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The Australian Medical Response in Kot Addu Pakistan following the flood crisis of 2010

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Abstract

Following the devastating floods affecting Pakistan in 2010 an Australian Medical Task Force comprising of military and civilian members was deployed to the Pakistani town of Kot Addu to assist with the overwhelmed health care facilities. Civilian doctors, nurses and paramedics were drawn from across Australia to participate in the mission. The clinic was set up on a sports field with inflatable tent structures and staff lived in basic accommodation facilities. Over 11,000 consultations were completed during the 48 days that the clinic operated. Common conditions encountered included malaria, malnutrition, tuberculosis and diarrheal illness. The basic accommodation, nutritional and economic needs of the population need ongoing attention.

Key words: humanitarian relief; Pakistan; flood

Introduction

In late July 2010 monsoon rains struck Pakistan causing devastating floods. At the invitation of the Pakistani Government, the Australian Government set up a health centre in the flood-affected town of Kot Addu in Punjab province, central Pakistan. The aim was to assemble a task force to staff the facility and provide primary health care services to support the overwhelmed local health system. The task force comprised of Australian civilian staff selected by the Australian Medical Assistance Team (AUSMAT) as well as Australian Defence Force (ADF) staff. The AUSMAT 'team alpha' component left Australia on

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31 August 2010 and worked at the clinic for 30 days. The second civilian component named 'team bravo' relieved team alpha members for the final 21 days of the clinic which closed on 19 October 2010.

The Floods

The earliest reports in the international media of the Pakistani floods were on 30 July 2010.[1] Initial reports described loss of life from flash flooding and by mid August 2010 the Pakistan National Management Disaster Authority reported that 1/5 of the country was submerged in flood water. Subsequently, the international focus shifted to the enormity of the humanitarian and economic devastation as the flood waters moved along the Indus River from the mountainous north to the Arabian Sea in the south. The threat to health was amplified by the damage to shelter, with millions of people being displaced from their homes and many living in tent accommodation. The United Nations Secretary-General Ban Ki-moon described the Pakistani flood crisis as "a slow-motion tsunami".[2] The economic damage is likely to have a long lasting effect, with the loss of crops as well as the drowning of livestock, in what remains a largely agricultural based society.

Composition of the team

The Pakistan flood assistance was a new model of joint deployment of civilian and military teams. The lead organisation for the medical response was AusAID, the Australian Government agency responsible for managing Australia's overseas aid programs. There were over 160 military staff involved in the mission including management staff, medical staff, engineers, plumbers, electricians, force protection staff, logistics staff and environmental health officers. The Australian military were unarmed throughout the mission with Pakistani military providing security. Staff for the clinic was drawn from both military and civilian ranks. The civilian component was identified by AUSMAT and was drawn from Western Australia, South Australia, Victoria, Queensland and the Northern Territory. The civilian team alpha consisted of 6 doctors, 8 nurses and 3 paramedics and team bravo of 4 doctors, 5 nurses and 1 paramedic. Nurses who were deployed had backgrounds in emergency, paediatric, intensive care, immunisation and remote nursing. The experience acquired through remote nursing practice was particularly valuable to the team. Doctors who were deployed had backgrounds including emergency medicine, general practice, paediatrics and infectious diseases.

Setting up the clinic

The clinic was set up in the town of Kot Addu which was severely affected by the floods. Kot Addu is a agricultural town which lies on the Indus River in the geographical centre of Pakistan. The Australian military carried out the logistics for setting up and maintaining the clinic and accommodation facilities. A sports field within the Kot Addu power station complex was chosen as the site for the clinic. Because of the strategic importance of the power station there was a pre-existing 4 metre high fence that surrounded the entire complex, including the oval. Large military tents with inflatable support structures and dome ceilings were used for the clinic structures. Separate tents for male and female review were erected, with a further 2 large tents to house the pathology, pharmacy, x-ray services as well as a field hospital for the camp staff. These clinical areas had air conditioning units installed (Figure 1). The clinic was advertised with a large sign erected at the front gate as well as pamphlet distribution and information via the religious leaders in the area. The accommodation facilities that were set up at the alternate end of the oval are described below.

Figure 1. Medical tent with air conditioning units.

Life on camp

On 3 September 2010 when team alpha arrived in Kot Addu the temperature was 47 degrees Celsius with high humidity. Within 48 hours 10% of the military and civilians who had arrived on this flight were admitted to the field hospital for heat related illness. Military engineers set up field water purification systems while the environmental health staff carried out mosquito trapping, insecticide fogging and larvicide placement into nearby bodies of water. The living conditions were basic with can toilets and splash buckets for showering. Food was from military ration packs for the first weeks, after which some limited fresh supplements with breakfast cereal became available. The accommodation tents were standard military canvas frame tents below which staff slept in mosquito dome tents (Figure 2). Because of the security considerations staff rarely left the fenced oval area.

The clinic flow

Patients entered the clinic area through an opening cut into the concrete fence surrounding the facility. Local Pakistan forces utilising metal detectors were responsible for the security screening of all patients coming into the clinic area. Patients were separated into male and female streams and if well enough were initially assessed in chairs outside the tent (Figure 3). Stretchers were available for patients who were unwell. Although English is reasonably widely spoken in Pakistan it was rare in this rural area. Australian military staff as well as local Pakistani men and women were employed as translators. Malnourished children were identified, treated with vitamin supplements and all members of the family were treated empirically for worm infection. Subsequently a list of malnourished children was passed on to local non-government organisations working within the nutrition cluster to provide nutritional support in the community. When malaria was diagnosed patients were appropriately treated and then with consent, details of their address were passed on to health authorities to assist in planning public health responses. Medical records were recorded on modified World Health Organisation (WHO) medical cards. Electronic daily reports identifying the frequency of major diagnoses were sent to the WHO.

The majority of medications were obtained through the WHO kit modules, although some medicines including oral artemisinin-based combination therapy for malaria, were in short supply and were accessed through local pharmacies. The x-ray service was fully digitised with the ability to print films when it was necessary to refer on to local health facilities. The laboratory had capacity for microbiology, including Gram stain and culture, as well as rapid diagnostic tests and microscopy for malaria. Full blood counts as well as renal and liver function tests were also available.

Clinical staff were rostered to morning or evening shifts with a mix of doctors, nursing staff and paramedics covering each shift. The clinic operated through daylight hours only. All

Figure 2. Accommodation tents for military and civilian staff at the Kot Addu medical clinic facility.

Figure 3. Pakistani men and women wait to be treated outside the Australian Health Centre in Kot Addu.

patients requiring ongoing care or further observation at the end of the day were escorted to the local hospital in Kot Addu.

Common medical conditions

The clinic staff completed over 11,000 consultations during the 48 days of the operation, averaging approximately 235 patients each day. The most common diagnosis was malaria with over 2300 confirmed cases by microscopy or Rapid Diagnostic Tests (RDT) and a further 1300 suspected cases. All patients with fever or a history of fever were screened for malaria with an average RDT positivity rate above 50%. Chronic disease was the second most common diagnosis, predominantly consisting of vascular disease, arthritis and gastro-oesophageal reflux. Tuberculosis was also a commonly identified disease. Diarrhoea illness amounted to about 700 cases. The Pakistani Ministry of Health laboratories confirmed cases of cholera from stool samples collected at the Kot Addu clinic. Malnutrition rates were high with over 70% of girls and 50% of boys below the 25th percentile on WHO weight-for-age charts. Midwives formed an important part of the medical response team and carried out pregnancy checks and referred several labouring women to the local hospital. Although in previous floods snake bite had been reported as a common cause of death,[3] we saw only 1 case of possible snake bite. A common clinical presentation of those exposed to the flood water was of body itch and subsequent dysuria and microscopic haematuria. Staff identified *Schistosoma* species on microscopy in several patients, with morphology of the eggs being most consistent with *Schistosoma mansoni*.

Lessons learned

The health intervention was brief and there are many health needs that remain. Ongoing support of local organisations which are supporting the shelter, economic and nutritional needs of the population is essential if the benefits of the clinic are to be sustained. There exists potential to improve public health responses to malaria and tuberculosis in the rural area of Kot Addu. Dissemination of the data indicating high malaria and tuberculosis rates in the area will help alert government and non-government organisations to focus planned interventions. The joint military and civilian deployment worked well. The logistic capacity brought to the mission by the ADF successfully facilitated the transformation of a soccer field to medical clinic in an environment with unstable security. On a daily basis patients would describe the loss of their homes and frequently would tell stories of the death of family members. The resilience of the Pakistani people in facing this severe natural disaster will leave a lasting impression.

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A confirmed case of Kunjin virus disease encephalitis acquired in rural Darwin, NT—The mosquito story

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Abstract

A Kunjin virus (KUN) case with encephalitis symptoms was reported from the Darwin area, Northern Territory on 17 June 2010. The diagnosis was confirmed on 5 August. Adult mosquito trapping showed high vector mosquito numbers at the time originating from large swamps in the Howard Springs area. The sentinel chicken program across the Top End indicated probable KUN activity in the area, but no arboviruses were isolated from the mosquitoes collected. With an incubation period for KUN of between 7 – 12 days and an onset date of 15 June, the patient most likely contracted the KUN around 5 June at his Howard Springs residence.

Key Words: Arbovirus; Kunjin; encephalitis; vectors; Culex annulirostris; mosquitoes; sentinel chickens

Case Report

An 80 year old Caucasian male presented to Royal Darwin Hospital on 17 June 2010 with a 3 day history of fever and worsening hip pain. On presentation he was febrile at 40 degrees Celsius and mildly confused. Over a 72 hour period his conscious state gradually worsened to a Glascow Coma Scale of 9. He developed encephalitis with progressive hypertonia of all limbs, including clonus of the lower limbs. He had marked progressive bilateral central nystagmous. His previous history was significant for recent cardiac bypass surgery in February 2010, in preparation for planned surgical management of his severe left hip osteoarthritis. He also reported chronic idiopathic myelofibrosis and previous heavy alcohol intake.

Presentation neutrophil count was normal at 7.4 x 10^9 /L and C reactive protein mildly elevated at 13 mg/L. Chest x-ray and cultures of blood, urine, bone marrow and his left hip were non-diagnostic. CT brain with contrast was normal on day 3 of his admission. MRI brain revealed non-specific white matter changes in the brain stem and right thalamus. On day 7 of his presentation he underwent a lumbar puncture which revealed a reactive pleocytosis of 26 leucocytes (96% mononuclear cells) with elevated protein 1.48 g/L and reduced glucose 2.5 mmol/L. Initial PCR was reported positive for Murray Valley encephalitis virus (MVE) on 29 June 2010, with CSF IgM subsequently reported equivocal for MVE and positive for Kunjin virus (KUN) on 5 July 2010.[1] The Centre for Disease Control (CDC) staff informed Medical Entomology (ME) of the suspected case of MVE on 1 July 2010. The PCR result for MVE was later rescinded and repeat attempts to isolate virus from CSF and blood failed.

The diagnosis of KUN disease was confirmed on 5 August when serial paired serology from 23 June 2010 and 20 July 2010 revealed a 4-fold increase in KUN neutralising antibodies from 2560 to 10,240. MVE neutralising antibodies were not detected in either of the paired sample. Subsequently, the same result was reported from a second laboratory.

Despite fever persisting for 14 days, he remained haemodynamically stable, with hypertension being a significant management problem. Complications of his hospital stay included an acute gastrointestinal haemorrhage and a hospital acquired pneumonia. After 4 weeks his sensorium began to improve and he was discharged to a rehabilitation ward on the 4 August 2010. His main barrier to being discharge as of the 1 October 2010 was his severe hip osteoarthritis.

ME received the first Flavivirus Disease Case Investigation form from CDC on 5 July 2010. The patient had been in Adelaide between February and 3 June 2010, and otherwise predominantly remained in his residence in rural Howard Springs, approximately 22 km south east of Darwin city. He did not have flyscreens

Figure 1 Howard Springs adult mosquito EVS trap sites

on his doors at home and usually slept with the doors open. He travelled on only 2 occasions to the local shops and once to an outpatient medical appointment at the local hospital. When his conscious state improved the patient reported being troubled by occasional mosquitoes at his residence since his return from Adelaide.

ME sentinel chicken surveillance and media warnings

Sentinel chickens are maintained in the NT to give advanced warning for flavivirus disease.[2,3.] From January to June 2010, sentinel chickens in Jabiru and Tennant Creek seroconverted to MVE in April and May respectively, with 1 seroconversion in Howard Springs in June. Seroconversions to KUN occurred in Howard Springs in January and 1 in the Adelaide River Coastal Plains flock in June. As of October in the 2010/11 year there was 1 seroconversion to KUN each in Leanyer, Coastal Plains and the Nhulunbuy flocks in July, with none in the Howard Springs flock. The Howard Springs flock is located in Howard River Park near to the extensive Howard Swamp.

On 4 and 30 March and 14 April 2010 MVE media warnings for the entire NT were issued by Department of Health & Families, for the period until the end of June 2010. Due to the suspected MVE case in Howard Springs in June, an additional media warning was released on 2 July, for the period to the end of July 2010.

