	783
Crusted scabies	4	7	0	2	16	8	6	4	3	4	29	25
Cryptosporidiosis	3	3	3	0	7	85	0	0	0	2	13	90
Dengue	0	0	0	0	22	5	1	0	0	1	23	6
Gonococcal conj	1	0	0	0	0	0	0	0	0	0	1	0
Gonococcal infection	251	262	25	21	116	170	28	50	54	79	474	582
Group A strep invasive	10	12	3	3	13	11	2	5	1	5	29	36
Hepatitis B - new	0	1	0	0	2	0	0	0	0	0	2	1
Hepatitis B - unspec	3	2	0	1	11	18	5	0	2	1	21	22
Hepatitis C - new	1	1	0	0	3	0	0	0	1	0	5	1
Hepatitis C - unspec	0	6	0	0	2	16	0	0	0	2	2	24
Hepatitis D	0	0	0	1	0	0	0	0	0	0	0	1
H Influenzae non-b	1	0	0	0	1	0	0	0	0	0	2	0
HIV	4	1	2	0	12	4	1	0	1	1	20	6
HTLV1 adult TCL	1	0	0	0	0	0	0	0	0	0	1	0
HTLV1 asyptom/unspec	7	14	1	1	2	0	0	0	1	0	11	15
HUS	0	0	0	0	0	1	0	0	0	0	0	1
Influenza	606	489	40	42	866	226	270	41	62	50	1,844	848
Kunjin Virus	0	0	0	0	0	0	0	0	0	1	0	1
Lead - elevated	0	0	1	0	8	105	4	4	0	5	13	114
Legionellosis	0	0	0	0	2	1	0	0	0	0	2	1
Leprosy	0	0	0	0	0	0	1	0	0	0	1	0
Leptospirosis	0	0	0	0	1	0	0	0	0	2	1	2
LGV	0	0	0	0	2	0	0	0	0	0	2	0
Listeriosis	0	0	0	0	1	0	0	0	0	0	1	0
Malaria	0	0	1	0	8	2	0	0	0	0	9	2
Melioidosis	0	0	1	0	11	11	3	3	3	2	18	16
Meningococcal infection	1	0	0	0	0	0	0	0	0	0	1	0
Mumps	0	0	0	0	2	1	0	0	0	0	2	1
MVE	0	0	0	0	0	2	0	0	0	3	0	5
Non TB Mycobacteria	0	0	0	0	3	5	0	0	0	0	3	5
Paratyphoid	0	0	0	0	0	2	0	0	0	0	0	2

(table continued next page)

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		N T	
	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023	2024	2023
Pertussis	3	0	1	0	6	2	1	0	1	0	12	2
Pneumococcal disease	6	6	1	3	3	5	0	0	3	1	13	15
Q Fever	0	0	0	0	1	0	0	0	0	0	1	0
Rheumatic Fever	12	23	7	4	7	8	3	3	5	4	34	42
Rheumatic heart disease	8	8	5	1	7	8	1	2	6	6	27	25
Ross River Virus	0	0	1	0	14	16	0	3	3	1	18	20
Rotavirus	4	6	1	0	21	9	0	0	2	0	28	15
RSV infection	181	33	11	5	321	53	14	16	60	9	587	116
Salmonellosis	11	7	2	4	81	66	3	4	7	4	104	85
Shigellosis	7	18	3	4	12	15	2	2	2	4	26	43
STEC/VTEC	0	0	0	0	0	1	0	0	1	0	1	1
Syphilis < 2y duration	27	29	1	5	24	10	5	0	7	7	64	51
Syphilis > 2y or unk duration	2	1	1	0	7	4	0	1	5	1	15	7
Trichomoniasis	236	234	40	42	190	288	78	112	83	100	627	776
Tuberculosis	0	0	0	0	6	3	0	0	1	3	7	6
Typhoid	0	0	0	0	1	1	0	0	0	0	1	1
Typhus	0	0	0	0	1	1	0	0	0	0	1	1
Varicella - unspec	4	5	2	0	10	36	0	0	4	1	20	42
Vibrio food poisoning	0	0	0	0	0	1	0	0	0	0	0	1
Vibrio invasive	0	0	0	0	0	0	1	0	0	0	1	0
Yersiniosis	1	1	0	0	4	7	0	0	0	0	5	8
Zika	0	0	0	0	4	0	0	0	0	0	4	0
Zoster	7	13	1	2	86	59	5	2	4	5	103	81
Sum:	**1,792**	**1,549**	**200**	**178**	**2,985**	**2,332**	**534**	**325**	**465**	**396**	**5,976**	**4,780**