Mosquito investigations

ME set 4 adult mosquito CO^2 baited encephalitis virus surveillance (EVS) traps in the Howard Springs area on 5 July 2010, sited at the south western edge of Dutchies Lagoon, the patient's residence, the Howard Springs Reserve and west of the Howard Springs Rd and Gunn Point Rd intersection (see Figures 1-5). [4] The traps were collected on 6 July and most of the collected mosquitoes were processed for virus isolation

Figure 2. CO2 trap at case residence

Figure 3. CO2 trap at Dutchies Lagoon

Figure 4. CO2 trap at Howard Springs Rd

Figure 5. CO2 trap at Howard Springs Reserve

Table 1: Adult mosquito non-monitoring results, Howard Springs 06/7/2010

Date collected	06-Jul-2010

TOTALS	Howard Springs Rd	Howard Springs Reserve	Dutchies Lagoon	Stow Rd residence	Trap location	INSECT_FU Data
3	2	0	0	1	No. of females	*Ae. (Fin) kochi*
0	0	0	0	0	No. of males	
1	1	0	0	0	No. of females	*Ae. (Och) vigilax*
0	0	0	0	0	No. of males	
1699	786	775	110	28	No. of females	*An. (Ano) bancroftii*
0	0	0	0	0	No. of males	
1	1	0	0	0	No. of females	*An. (Ano) powelli*
0	0	0	0	0	No. of males	
113	22	0	89	2	No. of females	*An. (Cel) farauti s.l.*
0	0	0	0	0	No. of males	
4	1	0	3	0	No. of females	*An. (Cel) meraukensis*
0	0	0	0	0	No. of males	
4	1	0	2	1	No. of females	*An. Species*
0	0	0	0	0	No. of males	
3307	2101	262	127	817	No. of females	*Cq. (Coq) xanthogaster*
3	2	0	0	1	No. of males	
251	56	12	182	1	No. of females	*Cx. (Cui) pullus*
0	0	0	0	0	No. of males	
3102	2019	439	416	228	No. of females	*Cx. (Cux) annulirostris*
0	0	0	0	0	No. of males	
1	0	0	1	0	No. of females	*Cx. (Cux) bitaeniorhynchus*
0	0	0	0	0	No. of males	
3	1	0	2	0	No. of females	*Cx. (Cux) palpalis*
0	0	0	0	0	No. of males	
3	0	0	0	3	No. of females	*Cx. (Cux) quinquefasciatus*
0	0	0	0	0	No. of males	
2	0	0	2	0	No. of females	*Cx. (Cux) species*
0	0	0	0	0	No. of males	
67	2	63	2	0	No. of females	*Cx. (Cux) squamosus*
0	0	0	0	0	No. of males	
8	0	8	0	0	No. of females	*Cx. (Cux) vicinus*
0	0	0	0	0	No. of males	
289	41	247	1	0	No. of females	*Cx. (Cux) Vishnui group*
0	0	0	0	0	No. of males	
1	0	0	1	0	No. of females	*Cx. (Lop) cubiculi*
0	0	0	0	0	No. of males	
120	0	0	120	0	No. of females	*Cx. (Lop) hilli*
0	0	0	0	0	No. of males	
6	0	0	6	0	No. of females	*Cx. (Lop) species*
0	0	0	0	0	No. of males	
23	0	1	22	0	No. of females	*Cx. (Lop) species 167*
0	0	0	0	0	No. of males	
3	0	3	0	0	No. of females	*Ho. ( ) species 157*
0	0	0	0	0	No. of males	
44	3	17	24	0	No. of females	*Ma. (Mnd) uniformis*
0	0	0	0	0	No. of males	
1	0	1	0	0	No. of females	*Tp. (Trp) magnesianus*
0	0	0	0	0	No. of males	
1	0	1	0	0	No. of females	*Ur. (Ura) albescens*
0	0	0	0	0	No. of males	
9057	5037	1829	1110	1081	Total No. of female	TOTALS
3	2	0	0	1	Total No. of males	

between 6 July and 9 July 2010 at the ME laboratory. The processed mosquitoes were sent to the Berrimah Veterinary Laboratory for virus isolation.[5]

Climate information

Only 5mm of rain was recorded for Howard Springs in May and no rainfall in June 2010. The Darwin airport received a total of 66mm of rain in May, with a total of 46mm recorded between 27 to 29 May. No rain was recorded in June 2010 by Bureau of Meteorology (BOM). However, large swamps in the Howard Springs area, such as Dutchies Lagoon and Howard Swamp would still have contained large amounts of water in June, providing an extensive mosquito breeding habitat since the end of the wet season.

Results of mosquito trapping and investigations

The Howard Springs area adult mosquito trapping results showed elevated to high numbers of the principal potential MVE and KUN vector, the common banded mosquito (*Culex annulirostris),* as well as high numbers of the non MVE and KUN vectors *Anopheles bancroftii* and *Coquillettidia xanthogaster* at all sites (Table 1).[6] *An. bancroftii* and *Cq. xanthogaster* breed in fresh water swamps, with over 300 specimens per trap/night indicating an appreciable nearby pest problem.

The high *Cx. annulirostris* numbers (2,019 per trap) in the Howard Springs Rd trap indicated a severe pest problem at that site, with 600 *Cx. annulirostris* per trap/night considered to indicate an appreciable pest level to nearby residents.[7] The numbers at the residence, while not at an appreciable pest problem level, would have still constituted a pest problem, and would have been high enough to result in numerous bites to relatively unprotected people at that site at the time of trapping.

Cx. annulirostris breeds in temporary and longer term freshwater flooded areas and swamps with emergent vegetation.[6] *Cx.annulirostris* has a flight range of 2km to greater than 10km, and an examination of aerial photos indicated that the majority of this species were probably coming from the extensive Howard Swamp area, which is located about 6 km north east of the patient's residence. Other potential major sources of *Cx. annulirostris* are the paperbark swamp located about 2 km north west of the residence and Dutchies Lagoon. However, at this time of the year the paperbark swamp would have been in the process of drying and would not have been as productive a source of *Cx. annulirostris* compared with the Howard Swamp because of the more discrete margins, the reduced amount of emergent vegetation, and the concentration of aquatic insect predators of mosquito larvae in the former site. Both *An. bancroftii* and *Cq. xanthogaster* have a flight range of approximately 3 to 5km, with the results indicating that these species were breeding in the same 2 major breeding sites above and dispersing to the case residence locality.

Routine mosquito larval or disease reactive adult mosquito control is not feasible in rural areas such as this, due to the large extent of swamps and wetlands suitable for mosquito breeding and harbourage, the inefficiency of such operations, and the relative large cost to public benefit ratio.

Virus isolation results

No arboviruses were isolated from the collected mosquitoes.

Conclusions

The incubation period for MVE and KUN is between 7 and 12 days.[8] With an onset date of 15 June 2010, the patient most likely contracted KUN disease around the 5 June 2010 while at his Howard Springs residence.

The present trapping was carried out approximately 3 to 4 weeks after the probable transmission period in June, and hence mosquito numbers would probably have been higher at the time of disease transmission. *Cx. annulirostris* were most likely breeding in high numbers in the swamp areas to the north east and north west of the case residence, with the most productive source being the Howard Swamp, with appreciable numbers also from the closer Dutchies Lagoon, and hence relatively high numbers would have been present in the case residence area around the acquisition date of the disease.

Sentinel chicken results from January to July 2010 did not indicate high KUN activity in the Top End, but the seroconversion to KUN in Howard Springs in January and the single chicken seroconversions in Leanyer, Coastal Plains and Nhulunbuy flocks in July indicated that KUN was indeed present across the Top End and likely to have been present in June. While the Top End of the NT is endemic for both MVE and KUN, and activity is usually detected each year in at least some of the flocks, sentinel chicken surveillance[7] is not likely to be able to pinpoint all risk areas. The KUN activity demonstrated by the sentinel chicken program across the Top End during the disease case acquisition period indicates that that the virus was probably present in the Howard Springs locality in June.

Although large scale larval or adult mosquito control in rural areas is not practical, there are opportunities for personal protection and reduction in vector contact by using personal protection such as screens, protective clothing, insect repellents and applying insect barrier sprays such as bifenthrin.

In summary, the patient most likely contracted KUN disease in the Howard Springs locality due to the high numbers of vector *Cx. annulirostris* and the probable presence of KUN in this locality in June 2010.

KUN cases have been recorded in the NT from Darwin to Alice Springs, with over 8 cases since 1997, and the last case in the Darwin region occurring in the Darwin rural area in March 2000. While KUN cases usually present relatively mild symptoms compared with MVE, and are not usually associated with encephalitis symptoms, this is one of the few confirmed cases of KUN encephalitis recorded in Australia.

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The Northern Territory remains dengue mosquito free…

A locally acquired case of dengue fever in a Darwin resident was reported in our Northern Territory (NT) Centre for Disease Control (CDC) Surveillance Newsletter for July 2010 and later picked up by the media. It was reported to likely be a one-off case with the risk of further cases felt to be very low.

Following intensive mosquito surveillance in the areas where the case had been when the disease was acquired, no dengue fever mosquito vectors were or have since been identified. Mosquito surveillance, particular targeting dengue vectors, continues.

Therefore this appears to have been a sporadic case of dengue fever transmitted by a "rogue" imported mosquito and the factors leading to such a case occurring are being compiled for analysis and publication.

Still it is important to recognise that Australia-wide, there has been an increased number of *imported* cases of dengue fever mainly from Indonesia and East Timor. There have also been several outbreaks of local transmission in far north Queensland where the dengue mosquito (*Aedes aegypti*) is prevalent.

Dengue fever is characterised by sudden onset of fever, retro-orbital headache, severe muscle and joint pain and a red blanching rash. Testing is by taking blood for NS1 antigen, PCR and serology. Serology for IgM antibody is often negative early in the disease (when the antigen and PCR tests are positive) but becomes positive within 5 days after onset.

The incubation period for dengue is 3-14 days (usually 4-7 days with a median of 5-6 days). It is important to establish a travel history to a dengue endemic area for anyone with possible dengue fever.

While there is no evidence of any dengue vector mosquitoes in the NT, it is important to keep an open mind and should signs and symptoms suggest dengue fever and you suspect a case of dengue fever may be locally acquired please notify CDC Darwin by phone (8922 8044).

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Dengue fever in northern Australia – a bit of history

Vanessa Johnston, CDC, Darwin

In August 2010 Mr. C, a 79 year old man, was at his home in rural New South Wales when he heard a radio report claiming that the first case of dengue fever in 70 years had been notified in northern Australia. That started him thinking about his own experience of dengue fever as a boy in northern Queensland nearly 70 years ago. Could he have been the last case of dengue fever before this?

What Mr. C did not realise was that the radio report was referring to the first locally acquired case of dengue fever since the 1950s in a Darwin-resident man who had not recently travelled outside of the Northern Territory (NT).

In Queensland where Mr. C was infected with dengue fever, there have been to this day sporadic outbreaks of the disease since the first cases were reported in that part of the county in the late nineteenth century.[1] The most recent of these was in Cairns in early October 2010. [2] The last major outbreak in northern Queensland was in 2008/9 and involved 915 cases over a 5 month period. As for Darwin, the recent case in July 2010 is thought to be an isolated incident as regular monitoring for many years has found no evidence in the area of mosquitoes capable of transmitting dengue and neither did special intensive investigations around this case at the time or since. The most likely explanation is that the source mosquito was imported, by ship or plane, perhaps with cargo.

Mr. C recalls well his own experience with dengue fever some 70 years ago at the age of 10 years. It was the 1940s during World War II and his diagnosis coincided with a large outbreak in

1941-43 where 85% of the population were reported to have been infected in some towns in Queensland.[3] He was a member of the Boy Scouts and had returned to Cairns where he lived, from a week-end camping trip to the Daintree. He remembers the sudden onset of "terrible fevers." The associated frontal headaches were "absolutely rotten" and he had aches and pains all over his body. He does not recall having a rash.

He stated that the worst part of this hospital stay were the regular "injections" he received every 6 hours. It remains a mystery as to what this treatment was, as currently there is no specific treatment for dengue; only supportive therapy of fluids, analgesia and antipyretics. He was hospitalised for 6 weeks, most of which he spent in a bed on the verandah of the Cairns Base Hospital which was overflowing at the time. He was discharged at the end of 6 weeks and returned to school. Happily, he made a full recovery from the disease and remains "alive and kicking today" not withstanding a bad bout of the shingles from which he is currently suffering. Fortunately, he says, "the doctors aren't trying to jab me with injections!"

Meanwhile in Darwin and the NT, while it has been a bumper year for imported dengue cases in travellers returning from overseas, there have not been any further reports of locally acquired infection. Nevertheless, there have been 2 recent occasions when the dengue mosquito, the *Aedes aegypti*, was detected while not in the Darwin area but in the NT - in Tennant Creek in 2004 and on Groote Eylandt in 2006. The Commonwealth subsequently funded the NT government to conduct a surveillance and eradication program which was successful.[4,5] Mosquito surveys are regularly conducted by the Medical Entomology branch of CDC to ensure that we are continually monitoring for the re-emergence of any exotic mosquito population in the NT. The price of an NT free of dengue mosquitos is eternal vigilance.

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Changes to the NT Notifiable Diseases Schedule

"Welcome invasive vibrio disease and ciguatera fish poisoning"

New notifiable diseases for the NT

There were 2 new Northern Territory (NT) notifiable diseases scheduled in the NT Government Gazette of 27 October 2010. These are the first new notifiable diseases for the NT since 2006. Doctors should report clinical cases to their local CDC.

1. **Invasive vibrio disease** has been made notifiable in the NT by both doctors and laboratories as a non-urgent notification. This is a rare disease which is usually acquired from brackish water via either ingestion or a wound infection and occurs in people who are immunocompromised, in particular those with chronic liver disease.[1,2] Only a handful of cases have been reported but it has a high mortality rate and it is thought that the communities along the Gulf of Carpentaria are most at risk.[1] NT CDC has developed a fact sheet.[3]
2. **Ciguatera fish poisoning** has been made notifiable in the NT by doctors as an urgent notification. This is a type of poisoning caused by a toxin (ciguatoxin) found in various tropical finfish. It is characterised by gastrointestinal symptoms, such as diarrhoea or vomiting, cardiac symptoms such as an irregular heart rate and low blood pressure and neurological symptoms such as numbness and tingling. It is uncommon but often occurs in outbreaks[4,5] and in the NT has been confined to the Arnhem Land coast.

NT notifiable diseases removed

The following diseases have been removed from the NT schedule.

1. **Hepatitis C chronic** – this category of hepatitis C is now defined under the Hepatitis C – unspecified category.
2. **Thrombotic Thombocytopaenia Purpura** – this disease is included in the case definition of "Haemolytic-uraemic syndrome" and is redundant.
3. **Hepatitis (acute)** – this is now included in the nationally defined "Hepatitis not elsewhere specified" category.

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Reduction in the number of doses of vaccine for rabies post- exposure prophylaxis

In November 2010 the Australian Technical Advisory Group on Immunisation (ATAGI) approved the American Advisory Committee on Immunisation Practices recommendation to change the post-exposure prophylaxis (PEP) vaccine schedule for immuno-competent people exposed to rabies from 5 to 4 doses (vaccine now to be given on days 0, 3, 7 and 14). The reduction in number of doses pertains only to this group of people.

Persons with immune impairment (through disease or treatment) who are potentially exposed to rabies should continue to receive 5 doses of post-exposure vaccine on days 0, 3, 7, 14 and 28.

The reduction in the number of recommended doses of vaccine was based on studies that indicated a 4 dose vaccine schedule (in combination with rabies immunoglobulin (RIG)) elicited adequate immune responses in the immuno-competent person and that a 5th dose of vaccine did not contribute to a more favourable outcome.[1]

The evidence to reduce number of vaccine doses of PEP from 5 to 4 applies ONLY to immuno-competent people who are exposed to rabies.

There is no change to PEP recommendations for people who are exposed to Australian Bat Lyssavirus (ABL). People who have not received pre-exposure prophylaxis and sustain a bat bite or scratch should continue to be offered RIG and 5 doses of rabies vaccine on days 0, 3, 7, 14 and 28.

There is no change to the recommendations for the administration of rabies immunoglobulin (RIG) for PEP for either rabies or ABL exposures. (See the *Australian Immunisation Handbook* pg 116 for administration advice*).*

There is no change to PEP for people who have previously been vaccinated (with 3 doses of rabies vaccine as pre-exposure prophylaxis) and are subsequently exposed to either rabies or ABL. These people should continue to receive 2 additional doses of rabies vaccine following the current exposure.

The next edition of the *Australian Immunisation Handbook* will be updated to reflect the change in protocol for dose reduction in rabies vaccine for PEP in the immuno-competent person.

Providers are reminded that rabies is now present in Bali. Travellers to Bali who have sustained animal bites and scratches should be assessed and offered PEP according to the schedule outlined above. Patients can be referred to their regional Centre for Disease Control during office hours and to the Emergency Department of the hospital on weekends and after-hours for treatment.

Reference

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Falls hospitalisations in the Northern Territory 1999-2008: the basis of need for a comprehensive falls prevention strategy

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Abstract

Falls are a major source of preventable morbidity and mortality particularly for older people. Most jurisdictions have well established coordinated, multi-faceted falls prevention strategies. The NT does not. This study analysed NT hospitalisation data for falls occurring in the community over the 10 years 1999-2008. Data is presented on number and rates of falls hospitalisations, type of injury, length of stay, types of fall, activity being undertaken and place of the fall, contribution of alcohol and cost of inpatient care. The rate of falls hospitalisation and their costs increased steadily during the study period. Rates of falls hospitalisation in the NT for both Indigenous and non-Indigenous people are consistently higher than in the rest of Australia. There are important variations within the NT. For Indigenous people hospitalisation rates are higher among young adults and middle aged people but lower in people aged over 64 years compared to non-Indigenous people. Central Australia has significantly higher rates than the Top End for both Indigenous and non-Indigenous people. This data highlights the need for a comprehensive Falls Prevention Strategy for the NT.

Key words: fall; hospitalisation, NT; Indigenous; non-Indigenous; alcohol

Introduction

Injuries as a result of falls represent a major cause of both morbidity and mortality for the Australian population, in particular older persons.[1,2,3] While there are differences in the approach to falls prevention within the acute hospital or residential aged care settings and those taking place in the community, there are important commonalities in the contributing factors to all falls and a need for continuity and links between the different sectors. In recent years there has been substantial effort to both prevent falls and mitigate their impact in most states via the development of comprehensive falls prevention programs that reach across all 3 sectors. Falls has been the major injury focus of the Australian Population Health Development Principal Committee (APHDPC) and a recent Australian Health Ministers' Council (AHMC) agreement bound all jurisdictions to the implementation of the National Falls Prevention Guidelines[4] which specifically address all 3 settings.

Within the Northern Territory (NT), there has not been a focus on falls prevention similar to that in other jurisdictions.[5,6] While individual institutions have falls prevention programs in place, they vary in the degree to which they are informed by the latest evidence. There is a lack of uniformity within sectors and limited coordination between sectors. With no over-arching plan binding the sectors together, there is a piecemeal rather than a comprehensive approach to falls prevention.

Available data concerning falls injury in the NT has so far been limited. In order to inform both the need for and nature of a comprehensive falls prevention approach, this paper will present an analysis of NT falls related hospitalisations over the period 1999-2008.

Methods

Data on hospital separations for injury for the calendar years 1999-2008 inclusive was extracted using the criteria of an S or T International Classification of Disease version 10 (ICD10) code in the primary diagnosis field. This was then narrowed to only include separations with a code in the range S00 to T75 and T79 for the primary diagnosis and an external cause code signifying an unintentional fall (W00-W19) as per the definition of unintentional falls used by the Australian Institute of Health and Welfare.[3] This definition only identifies falls that took place outside the hospital setting.

Admissions that were classified as either an intra- or inter-hospital transfer within the NT were closely examined and linked to the original

admission. Thus, where a patient might have been admitted to 1 hospital and then transferred directly to another, it was counted as only 1 admission and the length of stay was aggregated to cover the time spent in both hospitals. A similar method is also used in national falls reports.[8]

Directly age-standardised rates of falls hospitalisations were calculated with reference to the 2001 Australian population.

Costs of inpatient care were calculated with reference to the Diagnostic Related Group code for each separation.[9] Costs of emergency department care or transfers of patients were not included.

Results

During the 10 years there were 10,326 hospitalisations as a result of a fall occurring in the community. Males accounted for 56% of admissions while 61% occurred in non-Indigenous people. The age standardised rate of hospitalisations over the 10 year period was 680.5 per 100,000 population (95% CI 663.7 – 697.3). See Table 1.

Over the 10 year period both the number and rate of hospitalisations showed a statistically significant increasing trend in both Indigenous and non-Indigenous people (Chi square for trend p values all < 0.01). See Figure 1. This trend was also apparent in both males and females.

One third of hospitalisations occurred in people under 15 years of age with 16% in the 5-9 year age group. Thereafter, the proportion of all hospitalisations per 5 year age group decreased with increasing age. Persons over the age of 64 years comprised 15.3% of falls admissions. Age-specific rates of hospitalisation showed a small peak in 5-9 year olds then declined and remained relatively stable until beginning to increase at about the age of 50 years with a dramatic increase in people over the age of 64 years. Rates were slightly higher in males under the age of 45 years and higher in females aged 45 years and over. Among Indigenous people, rates were lower for those aged over 64 years but higher in the age range 25-64 years compared to non-Indigenous people. See Figure 2.

Type of injury

Fractures accounted for 68.6% of all admissions and were by far the most common injury type regardless of sex or Indigenous status, but were more common among females and non-Indigenous people. The highest proportion of hospitalisations due to fractures was 76.2% among non-Indigenous females. Hospitalisations for open wounds accounted for nearly twice the proportion of Indigenous people compared to non-Indigenous. See Table 2.

The proportion of admissions due to fractures was highest among 5 to 14 year old children (84%) and then among people aged 45 years and older (70%). Young children under the age of 5 years had the lowest proportion of admissions for fractures (57.1%) but the highest for open wounds (14.4%).

Table 1. NT falls hospitalisations and age-standardised rate / 100,000 population by gender and Indigenous status: 1999-2008

	Males	Females	Persons
Indigenous	2181 (21.1%) Rate: 760.1 (95% CI 714.8 – 805.4)	1812 (17.5%) Rate: 726.4 (95% CI 682.9 – 769.9)	3993 (38.7%) Rate: 752.5 (95% CI 720.6 – 784.4)
Non-Indigenous	3588 (34.7%) Rate: 615.5 (95% CI 589.7 – 641.3)	2745 (26.6%) Rate: 681.7 (95% CI 652 – 711.4)	6333 (61.3%) Rate: 649.9 (95% CI 630.3 – 669.5)
All	5769 (55.9%) Rate: 651.5 (CI 629.3 – 673.7)	4557 (44.1%) Rate: 700.8 (CI 675.9 – 725.8)	10326 Rate : 680.5 (CI 663.7 – 697.3)

Figure 1 : NT age-standardised hospitalisation rates by Indigenous status : 1999-2008

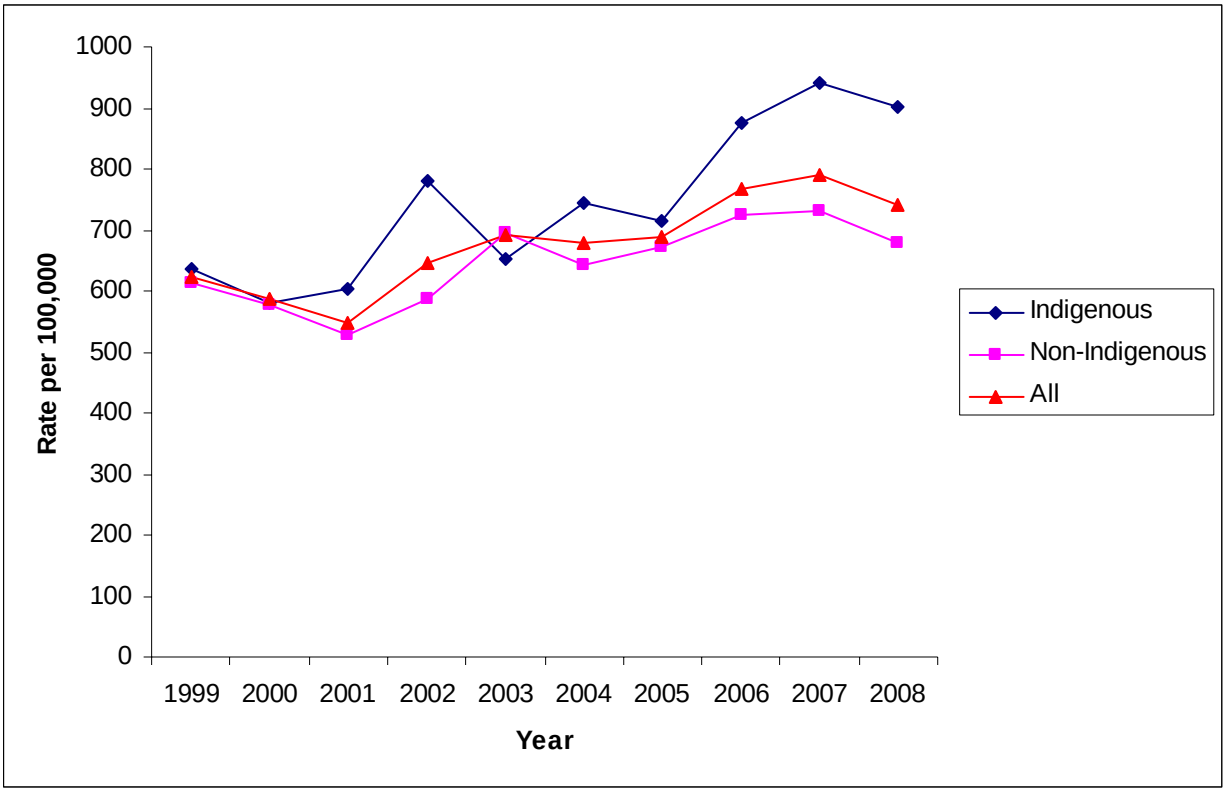


Figure 2: NT age-specific rates of falls hospitalisations by Indigenous status : 1999-2008