Dengue notifications for April to June 2024 – overseas acquired

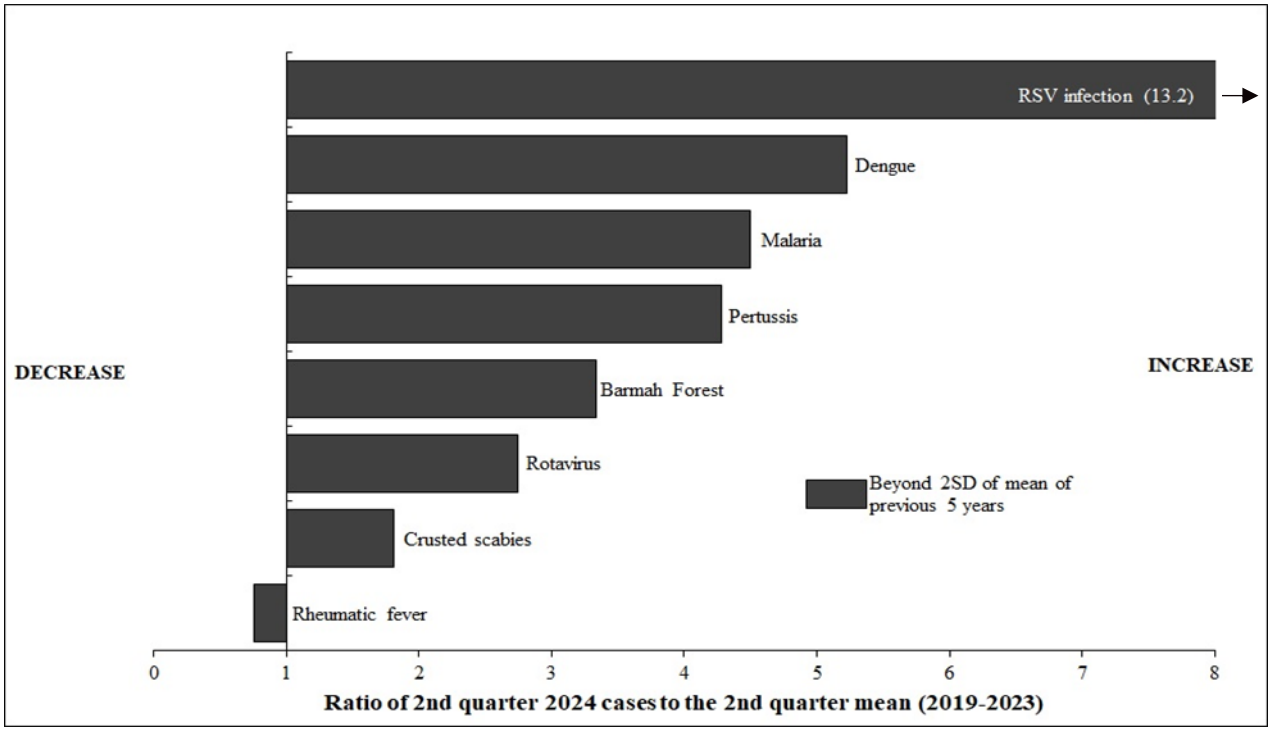
Number of cases	Origin of infection	NT Region notified (number of cases)
21	Indonesia	Darwin (20), East Arnhem (1)
2	Timor-Leste	Darwin (2)