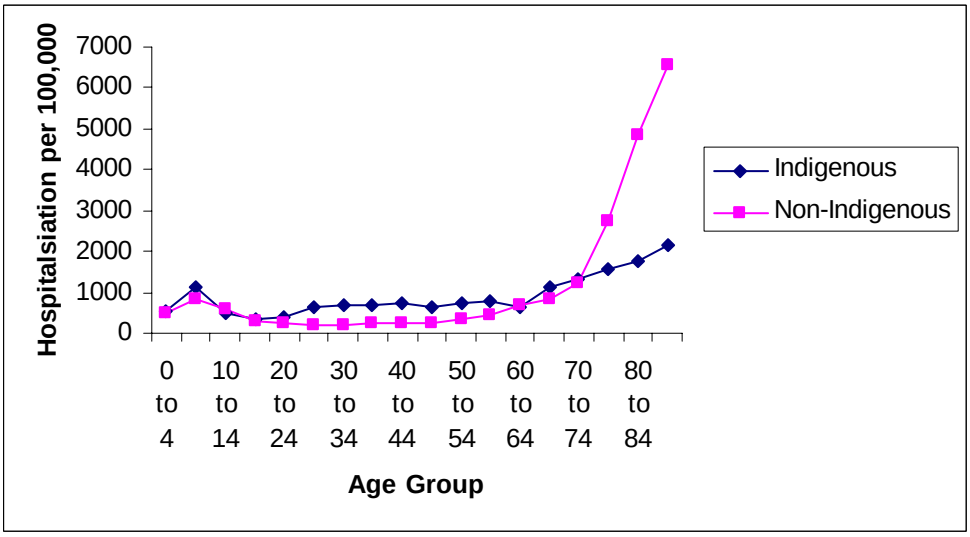


Table 2: NT falls hospitalisation injury type by gender and Indigenous status

	Indigenous			Non-Indigenous		
	Male	Female	Total	Male	Female	Total
Fracture	1353 62.0%	1183 65.3%	2536 63.5%	2458 68.5%	2091 76.2%	4549 71.8%
Dislocation	80 3.7%	48 2.6%	128 3.2%	108 3.0%	50 1.8%	158 2.5%
Open wound	268 12.3%	203 11.2%	471 11.8%	235 6.5%	157 5.7%	392 6.2%
Other	480 22.0%	378 20.9%	858 21.5%	787 21.9%	447 16.3%	1234 19.5%
Total	2181	1812	3993	3588	2745	6333

Table 3: NT falls hospitalisations: Most common site of injury by age group

Age Group	**0 to 4**	**5 to 14**	**15 to 24**	**25 to 44**	**45 to 64**	**65+**
Head	41.5%	8.3%	14.9%	17.2%	13.3%	14.1%
Neck	0.6%	1.4%	4%	3.6%	1.3%	0.8%
Thorax, abdomen, back & pelvis	1.9%	2.1%	8.5%	8.7%	11.8%	16.7%
Shoulder & upper arm	16.2%	15.9%	6.1%	6.1%	7.3%	7.8%
Elbow & forearm	26.6%	60%	24.9%	18.5%	20.3%	11.7%
Wrist & hand	0.9%	1.7%	10.6%	7.3%	4.4%	1.7%
Hip & thigh	5.4%	2.6%	2.7%	3.8%	13.2%	34.7%
Knee & lower leg	6%	6.5%	22.4%	26.5%	23.1%	10.7%
Ankle & foot	0.6%	1.3%	5.3%	7.6%	4.6%	1.3%
Other	0.4%	0.2%	0.5%	0.8%	0.6%	0.5%

NB rounding of totals lead to not all columns totalling 100%

Table 4: Mean length of stay in days for NT falls hospitalisations by gender and Indigenous status: 1999-2008

	Indigenous	Non-Indigenous	All persons
Male	4.9 (95% CI 4.4 – 5.3)	6.1 (95% CI 5.8 – 6.5)	5.6 (95% CI 5.4 – 5.9)
Female	5.5 (95% CI 5.0 – 5.9)	6.8 (95% CI 6.3 - 7.2	6.3 (95% CI 5.9 - 6.6)
Total	5.1 (95% CI 4.8 – 5.5)	6.4 (95% CI 6.1 – 6.7)	5.9 (95% CI 5.7 – 6.1)

Nearly 3/4 (73.7%) of admissions involved injuries to either the shoulder and upper limb or the hip and lower limb. The most common site of injury was the elbow and forearm (29.5%), followed by the knee and leg (16.3%) and the head (15.7%). There was significant variation in the most common site of injury according to the age group. See Table 3.

The differences in injury site between Indigenous and non-Indigenous people were relatively small and of the order of only a few percent. Among Indigenous people, head, shoulder and upper arm injuries were slightly more common and hip and thigh injuries less so. However, in people over the age of 64 years, hip and thigh injuries comprised 42% of all injuries in Indigenous people as against 33% in non-Indigenous people.

Head injuries because of the potential for brain injury can be particularly concerning. There were 756 admissions for which a diagnosis of skull, orbit or maxillary fracture, diffuse or focal brain injury or concussion was made either as a primary or secondary diagnosis. A skull fracture was observed in 236 people. Head injuries were more common in non-Indigenous compared to Indigenous people (7.96% of all admissions vs 6.06%, Chi squ=13.2, $p<0.01$) and in males than females (8.53% vs 5.57%, Chi squ 33.2, $p<0.01$). There was little difference in the occurrence of head injuries between people above and below 65 years of age.

Length of stay

The mean length of stay for all persons over the study period was 5.9 days with longer stays for females and non-Indigenous people. See Table 4.

The length of stay was substantially longer for those over the age of 64 years (13.2 days) than those under 65 years (4.6 days). It was also longer for admissions due to fractures (6.9 days) or closed head injuries (6.2 days) than for persons with other injury types (3.3 days).

Type of fall, place of fall and activity during fall

ICD10 codes are available which describe the type of fall, where it took place and the activity being engaged in at the time. Unfortunately the proportion of hospitalisations was very high for which this information was either non-specific or not recorded.

The type of activity was unknown in 81% of all admissions (88% Indigenous, 76% non-Indigenous). Where the activity was known, engaging in sport was the most common activity leading to 45.6% of all admissions (50.1% Indigenous, 41.3% non-Indigenous). Place was unknown in 60% of cases (73% Indigenous, 52% non-Indigenous). Where the place of the fall was known in the NT, the home was the most common place at 46% followed by a sporting facility (13.9%). The type of fall was unknown in 23.3%. Where known, a slip, trip or stumble on the same level was the most common type of fall accounting for 36.8%% of admissions with falls involving playground equipment in second place causing 11.6%.

Alcohol involvement

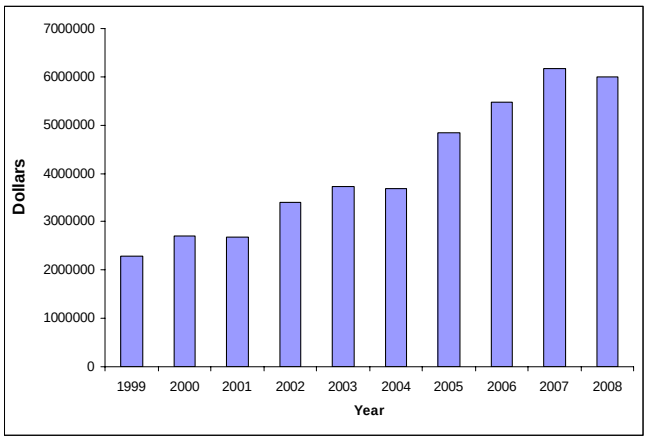
ICD10 codes are available to indicate whether alcohol intoxication or related conditions may have contributed to the event. There is no protocol to systematically record whether the admission is alcohol related or not so proportions of alcohol related admissions in this data will almost certainly be an under-estimate of the true proportion of admissions that are alcohol related.

Alcohol involvement as either acute intoxication, an alcohol withdrawal state or "harmful use" was recorded in 11.8% of all admissions. This was much more common for Indigenous people (20.9%) than non-Indigenous people (6%), in people under 65 years (12.6%) compared to those 65 years and over (7%) and in Central Australia (18.4%) than in the Top End (8.8%). A prevalence of alcohol involvement of 24.8% was seen among people aged 25-54 years (Central Australia, 34.6%; Top End 18.5%) and 28% among 30-44 year olds (Central Australia, 37.9%; Top End 21.6%). Among 30-44 year old Central Australian Indigenous people, 49% of admissions had alcohol involvement.

Costs

Over the 10 years the total costs for falls hospitalisation inpatient care amounted to $41,075,716 with a steady increase year by year with the exception of 2008. Total costs in 2008 were $5,990,923. See Figure 3. Mean cost per hospitalisation also rose steadily from $2,678 in

Figure 3: Total inpatient costs for NT falls hospitalisations by year: 1999-2008



1999 to $4,770 in 2008 with a mean cost over the full 10 years of $3,970. Mean costs for fracture hospitalisations were $4,278 and $6811 for closed head injuries. Admissions were more expensive for elderly people with a mean cost of $7,602 for those aged over 64 years compared to only $3,320 for those younger. The mean cost for Indigenous people was $3,424 and $4,315 for non-Indigenous people.

Regional differences

There were significant differences in the profile of falls hospitalisations between Central Australia (Alice Springs and Tennant Creek hospitals) and the Top End (Darwin, Katherine and Gove hospitals).

Central Australia had substantially higher rates of falls hospitalisations for both Indigenous and non-Indigenous people. See Table 5.

In addition, there were statistically significant differences ($p<0.05$) between the regions in the proportions of Indigenous admissions, those due to fracture and with alcohol involvement and in the mean length and cost of stay. See Table 6.

The proportion of alcohol involvement among non-Indigenous people was the same in both central Australia and the Top End (6%). However, there was a greater prevalence of this among Indigenous people in the centre (28.5%) than in the Top End (14.9%).

Discussion

For the purpose of this discussion, comparisons will generally be made between the data from the NT over the 10 year period of this study and Australian data from 2004/05 and 2005/06 which are the latest years for which national data are available. There are no reports available at the national level which report over a similar 10 year period. There are differences year by year within the NT, but analysis of individual year data shows the differences with the whole study period are generally not substantial (results not shown). The rate of falls hospitalisation in the NT has been consistently higher than in the rest of Australia over the 10 year period. The latest national data available is for the years 2004/05 and 2005/06.[1] See Table 7.

This difference appears mainly due to higher rates among people 15-64 years particularly in Indigenous people. It is of note that in persons over the age of 64 years, NT Indigenous people had lower rates of hospitalisations. See Figures 4 and 5. A possible explanation for higher rates among Indigenous people in the younger and middle years of life may lie in the more hazardous living environment of many Indigenous people, particularly those in remote communities. Another may be the contribution of alcohol consumption: in nearly half of all Central Australian Indigenous people between 30 and 44 years of age, alcohol was recorded as a factor in the admission.

The number of days that people in the NT remained in hospital was slightly less than for the rest of Australia. In the NT mean length of stay for males, females and all persons over the 10 year period were 5.6 days, 6.3 days and 5.9 days respectively. In 2005 in the NT the corresponding mean lengths of stay were 5.9, 6.9 and 6.3 days compared to 5, 7 and 6.1 days for Australia as a whole in 2005/06.[3]

However, lengths of stay for Territorians over the age of 64 years were markedly higher with a mean over the 10 years of 13.2 days. In 2005/06[13] the mean for all Australians of this age was 7.7 days and for Territorians 14.4 days in 2005. It is difficult to find an explanation for this difference. The lengths of stay for Indigenous and non-Indigenous people in the NT were within 0.5 of a day of each other. The site of injuries seem similar in the NT and Australia with 35% of NT hospitalisations involving the hip or thigh compared to 31% nationally while for injuries involving the head the respective proportions were 14% and 17%. In the NT 71%

Table 5: NT falls hospitalisations: number and age-standardised rate / 100,000 population (95% CI) by Indigenous status and region: 1999-2008

	Indigenous	Non-Indigenous	All persons
Central Australia	1786 Rate: 1065.9 (1006.3 - 1125.5)	1424 Rate: 831 (779.5 – 882.4)	3210 Rate: 910.8 (872.1 – 949.5)
Top End	2207 Rate: 592.4 (555.7 – 629.2)	4909 Rate: 608.4 (587.4 – 629.3)	7116 Rate: 614.3 (595.8 – 632.9)
Total	3993 Rate: 752.4 (720.6 – 784.4)	6333 Rate: 649.9 (630.3 – 669.5)	10326 Rate: 680.5 (663.7 – 697.3)

Table 6: Aspects of falls hospitalisations showing statistically significant differences between Central Australia and the Top End.

	Central Australia	Top End	All NT
Proportion of admissions that are Indigenous	55%	31%	38.7%
Proportion due to fractures	62%	72%	68.6%
Mean length of stay	4.1days	6.7 days	5.9 days
Mean cost per hospitalisation	$3666	$4108	$3970
Alcohol involvement	18.4%	8.8%	11.8%

Table 7: Age-standardised falls hospitalisation rates: NT and Australia, various years.