Malaria notifications for April to June 2024 - overseas acquired

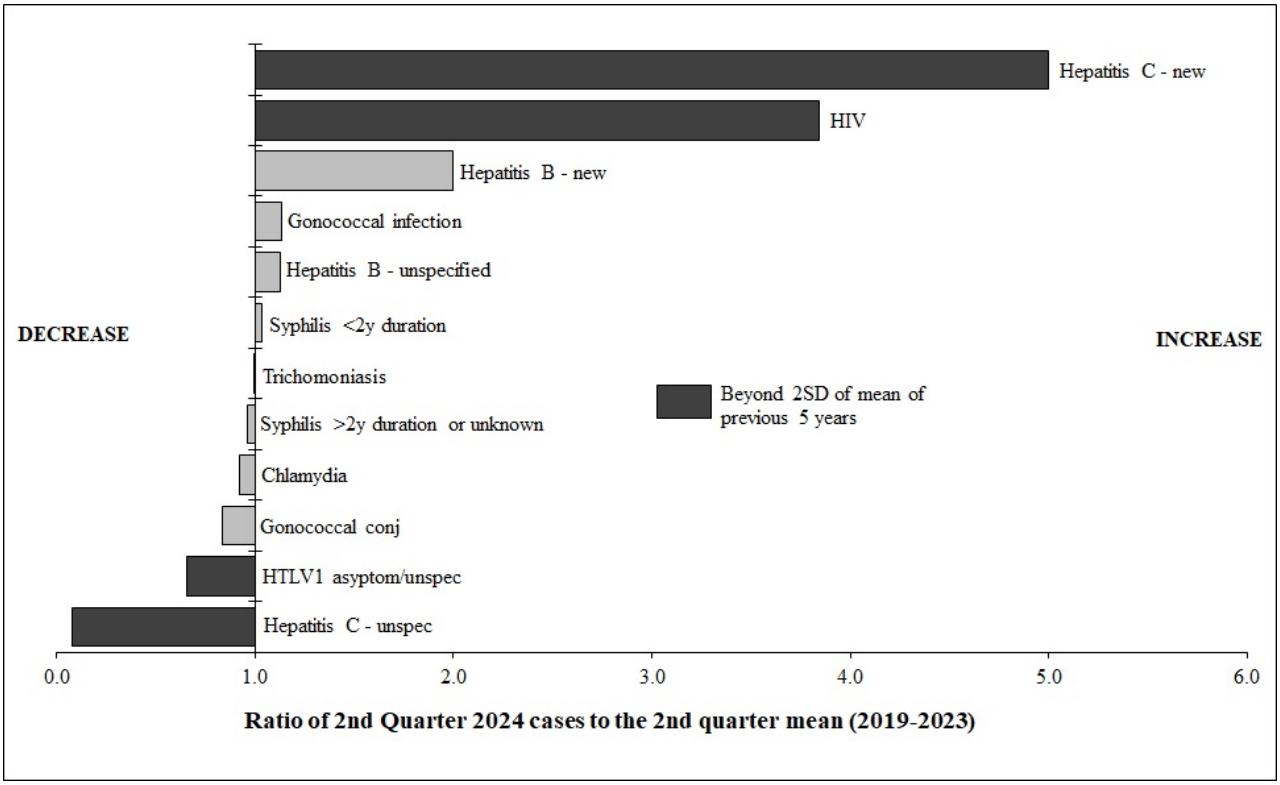
Number of cases	Origin of infection	Agent	Chemoprophylaxis	NT Region
4	Kenya	*P. falciparum*	3 took no prophylaxis, 1 took artemether/lumefantrine	Darwin
1	Burundi	*P. falciparum*	Nil	Darwin
1	Burundi	*Plasmodium* spp.	Nil	Darwin
1	Zambia	*P. falciparum*	Nil	Darwin
1	South Sudan	*Plasmodium* spp.	Nil	Barkly
1	Kenya	*Plasmodium* spp.	Artemether/lumefantrine	Darwin

Graphs of selected diseases and STIs – 2nd quarter, 2024

Ratio of the number of notifications in 2nd quarter of 2024 to the 2nd quarter mean (2019 – 2023): Selected diseases



Ratio of the number of notifications in 2nd quarter of 2024 to the 2nd quarter mean (2019 – 2023): Sexually transmitted infections



Comments on selected disease notifications

Amoebiasis

There were 2 notifications of amoebiasis in the 2nd quarter of 2024; 1 person acquired their infection in India and 1 in Indonesia; 1 of the cases had extraintestinal spread. There have been 5 notifications year-to-date, which is the most ever notified in a single year in the NT.

RSV infection

There were 587 notifications of respiratory syncytial virus (RSV) infection in the 2nd quarter of 2024. RSV infection was only made a notifiable condition in July 2021. The inclusion of RSV and influenza virus testing on the same testing panel as COVID-19 has likely resulted in higher case ascertainment.

Dengue

There were 23 notifications of dengue virus infection in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 4.4 cases. This represents a return toward pre-pandemic incidence. From 2015 to 2019, the 5-year 2nd quarter mean was 20 notifications. All cases acquired their infection overseas, with 21 cases acquiring their infection in Indonesia (19 from Bali specifically), and 2 cases from Timor-Leste. Dengue virus infection is not endemic in the NT although the vector mosquito, *Aedes aegypti*, has been detected in recent years in Tennant Creek and an intense elimination program is underway to eliminate this mosquito there.

Zika

There were 4 cases of Zika virus infection notified in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 0 cases; 2 cases acquired their infection in Timor-Leste; 1 in Bali, Indonesia; and 1 case acquired their infection locally, through sexual contact with an overseas acquired case.

Malaria

There were 9 notifications of malaria in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 2 notifications. Of the total, 5 cases acquired their infection in Kenya, 2 in Burundi, 1 in South Sudan and 1 in Uganda. Of the 9 notifications, 6 were *Plasmodium falciparum* with the remaining 3 unspeciated as 2 cases were detected by PCR only (*Plasmodium* spp. only), and 1 case was detected on PCR and also had low parasite counts on thick film but was unable to be speciated.

Pertussis

There were 12 notifications of pertussis in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 2.8 notifications. Other jurisdictions in Australia have seen a substantial increase in pertussis notifications during this quarter. These findings prompt the need for ongoing education to primary caregivers to be on the lookout for pertussis cases, and to aim for high coverage with pertussis-containing vaccines especially for maternal vaccination during each and every pregnancy.

Barmah forest

There were 4 notifications of Barmah Forest virus infection in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 1.2 notifications.

Rotavirus

There were 28 notifications of rotavirus in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 10.2 notifications.

Crusted scabies

There were 29 notifications of crusted scabies in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 16 notifications. The NT continues to observe high rates of crusted scabies.

Acute rheumatic fever

There were 34 notifications of acute rheumatic fever in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 48.8 notifications. Notifications of ARF are exceedingly high with the NT recording the highest rate (359.5/100,000) and cases (284) of ARF notified among Aboriginal people in Australia. Reference: AIHW: ARF and RHD in Australia, 2022

Hepatitis C - new

There were 5 notifications of hepatitis C – 'new' in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 1 notification.

HIV

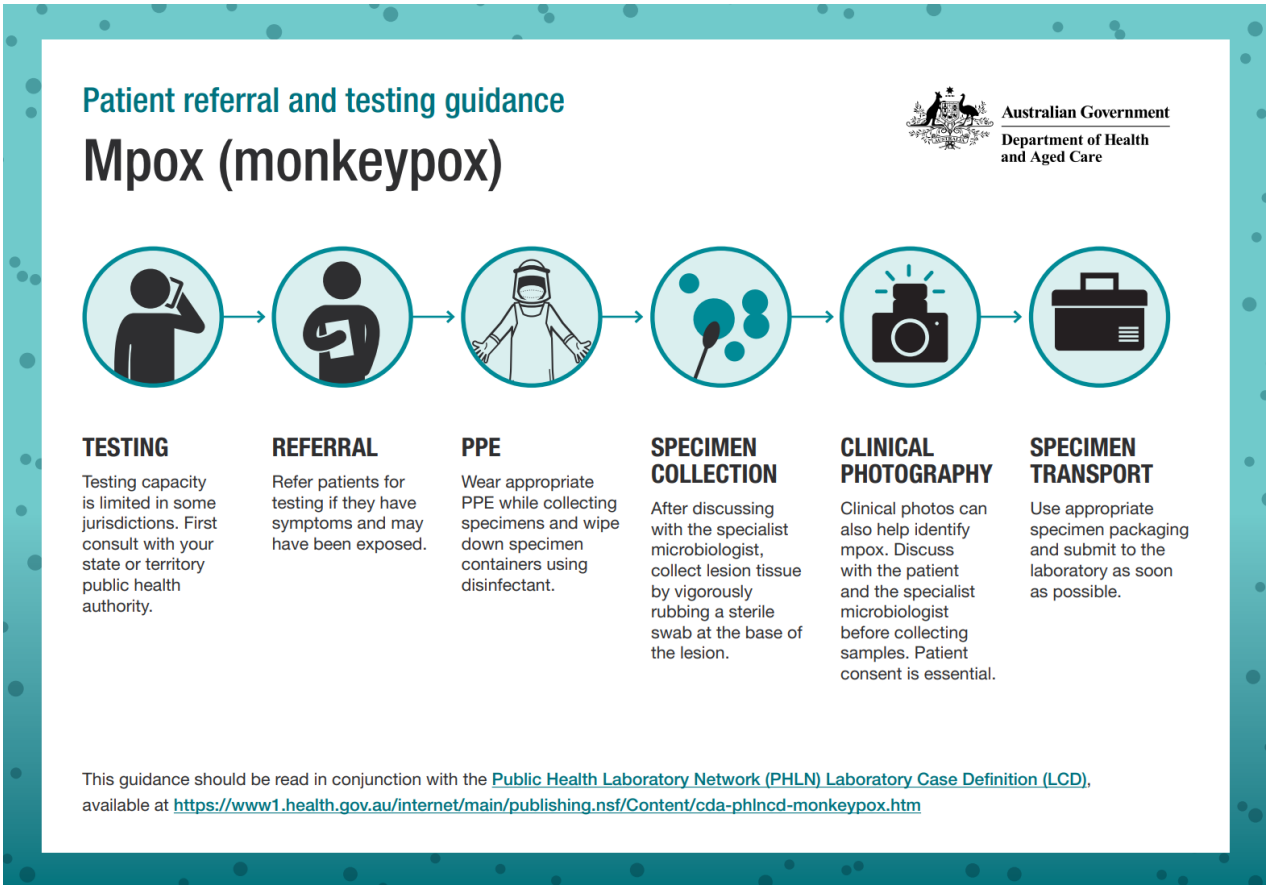
There were 20 notifications of HIV in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 5.2 notifications. Of the 20 cases, 4 cases were newly acquired in Australia and 16 cases were previously known to be positive overseas.

HTLV1 asymptomatic/unspecified

There were 11 notifications of HTLV1 asymptomatic/unspecified in in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 16.8 notifications.

Hepatitis C – unspecified

There were 2 notifications of hepatitis C – 'unspecified' in the 2nd quarter of 2024 compared to a 5-year 2nd quarter mean of 27.2 notifications. This may reflect a delay in hepatitis C classifications.