	Male	Female	All persons
Australia 2004/05	592.1	595.2	607.0
Australia 2005/06	597.9	622.9	624.8
NT 2004	657.8	690.7	677.2
NT 2005	593.8	748.4	687.1
NT 2006	750.1	773.3	766.5
NT 1999-2008	651.5	700.8	680.5

Figure 4: Under 65 years age-specific falls hospitalisation rates: NT Indigenous, NT non-Indigenous 2005 and Australia 2004/05

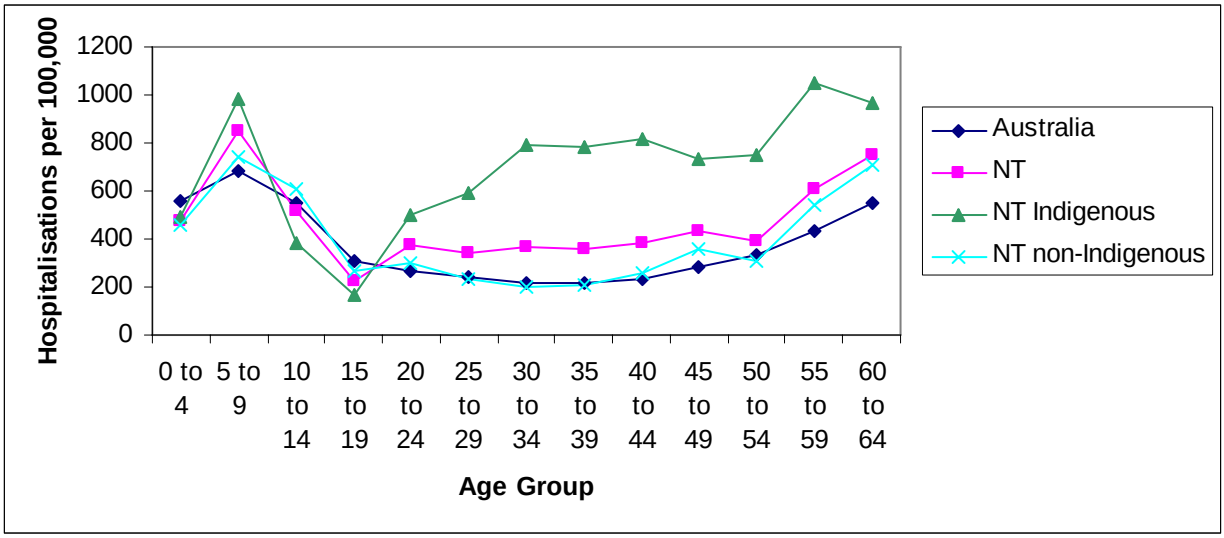
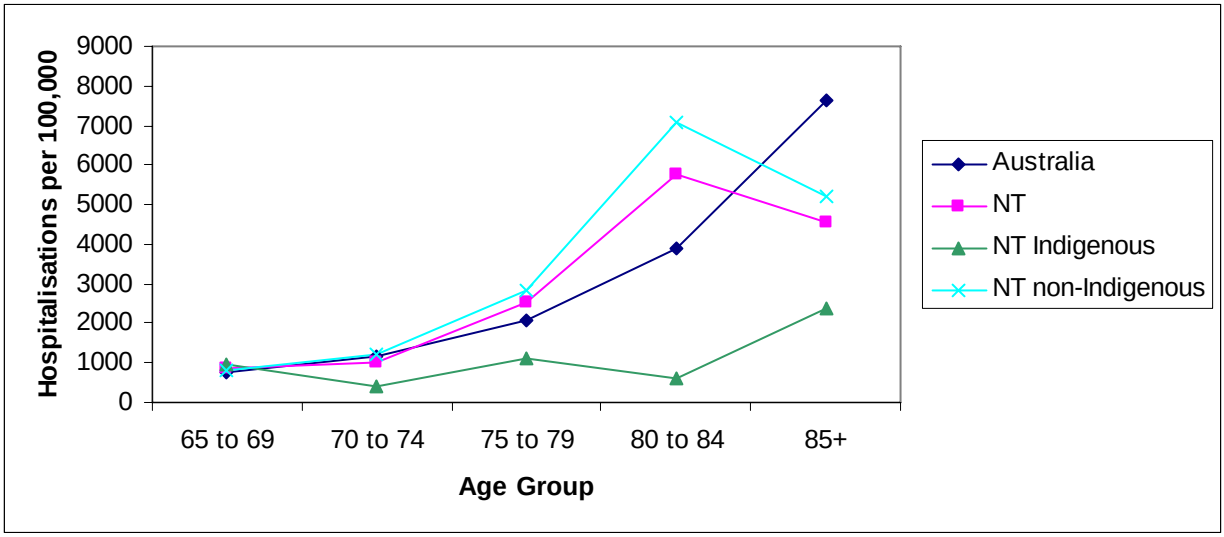


Figure 5: Over 64 years age-specific falls hospitalisation rates: NT Indigenous, NT non-Indigenous 2005 and Australia 2004/05



of admissions were due to a fracture in this age-group compared to 63.7% Australia wide. The proportion of persons for whom the site of injury was the hip or thigh and the injury was a fracture was very similar in the NT and Australia with 76.2% in males and 83.6% in females in the NT over the 10 years compared to 82.9% and 84.8% respectively Australia wide in 2005/06.

It is difficult to make comparisons concerning the nature of falls and place of occurrence or activity undertaken because of the very high proportion of cases in the NT for which this is not known : place was unknown in 60% and the type of activity in 81%. A slip, trip or stumble on the same level was the most common type of fall in both the NT (36.8%) and Australia (27%). Australia-wide, the home was the place where approximately half of all falls took place, similar to the 46% in the NT (when the place of fall was known).

Within the NT there are some differences between Indigenous and non-Indigenous people. Overall Indigenous people have higher rates of falls hospitalisations, but only to a modest degree and the excess is much less than that seen in a great many other causes of ill health. The excess is due to higher rates in people in their young adult and middle years of life. In older non-Indigenous people rates are very similar to the national rates while older Indigenous people have lower rates. The higher rates in younger people may be related to alcohol consumption. The lower rates in older Indigenous people are somewhat counter-intuitive given their higher rates of chronic diseases and generally more hazardous living environment. Fewer Indigenous people are admitted for fractures which most likely explains (at least partly) their shorter length and lower mean cost of stay.

The higher rates of hospitalisation for all people in Central Australia are quite remarkable. Indigenous, non-Indigenous and overall rates are all statistically significantly higher than in the Top End (Table 6). Indeed in the Top End, Indigenous people have lower rates of admission than non-Indigenous people although the difference is not statistically significant. Central Australia has a lower proportion of people admitted for fractures and a shorter mean length of stay. A potential explanation for the higher Central Australian rates may be a greater degree of alcohol involvement. Central Australia has for many years had significantly higher apparent per capita consumption of alcohol than the Top End.[14] Central Australia also has higher rates of alcohol attributable hospitalisations and deaths.[15,16]

This study did not take into account falls that occurred in a hospital environment. In spite of this, it reveals that the NT has a substantial and growing burden of injury due to falls with hospitalisation rates consistently higher than the rest of Australia. Yet, the NT is virtually alone among Australian jurisdictions in not having a

comprehensive falls prevention strategy that binds together the acute hospital setting, residential aged care facilities and the community sector. Over the past 2 years, the Safety and Injury Unit of the Centre for Disease Control has been working to build Falls Prevention networks. A Falls Prevention forum held in Darwin in June attended by over 100 delegates from all 3 sectors strongly recommended the establishment of a comprehensive Falls Prevention Strategy and for this to be led by the NT Department of Health and Families. The challenge remains.

Acknowledgements

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Healthy school aged kids: Rheumatic heart disease (RHD) screening

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Abstract

Many people with rheumatic heart disease (RHD) present with advanced disease leading to preventable complications, valve surgery, and early death. This suggests that if RHD could be detected early, and effective preventive treatment provided then there would be fewer people requiring valve surgery and fewer premature deaths.

Effective preventive treatment is available, and many people with RHD have heart murmurs that can be detected by auscultation. Thus there is a possibility that screening for RHD by auscultation for heart murmurs will reduce the burden of RHD.

Screening for RHD has been implemented in Northern Territory (NT) since 1997 through auscultation of children's hearts. The screening program is based on recommendations developed by the Department of Health and Families in 1996, the 2006 National Acute Rheumatic Fever/ Rheumatic Heart Disease Guidelines[1] and the 2007 Healthy School Aged Kids Program.[2] Screening of expanded age groups occurred following the NT Emergency Response.

To date, published outcomes of screening are limited to numbers of children with murmurs detected.

Results from Central Australia in 2009 showed that of 1200 children screened, 67 had murmurs detected and 2 have been diagnosed with RHD. This shows a low predictive value of a murmur, compared with the considerable burden of work on health services. Studies elsewhere comparing screening by auscultation with screening by echocardiography have demonstrated that auscultation detects around 10% of children with RHD.

Based on these findings, this paper recommends that current policy of screening through auscultation by doctors of 10 and 15 year olds as part of school aged screening be reviewed.[2]

Key words: rheumatic heart disease; screening; school aged

Background

Rheumatic Heart Disease (RHD) is an important cause of morbidity and mortality in Aboriginal people in the Northern Territory (NT), and a number of strategies are in place to control it. These strategies focus on primary and secondary prevention.

Primary prevention can be achieved through treatment of skin sores and sore throats with benzathine penicillin, while secondary prevention requires long term, regular 4 weekly injections of benzathine penicillin to prevent recurrent episodes of acute rheumatic fever (ARF).

Screening for RHD may also be a means to reduce morbidity and mortality if it enables early diagnosis and effective treatment.[1] This is likely to be possible if RHD screening meets certain criteria for screening, summarised in the National Heart Foundation (NHF) ARF/ RHD guidelines.[1]

- "*the disease should be an obvious burden for the individual and/or community in terms of death, suffering, economic or social costs* — this is implicit in populations with high rates of RHD and has been quantified by economic analysis;
- *the natural course of the disease should be well known and the disease should go through an initial latent stage or be determined by risk factors that can be detected by appropriate tests* — the natural history of RHD is well understood and there is a latent or early symptomatic stage;
- *adequate treatment or other intervention possibilities are indispensable. Adequacy is determined both by proven medical effect and ethical and legal acceptability* — secondary prophylaxis prevents the development or worsening of RHD*;*
- *screening followed by diagnosis and intervention in an early stage of the disease*

should provide a better prognosis than intervention after spontaneously sought treatment — milder valve lesions, which are often asymptomatic and thus the most common lesions that will be detected with screening, are more likely to resolve than more severe lesions in patients who adhere to secondary prophylaxis."

A suitable screening test or examination is however required to identify people with latent or early stage of disease. Without such a test, the potential benefits of screening cannot be achieved. The test must detect an adequate proportion of people with disease, exclude most people without disease, be acceptable and available within resources.

This paper aims to:

- describe the development of guidelines for RHD screening by auscultation in NT from available documentation
- report results of screening for RHD by cardiac auscultation in 2009, and
- discuss current RHD screening guidelines.

Development of NT Guidelines

Informal screening or case finding for RHD has been performed in the NT for many years. This was discussed in a paper which consolidated data and proposed screening guidelines.[3] Documented pilot screening projects from the discussion paper are outlined in Table 1.

The discussion paper recommended that screening of school aged children in rural Aboriginal communities include auscultation of all 10 year old and 15 year old children by primary care doctors. Children identified by cardiac auscultation should be referred to visiting paediatricians to determine which children need further investigation. No recommendation was made for screening of urban children; the paper noted that it was unclear who had responsibility for screening of urban children.

The discussion paper noted that a significant proportion of functional murmurs would be found, and that the expected yield of new RHD would be greatest in communities with limited medical services and when there has not been screening for many years.

National Heart Foundation RHD Guidelines

The NHF RHD Guidelines emphasised the potential for screening as a strategy to reduce morbidity and mortality from RHD, but noted that no published data were available to support development of Australian guidelines on screening for control of RHD.[1] Possible roles for both auscultation and echocardiography in screening for RHD were noted.

The NHF guidelines state that there is no evidence available to make their recommendation on screening for RHD, but a panel consensus was reached. They recommend that all NT Aboriginal school-aged children

Table 1: Pilot screening programs for RHD

Region, date, group screened	Number screened	Number with murmurs	Echocardiograms	New RHD identified
Katherine, 1993, children up to 14 years	561	36	21	0
Community 5, 1996, children	73	7	2	0
Island community, no date, school and adult screening	Not recorded	14	Not recorded	6, 2 adults 4 children
Island community, no date, footballers 13 to 40 years	180	6	Not recorded	3

should be screened by cardiac auscultation by a primary care doctor, at school entry and at age 10. Because of the limited sensitivity of auscultation the guidelines recommend referral for echocardiography of all children found to have a murmur, rather than referral to a paediatrician for assessment. There is no recommendation for screening for RHD outside the NT.[1]

Healthy School Aged Kids Program

The Healthy School Aged Kids Program was revised and updated in 2007 and the recommended health checks for school aged children were amended.[2] The recommendations for RHD screening were for cardiac auscultation by a primary care doctor for children at age 10 and age 15, as previously. However the program recommended that all children with new, undiagnosed heart murmurs or abnormal heart sounds undergo echocardiography rather than being assessed by a paediatrician.

Northern Territory Emergency Response (NTER)

The Northern Territory Emergency Response (NTER) was "a set of measures designed to protect children, make communities safe and build a better future for people living in Indigenous communities and town camps in the NT. The NTER was announced by the Australian Government in June 2007 in response to the *Little Children are Sacred* report which brought national attention to evidence of child abuse in the NT's Indigenous communities."[4]

Child health checks were one of the measures of the NTER, and these included cardiac auscultation of every child aged up to 16 years in the 73 NT communities where the response was implemented.

Results of RHD screening by auscultation in NT

Healthy School Aged Kids screening

Results from the screening program were published in *The Chronicle*, the publication of the Chronic Diseases Network in 2001. In the Top End, heart murmurs were heard in 19 of 199 children in 1999, and 44 of 396 children in 2000.[5] There was no comment about follow-up of children with murmurs.