Immunisation coverage in the Northern Territory

Northern Territory immunisation data is accessible from the Australian Government website. The following link provides tables of the latest annualised quarterly report on childhood immunisation coverage from the Australian Government Department of Health and Aged Care, which combines the December, March, June and September quarters for NT and Australia.

The data show the proportion of children fully immunised at 1, 2 and 5 years of age according to the National Immunisation Program Schedule.

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Abstracts from peer reviewed published articles related to the Northern Territory

Lower Rates of *Staphylococcus aureus* Bloodstream Infection in Patients on Hemodialysis Receiving Trimethoprim-Sulfamethoxazole Melioidosis Prophylaxis

Bryce A, Davison S, Currie B J, Birrell J M, Baird R W, Abeyaratne A, Majoni S W , Brewster-O'Brien T, Tong S Y C

Open Forum Infectious Diseases, Volume 11, Issue 8, August 2024, ofae431

https://doi.org/10.1093/ofid/ofae431

Hemodialysis is a risk factor for *Staphylococcus aureus* bloodstream infection (SAB). In this single-center study, SAB rates were 56% lower during the monsoonal wet season when patients on hemodialysis receive supervised melioidosis prophylaxis with trimethoprim-sulfamethoxazole. This intervention may reduce SAB rates in high-risk patients; however, further targeted studies are required.

Trimethoprim-sulfamethoxazole (TMP-SMX) is a broad-spectrum antimicrobial used in the treatment of a number of bacterial and fungal infections. The drug is also employed in lower dosages as a prophylactic agent, primarily in immunocompromised individuals, to reduce incidence of *Pneumocystis jirovecii* pneumonia (PJP). In the tropical Top End of the Northern Territory (NT) of Australia, patients requiring maintenance renal replacement therapy with hemodialysis receive supervised postdialysis TMP-SMX (160 mg/800 mg thrice weekly) for 6 months of the year during the monsoonal wet season as prophylaxis against *Burkholderia pseudomallei*, the causative agent of melioidosis [1]. This intervention has also been associated with a decrease in incidence of invasive *Streptococcus pyogenes* (group A Streptococcus) infection in the target population during the period of administration [2].

Literature from the premodern combined antiretroviral therapy era indicates that prophylactic TMP-SMX may reduce community-acquired [3] and invasive *Staphylococcus aureus* infections in patients living with human immunodeficiency virus (HIV) [4]. In patients on hemodialysis, who are at significantly elevated risk of *S aureus* bloodstream infection (SAB) [5] and associated morbidity and mortality, quantifying prophylactic TMP-SMX's efficacy against SAB is of particular relevance. Here, we describe the association of wet season TMP-SMX melioidosis prophylaxis and incidence of SAB in patients receiving hemodialysis in the NT during the wet and dry seasons.

Keywords: antibiotic prophylaxis, bloodstream infection, hemodialysis, *Staphylococcus aureus*, trimethoprim-sulfamethoxazole.

Performance of MALDI-TOF MS, real-time PCR, antigen detection, and automated biochemical testing for the identification of *Burkholderia pseudomallei*

Campbell S, Taylor B, Menouhos D, Hennessy J, Mayo M, Baird R, Currie BJ, Meumann EM

J Clin Microbiol. 2024 Sep 5:e0096124.

DOI: 10.1128/jcm.00961-24

ABSTRACT *Burkholderia pseudomallei* is the causative agent of melioidosis, a disease highly endemic to Southeast Asia and northern Australia, though the area of endemicity is expanding. Cases may occur in returning travelers or, rarely, from imported contaminated products. Identification of *B. pseudomallei* is challenging for laboratories that do not see this organism frequently, and misidentifications by matrix-assisted laser desorption/ionization time of flight mass spectrometry (MALDI-TOF MS) and automated biochemical testing have been reported. The *in vitro* diagnostic database for use with the Vitek MS has recently been updated to include *B. pseudomallei* and we aimed to validate the performance for identification in comparison to automated biochemical testing with the Vitek 2 GN card, quantitative real-time polymerase chain reaction (qPCR) targeting the type III secretion system, and capsular polysaccharide antigen detection using a lateral flow immunoassay (LFA). We tested a "derivation" cohort including geographically diverse *B. pseudomallei* and a range of closely related *Burkholderia* species, and a prospective "validation" cohort of *B. pseudomallei* and *B. cepacia* complex clinical isolates.

MALDI-TOF MS had a sensitivity of 1.0 and specificity of 1.0 for the identification and differentiation of *B. pseudomallei* from related *Burkholderia* species when a certainty cut off of 99.9% was used. In contrast, automated biochemical testing for *B. pseudomallei* identification had a sensitivity of 0.83 and specificity of 0.88. Both qPCR and LFA correctly identified all *B. pseudomallei* isolates with no false positives. Due to the high level of accuracy, we have now incorporated MALDI-TOF MS into our laboratory's *B. pseudomallei* identification workflow.