NT Emergency Response (NTER)

Progress data from the child health checks were published in December 2008, and a final report in December 2009. Data related to cardiac conditions are summarised in Table 2.[6,7]

The final report states that there were a total of

Table 2: NT Emergency Response: Cardiac conditions, screening and referrals

Region	Children reviewed	Known RHD	Children examined	Referred for cardiac investigation	Referred to cardiologist
Central Australia	2342	33 (1.4%)	2495	67 (2.7%)	10 (0.4%)
Arnhem	2462	28 (1.1%)	2301	69 (3.0%)	10 (0.4%)
Katherine/ Barkly	1788	23 (1.3%)	1714	77 (4.5%)	7 (0.4%)
Darwin Rural	2621	32 (1.2%)	2487	47 (1.9%)	3 (0.1%)
Total	9373	116 (1.2%)	8997	288 (3.2%)	30 (0.3%)

16,259 children in the age group 0 to 16 years. Thus the report estimates that 55% of all children underwent cardiac auscultation.[7]

The Central Australian RHD program was notified of 1 child newly diagnosed with RHD by NTER in Central Australia. After further assessment this child was diagnosed with ARF.

At the time of publication of the NTER report, 99 children aged 0 to 15 were reported to be on the RHD registers with RHD. In comparison, NTER clinicians reviewing clinic notes identified 116 in this age group with RHD.[6]

Healthy School Aged Kids Program 2009

The Healthy School Aged Kids screening was suspended in 2007 and 2008 while the child health checks of the NTER were underway. Following the NTER, the Department of Health and Families (DHF) program staff extended cardiac auscultation to all school aged children in 2009, in order to maintain the focus on child health that the NTER had generated. Results of screening in Central Australia are shown in Table 3.

Screening and heart examination were also undertaken in Top End. The ages of the children with murmurs are likely to reflect ages of children in the screening as shown in Figure 1. The 2 children with RHD were aged 6 and 10 years. Neither child had definite RHD on echocardiography and both were recommended to undergo clinical assessment to confirm the diagnosis. The 2 with non-RHD abnormalities on echocardiogram also were aged 6 and 10 years.

During the school screening program many children with known past ARF or RHD were identified as being due and overdue for echocardiography. However the waiting lists for echocardiography were long, in part because of the pressure on the limited echocardiography services required under the screening protocol following the NTER.

Discussion

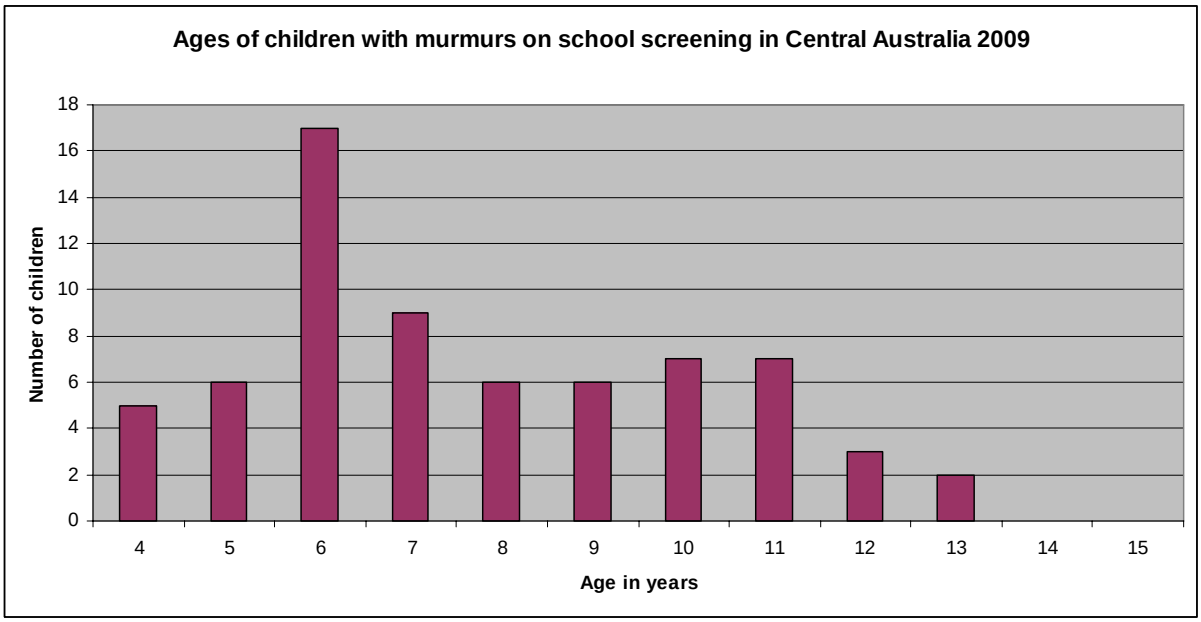
RHD meets many of the criteria for an effective screening program. Screening for RHD by cardiac auscultation has been implemented in the NT for 14 years as part of the Healthy School Aged Kids program. The aims of this screening are loosely described in the Healthy School Aged Kids manual, although there are no specific objectives. [5]

Evaluation can guide screening programs so that optimal use is made of resources for the best possible population health outcomes. RHD

Table 3: Healthy School Aged Kids 2009: Screening and heart examination in Central Australia

	Alice Springs Region	**Barkly Region**	**Total Central Australia**
Children screened	941	251	1192
Children auscultated	903	192	1095
New murmurs or abnormal heart sounds	47	20	67
Echocardiograms performed as at 21/5/2010	30	8	38
Discharged from follow-up echocardiogram by paediatrician	10	6	16
Awaiting echocardiogram or on recall	7	6	13
Echocardiogram normal	27	7	34
Abnormal echocardiography	3	1	4
Possible RHD identified on echocardiogram	2	0	2
Non-RHD abnormality on echocardiogram	1	1	2

Figure 1 Ages of children with murmurs on school screening in Central Australia 2009



screening can provide a focus of collaboration between primary health care, child health, paediatrics and rheumatic heart disease programs.

Reports of the screening program have provided information on murmurs detected and referrals.[5,6,7] However there has been no reporting of the numbers of cases of RHD identified through screening.

The number of cases of RHD identified through screening is 1 important outcome of the screening program. Only cases of definite RHD who commence prophylaxis can benefit from earlier intervention to improve their outcome.

The 2009 screening in Central Australia identified 2 children with possible RHD of over 1000 who had cardiac auscultation, 69 who were identified with murmurs and 38 who underwent echocardiography. This is 2.8% predictive value of possible RHD in children identified with murmur on screening; and a prevalence of newly detected RHD of 0.2%.

Two children with cardiac abnormalities other than RHD were detected through the screening in Central Australia. Screening children for heart disease is not recommended outside the newborn period, either in Australia or other comparable countries.[8,9]

The low rate of detecting RHD in this program was consistent with the 1997 discussion paper which noted that the yield of new RHD would be greatest in communities with limited medical services, and those where screening had not been performed for many years.[3]

While the yield of RHD cases was low, there is a risk of children with RHD being missed by cardiac auscultation, and being inappropriately reassured. Data from a study of screening echocardiography in Tonga suggested that over 90% of cases of RHD are missed on cardiac auscultation, in a project where auscultation was carried out by a person with specific training.[10]

The prevalence of known RHD among NT Indigenous children between 5 and 14 years of age is reported at 8.5 per 1000.[11] However, there are no estimates of prevalence of undiagnosed RHD. An echocardiography screening research program currently underway in children in the NT, Queensland and Western Australia will provide an estimate of prevalence of undiagnosed RHD, based on those presenting for echocardiography in nominated communities.[12]

The increased workload on the echocardiography services associated with the NTER and then the 2009 extended Healthy School Aged Kids screening of all children 5 to 15 years led to lengthened waiting times for echocardiography. This has affected all clients referred for echocardiography, including

children with screen-detected murmurs and those with established RHD and 21 children still had not undergone echocardiography over 12 months after screening. Of the children identified with heart murmurs by the primary care doctor at initial screening 16 have been reviewed by a paediatrician, and the referrals for echocardiography have been cancelled. This process is consistent with the original screening recommendations, but not with the current recommendations.[1,2,3]

Review of case notes as part of the Healthy School Aged Kids program identified children overdue for echocardiography on RHD care plans. Many children identified with murmurs were found to have previously been identified with murmurs and normal echocardiography. Therefore strengthening of recall systems in children already identified as 'at risk' will progress appropriate case management and markedly improve RHD outcomes.

Other states of Australia do not undertake RHD screening, and this is consistent with the NHF guidelines which recommend screening only for NT Aboriginal children, including both urban and rural.[1,2]

Conclusion and recommendations

Concern about preventable morbidity and mortality from RHD in the NT remains high. However, the role of school aged screening by cardiac auscultation by a primary care doctor has not been demonstrated. Outcomes of the 2009 Healthy School Aged Kids screening in Central Australia would suggest that the current protocol be evaluated noting:

- the low sensitivity of auscultation in detecting RHD demonstrated in studies elsewhere,[10]
- the low predictive value positive of a murmur, and
- the need to prioritise use of limited echocardiography services.

Recall systems for children with known RHD or previous ARF for echocardiography should be strengthened. Results from the Healthy School Aged Kids school screening program suggest that there is an on-going role for chart review in identifying children with RHD and previous ARF who are due and overdue for echocardiography. At what age (or ages) this is best done needs to be determined.

The possibility of community, rather than clinic based screening for ARF, as proposed by the World Health Organisation[13] has not been discussed in Australia.[2] Screening by echocardiography is also under investigation.[12]

Adequate uptake of prophylaxis for people known to be at risk of RHD is an essential requirement to control RHD and at present this is not being achieved.[1,14.]

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Hafnia alvei – a possible cause of gastroenteritis?

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Abstract

When investigating a large outbreak (62 persons reportedly ill) of gastroenteritis in the Northern Territory, Salmonella Lansing was isolated from 1 clinical specimen, rotavirus from another specimen and Hafnia alvei was isolated from 2 further specimens of other clinical cases. No other recognised pathogen was isolated from the specimens that grew H. alvei and no other pathogens were isolated from the stool samples submitted . The symptom presentations of the Salmonella Lansing case and rotavirus case were different to those gathered from the other outbreak cases which were more uniform.

In light of these results, the role of H. alvei as a cause of gastroenteritis was considered. The role of H. alvei as a possible enteric pathogen has been debated in the literature for a number of years, and is complicated by the fact the organism may be a member of the Escherichia group, having been misidentified by commercial identification systems.

Keywords: Hafnia alvei; Escherichia albertii; gastroenteritis; outbreak; diarrhoea

Introduction

In August 2010 the Northern Territory (NT) Centre for Disease Control was alerted to an outbreak of gastroenteritis in a regional area of the NT. The outbreak involved participants on a rally drive. Of the 105 participants, 62 were reportedly ill and 27 cases were interviewed. Most cases presented with a diarrhoeal illness lasting 1-2 days, with no fever and no vomiting reported. Of the 62 cases, only 5 persons submitted stool samples for analysis. Of these 5 samples, 1 sample was positive for *Salmonella* Lansing, 1 sample was positive for rotavirus and 2 samples contained *Hafnia alvei*. No other recognised enteric pathogens were isolated from the 2 samples that grew *H. alvei*. The symptom presentations of the *Salmonella* Lansing case and rotavirus case were different to the other outbreak cases. The *Salmonella* Lansing case experienced multiple episodes of diarrhoea (more than 10 episodes a day) lasting several days. The rotavirus case experienced vomiting, diarrhoea and fever. Of the remaining ill rally drive participants interviewed (n=25), only 1 other case reported vomiting and 2 others cases reported fever.

The etiological agent for the outbreak was not clear. The illness described by cases was not typical of salmonellosis or rotavirus infection, being characterised by a small number of episodes of diarrhoea lasting 1 to 2 days, and with few reports of fever or vomiting. The isolation of *Salmonella* Lansing from 1 specimen and rotavirus from another was not convincing epidemiological evidence that either organism was the causative pathogen. The isolation of *H. alvei* from 2 outbreak cases was of interest in the absence of not isolating any other pathogens from multiple cases.

Several food samples were submitted for testing, firstly for a panel of enteric pathogens, with later samples tested only for *Salmonella* species. There were no pathogens isolated from the samples tested for the panel of enteric pathogens. The selective testing of some food samples for 1 pathogen limited the investigation. This was due to the early presumption that *Salmonella* may have been the etiological agent involved in the outbreak. Enquiries were later made about testing food samples for *H. alvei* but this was not possible.

The significance of *Hafnia alvei* in gastroenteritis?