IMPORTANCE *Burkholderia pseudomallei* causes melioidosis, a disease associated with high morbidity and mortality that disproportionately affects rural areas in Southeast Asia and northern Australia. The known area of endemicity is expanding and now includes the continental United States. Laboratory identification can be challenging which may result in missed or delayed diagnoses and poor patient outcomes. In this study, we compared mass spectrometry using an updated spectral database with multiple other methods for *B. pseudomallei* identification and found mass spectrometry highly accurate. We have therefore incorporated this fast and cost-effective method into our laboratory's workflow for *B. pseudomallei* identification.

Keywords: *Burkholderia pseudomallei;* MALDI-TOF MS; melioidosis; phenotypic identification.

Tuberculosis reactivation following apremilast therapy for psoriasis: Time to consider routine TB screening?

Adams L, Smith E, Tilakaratne D, Krause V

Australas J Dermatol. 2024 Sep 11.

https://doi.org/10.1111/ajd.14364

Apremilast is a relatively new oral treatment for psoriasis, which reduces expression of pro-inflammatory factors, including tumour necrosis factor-α (TNFα), critical to the immune control of *Mycobacterium tuberculosis* infection. In randomised controlled trials (RCTs) for apremilast no new cases of active tuberculosis (TB) were identified, thus, screening for latent TB infection (LTBI) is not currently recommended prior to apremilast initiation. We describe a case of *M.tuberculosis* reactivation shortly after commencement of apremilast for psoriasis. We are recommending clinicians perform LTBI risk assessment in all patients, and appropriate LTBI screening in select populations prior to apremilast initiation.

Use of Comparative Genomics to Resolve an Unusual Case of Aminoglycoside Susceptibility in the Melioidosis Pathogen *Burkholderia pseudomallei* in Bangladesh

Kaestli M, Farook S, Jilani Md S A, Anwar S, Siddiqui T A, Mayo M, Podin Y, Webb JR, Dance D A B, Currie B J

Am J Trop Med Hyg. 2024 Sep 3:tpmd240144.

DOI: 10.4269/ajtmh.24-0144

Melioidosis is an emerging tropical infectious disease with a rising global burden caused by the environmental bacterium *Burkholderia pseudomallei.* It is endemic in Southeast and South Asia, including Bangladesh. A rare aminoglycoside-susceptible *B. pseudomallei* isolate (Y2019) has recently been reported from a melioidosis patient in Dhaka, Bangladesh. To understand the geographical origins of Y2019, we subjected it and 10 other isolates from Bangladesh to whole-genome sequencing. In a phylogenetic tree with a global set of *B. pseudomallei* genomes, most Bangladeshi genomes clustered tightly within the Asian clade. In contrast, Y2019 was closely related to ST881 isolates from Sarawak, Malaysian Borneo, a gentamicin-sensitive sequence type, suggesting infection in Borneo. Y2019 also contained the same gentamicin sensitivity conferring nonsynonymous mutation in the drug efflux pump encoding the amrB gene. In the absence of a full travel history, whole-genome sequencing and bioinformatics tools have revealed the likely origin of this rare isolate.

Scabies

Fernando D D, Mounsey K, Bernigaud C, Surve N, Chávez G E E, Hay R J, Currie B J, Chosidow O & Fischer K

Nature Reviews Disease Primers volume 10, Article number: 74 (2024)

https://doi.org/10.1038/s41572-024-00552-8

Scabies is one of the most common and highest-burden skin diseases globally. Estimates suggest that >200 million people worldwide have scabies at any one time, with an annual prevalence of 455 million people, with children in impoverished and overcrowded settings being the most affected. Scabies infection is highly contagious and leads to considerable morbidity. Secondary bacterial infections are common and can cause severe health complications, including sepsis or necrotizing soft-tissue infection, renal damage and rheumatic heart disease. There is no vaccine or preventive treatment against scabies and, for the past 30 years, only few broad-spectrum antiparasitic drugs (mainly topical permethrin and oral ivermectin) have been widely available. Treatment failure is common because drugs have short half-lives and do not kill all developmental stages of the scabies parasite. At least two consecutive treatments are needed, which is difficult to achieve in resource-poor and itinerant populations. Another key issue is the lack of a practical, rapid, cheap and accurate diagnostic tool for the timely detection of scabies, which could prevent the cycle of exacerbation and disease persistence in communities. Scabies control will require a multifaceted approach, aided by improved diagnostics and surveillance, new treatments, and increased public awareness.