The isolation of *H. alvei* in 2 stool specimens from outbreak cases raised the question - what role does this organism play in cases of gastroenteritis? In addition to the NT outbreak, there had been recent discussion at a national level about the role of organisms identified as *H. alvei* as enteric pathogens (Mansell, *pers comm*. 2010). There is some debate in the literature whether *H. alvei* is a cause of gastroenteritis, with the view being there has been insufficient laboratory, epidemiological and clinical data to support its position as an enteric pathogen.[1] There have been documented case studies and outbreaks reported in the literature where *H. alvei* has been considered a possible enteric pathogen. It was reported as a possible cause of gastroenteritis in an immuno-compromised patient when it was cultured as the single organism in high bacterial counts over the course of the patient's gastrointestinal illness.[2] A probable case of haemolytic uremic syndrome (HUS) case was speculated to be due to a toxigenic strain of *H. alvei*.[3] The organism was isolated along with other enteric pathogens in specimens from a small number of travellers with diarrhoeal symptoms returning from Morocco, with this epidemiological association thought to be significant.[4] *H. alvei* was also considered a possible etiological agent in 2 nosocomial outbreaks of gastroenteritis when it was isolated in heavy to predominant growth from a large proportion of samples and in the absence of other pathogens.[5]

While outbreaks of gastroenteritis have been attributed to *H. alvei* in the past, its etiological role has been complicated by confusion over its identification using commercial microbial identification systems. In 1 outbreak in Bangladesh, isolates initially identified as *H. alvei* using the API20E system were later reclassified as members of the *Escherichia* group after using additional identification methods examining the genotypic and phenotypic characteristics of the isolates[7], with *Escherichia albertii* subsequently proposed as a new species.[1,6,7] Other studies have shown that *E. albertii* has been misidentified as *Hafnia, Salmonella, E coli* and *Yersinia* ruckeri by a variety of different commercial identification systems.[8] The isolates from the NT outbreak were also identified by the API20E system, and so there is a possibility the isolates from the NT outbreak were actually *E. albertii*. Further testing to clarify the identification of the isolates was not possible. *H. alvei* is often considered part of the normal enteric flora (Baird, *pers comm.*, 2010) though there is no reliable data for the rate of isolation of *H. alvei* from clinical specimens in routine practice.[5] At present, *E. albertii* is not contained on the databases of many commercial identification systems[9], so it is not possible to distinguish isolates of *H. alvei* from *E. albertii* when commercial systems alone are used to identify these isolates.

Conclusion

The definitive attribution of this outbreak to *H. alvei* is not possible given the small number of cases presenting specimens for analysis and subsequent isolation of *H. alvei* from only 2 specimens. Food samples could also not be tested for the organism. There are questions concerning the identification of the isolates, given the limitations of current commercial identification systems. Even though the epidemiological and clinical evidence from this investigation can not clearly support the role of this organism as an enteric pathogen and cause of the gastroenteritis outbreak, it did provoke some interesting questions in terms of outbreak investigation and the possible causative agents of gastroenteritis.

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Extension to indications for Human Papillomavirus Vaccine (Gardasil ®)

Immunisation with the Human Papillomavirus (HPV) Vaccine, Gardasil®, which protects against the 4 types of HPV most commonly associated with cervical cancer and genital warts, now holds promise for reducing the overall burden of clinical HPV disease.

The Therapeutic Goods Administration (TGA) has recently approved the extension of the indication for Gardasil® to include males 9 to 26 years of age and for females aged 9 through to 45 years of age.

The new indication for males to receive the vaccine was based on a multicentre clinical trial in over 4000 males aged 16 through to 26 years. The trial measured immune responses and vaccines effectiveness in reducing genital lesions (penile/ perianal/perineal /intraepithelial neoplasia) and infection caused by HPV types 6, 11, 16 and 18.

In 2007-9 the National HPV Vaccination Program offered free vaccine to all women aged 12-26 years. From 2010 all girls in Year 7 (or aged 12 years of age) in the Northern Territory will be offered Gardasil®, as part of an ongoing school based program.

Despite the initial success of this program which has greatly increased public knowledge and awareness about the link between HPV and cervical cancers, HPV remains the most prevalent viral sexually transmitted infection (STI) in the world, with evidence of infection in nearly 80% of sexually active adults. Persistent infection with high risk types of HPV is strongly associated with the development of cervical, penile and anal cancers. In addition HPV infection may also cause oral, head and neck cancers. It will take many years for the vaccination program to markedly impact on prevalent rates of HPV.

To access the vaccine, males from age 9 to 26 years and females not covered by the school year program in the years 9 to 45 are required to obtain a private prescription from their doctor and self fund the vaccine.

In remote communities the vaccine is offered to girls at 12 years of age.

The dosing schedule for administration of Gardasi® is 0, 2 and 6 months.

Participation in cervical screening is still required and recommended for all sexually active women whether they are vaccinated or not.

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2011 Flu Vaccine - Gearing up for good coverage rates

In 2010 the following 2 'at risk' groups

- those over 6 months of age with risk factors* for severe disease, and
- all pregnant women

were added to the 2 'at risk' groups already eligible for free flu vaccination,

- all Indigenous people 15 years and over and
- all people 65 years and over.

Primary health care providers should plan now to ensure all 'at risk' groups are offered influenza vaccine in 2011 and aim for good immunisation coverage.

It is expected that the 2011 flu vaccine will be available the week of 10 February 2011.

Risk factors for severe influenza:

- Heart problems including rheumatic heart disease, cyanotic congenital heart disease, coronary artery disease and congestive cardiac failure
- Chronic lung/breathing problems including severe asthma, suppurative lung disease, bronchiectasis, cystic fibrosis, chronic obstructive pulmonary disease and chronic emphysema
- Chronic illness requiring medical follow-up or hospitalisation in the preceding year including diabetes mellitus, chronic metabolic diseases, chronic renal failure, haemoglobinopathies and impaired immunity including drug-induced immune impairment
- Chronic neurological problems including multiple sclerosis, spinal cord injuries and seizure and neuromuscular disorders
- People with lowered immunity including HIV, malignancy and chronic steroid use
- Children over 5 years to 10 years who receive long term aspirin.

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Centre for Disease Control

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Trachoma

What is trachoma?

Trachoma is a preventable infectious eye disease caused by repeated infection with eye strains of the bacteria *Chlamydia trachomatis*. It causes painful blindness in older people who have had severe active trachoma usually in childhood.

How is it spread?

Trachoma occurs in areas with overcrowded housing where personal and community hygiene are difficult to maintain. The *Chlamydia trachomatis* bacterium is easily spread through infected eye secretions. These secretions are passed back and forth between young children during close contact such as playing and sharing the same bedding. Flies can also spread the bacterium.

Children are the main reservoir of infection. Dirty faces are the most important risk factor in the transmission of trachoma.

What are the symptoms?

It is important to note that active trachoma in children often causes no symptoms. Trachoma can be present even in children with clean faces. However, children with active trachoma may have red, sore, sticky eyes and nasal discharge.

Inflammation and follicles under the upper eyelids are the hallmarks of active trachoma.

As trachoma progresses, scarring develops under the eyelids. The eyelashes turn in and rub on the cornea. This abnormal condition is called trichiasis. This may be painful and will cause corneal scarring, followed by visual loss and then blindness.

Who is at risk?

Aboriginal people in remote Australia are most at risk of developing trachoma. Young children, especially those with poor personal and family hygiene practices are at the highest risk.

Australia is the only developed country with blinding trachoma. Trachoma is a common cause of blindness in Aboriginal adults.

Active inflammation from trachoma is usually seen in young children and adolescents. The highest rates of disease are found in preschool children aged 3-8 years.

The cycle of repeated active infection and resolution occurs over many years. Teenagers and adults have the scarring stage of trachoma. Without treatment, adults may develop trichiasis which can ultimately lead to blindness.

What is the infectious period?

Trachoma is highly infectious in its early stage and may be infectious intermittently as long as active trachoma infection persists. People who are at risk experience repeated episodes of infection. Adults and those without clinical signs may still have episodes of infection and be infectious.

What is the treatment?

The antibiotic azithromycin is used to treat active trachoma. A single dose is given, and may be repeated in 6 to 12 months.

Children with trachoma and everyone who sleeps in the same house as any child with trachoma should be treated with azithromycin. If there is a high rate of trachoma in a community, then all Aboriginal members of the community should be treated. If a child with active trachoma sleeps in several different houses all the members of those houses should be treated.

Adults who complain of a sore eye need to be examined for trichiasis. Health services need to ensure that a process is in place for timely surgical referral and treatment of people with trichiasis.

CENTRE FOR DISEASE CONTROL

The World Health Organisation and the Communicable Disease Network Australia recommend the SAFE strategy;

Surgery – surgical correction for trichiasis

Antibiotics - azithromycin for cases of active trachoma and their contacts (that is all household members)

Facial cleanliness – promote clean faces to reduce spread of infection

Environmental improvements – Improve overcrowding, water and sanitation facilities. It is especially important to address barriers to face washing.

These 4 actions are aimed at eliminating trachoma by reducing the risk and frequency of transmission and preventing trichiasis with surgery.

How can trachoma be prevented?

The promotion of clean faces in children along with environmental improvements to reduce overcrowding and to support good hygiene practices are the best ways to control trachoma.

For more information contact the Centre for Disease Control in your region

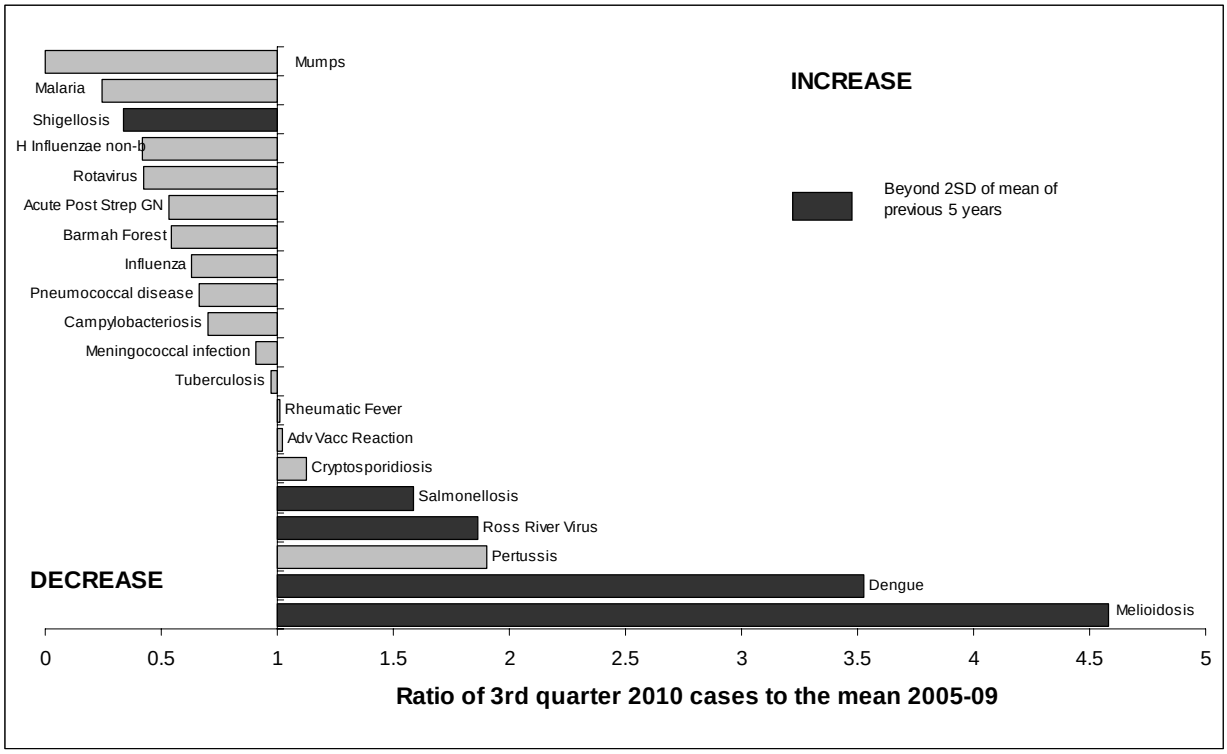
Alice Springs	8951 7540
Darwin	8922 8044
Katherine	8973 9049
Nhulunbuy	8987 0357
Tennant Creek	8962 4259

or http//www.nt.gov.au/health/cdc

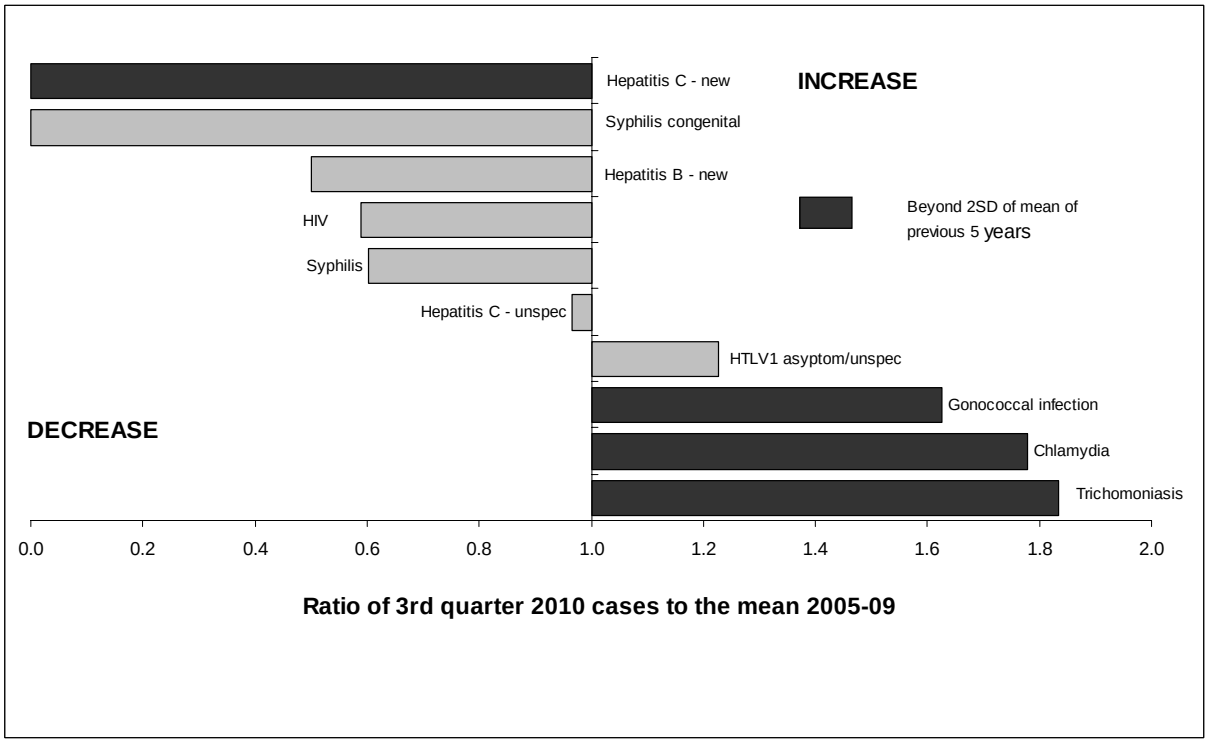
NT NOTIFICATIONS OF DISEASES BY ONSET DATE & DISTRICTS
1 July—30 September 2010 & 2009