Mycoplasma genitalium retrospective audit of Northern Territory isolates from 2022

Proudmore K, Gunathilake M, Crawford L, Freeman K, Menouhos D, Baird R

Commun Dis Intell (2018) 2024;48

https://doi.org/10.33321/cdi.2024.48.43

The Northern Territory (NT) has the highest rates of sexually transmitted infections (STI) in Australia; however, the local prevalence of *Mycoplasma genitalium (M. genitalium)* has not been previously determined. This study was designed to review *M. genitalium* detection, to determine the regional NT prevalence and macrolide resistance rates. In our study the NT background prevalence of *M. genitalium* is 13%, with the highest detection rates occurring in central Australia and in correctional facility inmates. Symptomatic patients attending sexual health clinics have a positivity rate of 12%, but very high macrolide resistance. The decision to screen for *M. genitalium* should be based on several factors, including the prevalence of the infection in the local population; the availability of effective treatments; and the potential benefits and risks of detection and therapy.

Keywords: *Mycoplasma genitalium*; STI; Northern Territory; sexually transmitted disease; infectious diseases

Clinical effectiveness and analytical quality of a national point-of-care testing network for sexually transmitted infections integrated into rural and remote primary care clinics in Australia, 2016–2022: an observational program evaluation

Causera L, Ward J, Smith K, Sahaa A, Andrewartha A, Wanda H, Hengela B, Badmana S G, Tangeya A, Matthews S, Make D, Gunathilake M, Moore E, Speers D, Persing D, Andersoni D, Whiley D, Maher L, Regan D, Donovana B, Fairley C, Kaldor J, Shephard M, Guya Ron behalf of the TTANGO2 Collaboration

The Lancet Regional Health – Western Pacific, Volume 48, 101110

DOI: 10.1016/j.lanwpc.2024.101110

Background

To address inequitable diagnostic access and improve time-to-treatment for First Nations peoples, molecular point-of-care (POC) testing for chlamydia, gonorrhoea and trichomonas was integrated into 49 primary care clinics across Australia. We conducted an observational evaluation to determine clinical effectiveness and analytical quality of POC testing delivered through this national program.

Methods

We evaluated (i) implementation by measuring trends in mean monthly POC testing; ii) clinical effectiveness by comparing proportions of positive patients treated by historical control/intervention period and by test type, and calculated infectious days averted; (iii) analytical

quality by calculating result concordance by test type, and proportion of unsuccessful POC tests.

Findings

Between 2016 and 2022, 46,153 POC tests were performed; an increasing mean monthly testing trend was observed in the first four years ($p < 0.0001$). A greater proportion of chlamydia/gonorrhoea positives were treated in intervention compared with historical control periods (≤2 days: 37% vs 22% [RR 1.68; 95% CI 1.12, 2.53]; ≤7 days: 48% vs 30% [RR 1.6; 95% CI 1.10, 2.33]; ≤120 days: 79% vs 54% [RR 1.46; 95% CI 1.10, 1.95]); similarly for trichomonas positives and by test type. POC testing for chlamydia, gonorrhoea and trichomonas averted 4930, 5620 and 7075 infectious days, respectively. Results concordance was high [99.0% (chlamydia), 99.3% (gonorrhoea) and 98.9% (trichomonas)]; unsuccessful POC test proportion was 1.8% for chlamydia/gonorrhoea and 2.1% for trichomonas.

Interpretation

Molecular POC testing was successfully integrated into primary care settings as part of a routinely implemented program achieving significant clinical benefits with high analytical quality. In addition to the individual health benefits of earlier treatment, fewer infective days could contribute to reduced transmissions in First Nations communities.

Keywords

Chlamydia, Gonorrhoea, Trichomoniasis, Sexually transmitted infections, POC testing, Implementation, Scaling up, Clinical effectiveness.

Antimicrobial prescribing in referral hospitals in Timor-Leste: results of the first two national point prevalence surveys, 2020-21

Ximenes G, Saha S K, Guterres H, Vieira A, Harris L, Mahony M, Dos Santos A, Toto L, Amaral E, Spargo J C, Tay S Y, Amaral S, Champlin K, Draper A D K, Francis J R, Yan J, Lynar S

JAC Antimicrob Resist. 2024 Aug 1;6(4):dlae123.

DOI: 10.1093/jacamr/dlae123

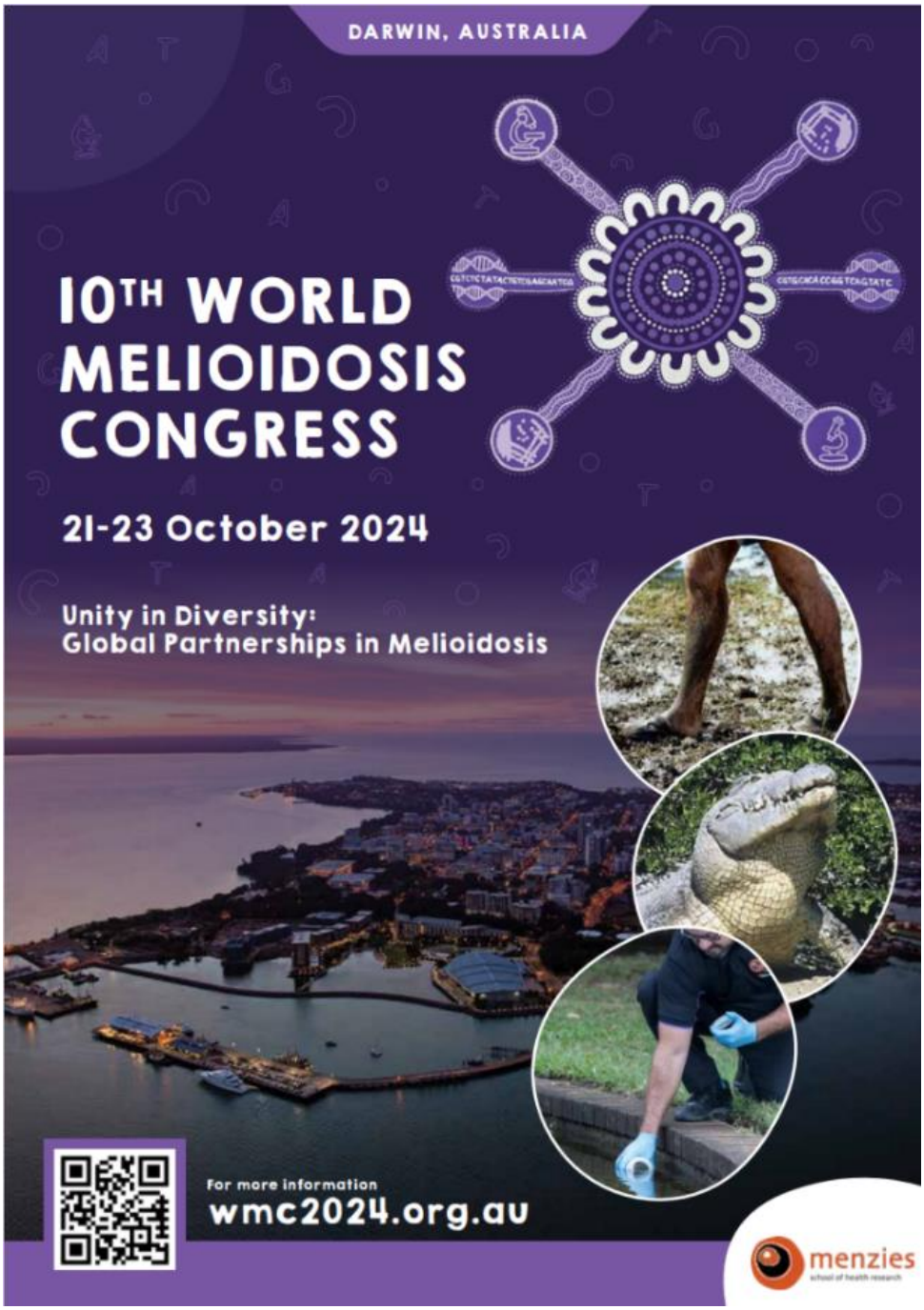
Objectives: To describe antimicrobial use (AMU) in patients admitted to hospitals in Timor-Leste.

Methods: In 2020 and 2021, we undertook antimicrobial prescribing point prevalence surveys across all six hospitals in Timor-Leste (one national and five municipal) to describe AMU and appropriateness in admitted patients.

Results: In 2020, 291/394 (73.9%) surveyed patients had been prescribed antimicrobials, compared with 260/403 (64.5%) in 2021 ($P = 0.004$). Most (309/551; 56.1%) were prescribed one antimicrobial, and 179/551 (32.5%) were prescribed two. The most commonly prescribed antibiotics were ceftriaxone (38.5% in 2020, 41.5% in 2021) and ampicillin (35.7% in 2020, 32.3% in 2021), followed by gentamicin, metronidazole and cloxacillin. Reserve antibiotics like meropenem and vancomycin were minimally used. Of all antimicrobial prescriptions, 70.8% were deemed appropriate in 2020 and 69.1% in 2021. Antimicrobial prescriptions for surgical and post-partum prophylaxis were frequently deemed inappropriate [37/50 (74.0%) and 39/44 (88.6%) prescriptions, respectively].

Conclusions: Most patients admitted to hospital in Timor-Leste are prescribed antimicrobials, and

approximately one-third of these prescriptions are inappropriate. However, this was in the context of limited local guideline availability at the time of surveys and limited microbiological culture capacity outside of the capital, Dili. Improved microbiological guidance, iterative guideline revisions based on local antimicrobial resistance (AMR) surveillance data, and enhanced stewardship activities including further point prevalence studies, could improve antimicrobial use, optimize patient outcomes and reduce AMR in Timor-Leste.



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