	Alice Springs		Barkly		Darwin		East Arnhem		Katherine		NT	
	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009	2010	2009
Acute Post Strep Glomerulonephritis	1	1	0	1	1	4	1	2	2	2	5	10
Adv Vaccine Reaction	2	1	0	0	5	4	2	1	0	1	9	7
Amoebiasis	0	0	0	0	0	0	0	0	1	0	1	0
Arbovirus not otherwise specified	0	0	0	0	0	1	0	0	0	0	0	1
Barmah Forest	2	3	0	0	7	11	0	1	0	1	9	16
Campylobacteriosis	6	5	4	0	26	36	2	0	4	5	42	46
Chickenpox	6	0	0	1	18	12	2	1	0	11	26	25
Chlamydia	259	117	16	9	375	211	54	28	85	56	789	421
Chlamydial conjunctivitis	4	14	0	0	5	2	0	0	0	1	9	17
Cryptosporidiosis	2	3	0	1	3	3	1	1	3	2	9	10
Dengue	0	0	0	0	10	4	0	0	2	0	12	4
Food/water borne disease	0	0	1	0	0	0	0	0	0	0	1	0
Gonococcal conjunctivitis	0	0	0	0	0	0	0	0	1	0	1	0
Gonococcal infection	326	147	19	7	103	67	33	14	90	58	571	293
Hepatitis A	0	0	0	0	4	0	0	0	0	0	4	0
Hepatitis B - chronic	20	7	3	0	5	7	12	16	8	6	48	36
Hepatitis B - new	0	0	0	0	1	1	0	0	0	0	1	1
Hepatitis B - unspecified	15	14	0	2	17	17	1	0	11	4	44	37
Hepatitis C - new	0	0	0	0	0	0	0	0	0	1	0	1
Hepatitis C - unspecified	12	3	1	1	30	20	0	1	6	6	49	31
H Influenzae non-b	1	2	0	0	0	1	0	0	0	0	1	3
HIV	0	1	0	0	2	6	0	0	0	0	2	7
HTLV1 asyptomatic/unspecified	26	8	0	0	0	1	0	0	1	0	27	9
Influenza	3	376	0	60	201	670	13	140	6	209	223	1455
Legionellosis	1	0	0	0	1	1	0	0	0	1	2	2
Leptospirosis	0	0	0	0	0	0	0	0	0	1	0	1
Malaria	0	1	0	0	1	4	1	0	0	0	2	5
Measles	0	0	0	0	1	0	0	0	0	0	1	0
Melioidosis	0	0	0	0	10	3	1	0	0	0	11	3
Meningococcal infection	2	1	0	0	0	2	0	0	0	0	2	3
Mumps	0	0	0	8	0	0	0	0	0	0	0	8
Pertussis	81	9	1	1	17	29	0	7	0	3	99	49
Pneumococcal disease	9	18	0	2	6	11	0	2	2	5	17	38
Q Fever	0	2	0	0	0	0	0	0	0	0	0	2
Rheumatic Fever	6	5	0	0	6	3	2	2	2	3	16	13
Ross River Virus	5	9	0	1	64	44	3	3	3	2	75	59
Rotavirus	21	15	1	0	7	9	4	1	5	4	38	29
Salmonellosis	11	11	1	1	88	57	7	8	20	12	127	89
Shigellosis	3	5	0	2	5	5	0	3	2	2	10	17
Syphilis	10	8	1	0	7	14	5	3	9	4	32	29
Syphilis congenital	0	0	0	0	0	1	0	0	0	0	0	1
Trichomoniasis	206	127	43	21	197	149	102	52	179	102	727	451
Tuberculosis	0	2	1	0	4	4	0	1	2	1	7	8
Typhus	0	0	0	0	0	1	0	0	0	0	0	1
Varicella unspecified	0	0	0	0	1	0	0	0	0	0	1	0
Vibrio food poisoning	0	0	0	0	1	0	0	0	0	0	1	0
Yersiniosis	0	0	0	0	0	1	0	0	0	0	0	1
Zoster	1	9	1	2	23	19	3	2	3	5	31	37
Total	**1,041**	**924**	**93**	**120**	**1,252**	**1,435**	**249**	**289**	**447**	**508**	**3082**	**3276**

Ratio of the number of notifications (3rd quarter 2010 cases to the mean 2005-09): selected diseases



Ratio of the number of notifications (3rd quarter 2010 cases to the mean 2005-09): sexually transmitted infections and other blood borne viruses



Comments on notifications p 37

Ross River virus infection

There were 75 cases of Ross River virus (RRV) infection in the 3rd quarter compared with an expected number of 40. Most of this increase was in July in residents from the greater Darwin region, which includes the Darwin rural area and other more remote communities. This number of cases is highly unusual and not related to the large plagues of the *Aedes vigilax* mosquito that occurred later in August to October.

In June there was a large spike in *Culex annulirostris* numbers in Holmes Jungle Swamp due to the late and extended rains of the previous wet season which kept the swamp flooded for an unusually long period. Medical Entomology sprayed the swamp as soon as the spike occurred but the mosquito numbers remained up over a 3 week period. This together with a possible extended breeding season of the main animal host (wallabies) meant that conditions were ideal for RRV disease transmission.

Other swamps close to Darwin's rural area also remained full into this quarter, meaning that *Culex annulirostris* numbers probably remained high elsewhere, outside the Darwin mosquito monitoring area. The infected mosquitoes would have transmitted in June or early July explaining the peak in case numbers.

Chlamydia, gonorrhoea and trichomoniasis

Investigations of the cause for the increase in the notifications of these 3 sexually transmitted diseases (STIs) this quarter found that the vast majority of cases occurred in remote districts, especially in communities where a prevalence study was being carried out for the STRIVE project—a randomised control trial to investigate whether best practice sexual health services can lead to reduction of STI rates. The test positivity rates for remote communities in Central Australia were similar to the prevalence detected in the 2009 Annual STI Screen. Therefore, it is most likely that increase in notification reflects better detection due to increased testing.

Newly acquired Hepatitis C

The enhanced surveillance for hepatitis C is still being implemented. The number of newly acquired hepatitis C has been between 1 and 2 per quarter in the last 2 years. Having no new notifications in this quarter may be normal fluctuation. There is no evidence to suggest a decrease in testing.

Melioidosis

During the 2009-10 wet season there were a record number of melioidosis cases notified and this trend continued throughout 2010. In the 3rd quarter there were 11 cases compared to a 5 year mean of just over 2 cases. While weather conditions have been wetter than average the cause of this increase is still not clear and investigation into the increase in numbers since October 2009 is continuing. It will be interesting to see what happens over the coming wet season.

Dengue

There were 12 cases of dengue in the 3rd quarter compared with an expected 3 cases. While high this was less than the previous quarter (16 cases). The origin of the infections were Indonesia, East Timor, Philippines and Vietnam.

Salmonellosis

Salmonellosis notifications in this quarter were greater than expected (127 vs. 80 expected). Most cases were sporadic. However, there was one cluster of 7 cases of *S*. Typhimurium phage type 135A, with 3 of these cases linked to a kebab shop. The vehicle of infection at the shop was not identified and no other common links could be established for the cluster. There was also an outbreak of *S.* Virchow phage type 8 in a family group of 6 persons, with *S*. Virchow PT8 detected in 4 stool specimens. The vehicle of infection was again not identified.

Shigellosis

Shigellosis numbers this quarter were below the expected number (10 vs. 30 cases expected). The reason for this is not clear. Nationally, there have been 131 shigellosis notifications for July-September, compared to 147 cases expected.

Immunisation coverage for children aged 12-<15 months at 30 Sept 2010

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	% Fully vaccinated
Darwin	303	90.4%	90.1%	90.8%	90.1%	89.8%
Winnellie PO Bag	113	93.8%	93.8%	94.7%	93.8%	93.8%
Palm/Rural	219	92.7%	92.7%	93.6%	92.2%	92.2%
Katherine	117	89.7%	89.7%	90.6%	88.9%	88.9%
Barkly	20	80.0%	80.0%	80.0%	80.0%	75.0%
Alice Springs	143	88.1%	88.1%	89.5%	88.1%	88.1%
Alice Springs PO Bag	61	90.2%	90.2%	91.8%	90.2%	90.2%
East Arnhem	55	96.4%	96.4%	96.4%	96.4%	96.4%
NT	1031	91.0%	90.9%	91.8%	90.7%	90.5%
Indigenous	461	87.4%	87.4%	89.4%	87.4%	87.4%
Non-Indigenous	570	93.9%	93.7%	93.7%	93.3%	93.0%
Australia Indigenous	3,455	85.7%	85.6%	85.9%	85.6%	85.5%
Australia non-Indigenous	70,515	92.4%	92.4%	92.2%	92.1%	92.0%
Australia Total	73,970	92.1%	92.0%	92.0%	91.8%	91.7%

Immunisation coverage for children aged 24-<27 months at 30 Sept 2010

Region	Number in District	% DTP	% Polio	% HIB	% Hep B	%MMR	% Fully vaccinated
Darwin	274	94.9%	94.9%	90.9%	94.5%	94.9%	90.5%
Winnellie PO Bag	76	98.7%	98.7%	94.7%	98.7%	98.7%	94.7%
Palm/Rural	245	96.7%	96.3%	92.7%	96.7%	95.9%	91.8%
Katherine	78	97.4%	97.4%	93.6%	97.4%	97.4%	92.3%
Barkly	23	95.7%	95.7%	91.3%	95.7%	100.0%	91.3%
Alice Springs	118	96.6%	96.6%	92.4%	96.6%	94.9%	92.4%
Alice Springs PO Bag	69	100.0%	100.0%	95.7%	100.0%	100.0%	95.7%
East Arnhem	61	98.4%	98.4%	95.1%	96.7%	96.7%	90.2%
NT	944	96.7%	96.6%	92.7%	96.5%	96.3%	91.9%
Indigenous	354	97.7%	97.7%	95.2%	97.7%	98.9%	95.2%
Non-Indigenous	590	96.1%	95.9%	91.2%	95.8%	94.7%	90.0%
Australia Indigenous	3,613	94.7%	94.6%	92.9%	94.6%	93.9%	90.2%
Australia non-Indigenous	69,626	95.1%	95.0%	95.0%	94.5%	94.1%	92.7%
Australia Total	73,239	95.0%	95.0%	94.9%	94.5%	94.1%	92.6%

Immunisation coverage for children aged 60-<63 months at 30 Sept 2010

Region	Number in District	% DTP	% Polio	%MMR	% Fully vaccinated
Darwin	278	80.2%	80.2%	80.6%	79.5%
Winnellie PO Bag	92	95.7%	95.7%	95.7%	95.7%
Palm/Rural	208	84.6%	84.6%	83.7%	83.7%
Katherine	79	93.7%	93.7%	93.7%	93.7%
Barkly	22	90.9%	90.9%	90.9%	86.4%
Alice Springs	132	84.1%	84.1%	81.1%	81.1%
Alice Springs PO Bag	74	94.6%	94.6%	94.6%	94.6%
East Arnhem	65	89.2%	89.2%	89.2%	89.2%
NT	950	86.3%	86.3%	85.8%	85.4%
Indigenous	389	89.2%	89.2%	88.4%	86.6%
Non-Indigenous	561	84.3%	84.3%	84.0%	84.5%
Australia Indigenous	3,150	85.0%	85.0%	85.6%	84.5%
Australia non-Indigenous	68,531	89.8%	89.8%	89.7%	94.2%
Australia Total	71,681	89.6%	89.6%	89.5%	93.7%

Immunisation Coverage 30 September 2010

Charles Roberts , Coordinator of NT Immunisation Register, CDC, Darwin

Immunisation coverage rates for NT children by regions based on Medicare address postcode as estimated by the Australian Childhood Immunisation Register are shown on page 39.

Background information to interpret coverage

Winnellie PO Bag is postcode 0822, which includes most Darwin Rural District communities, some East Arnhem District communities and some people who live in the Darwin "rural area" who collect mail from the Virginia store or Bees Creek. Alice Springs PO Bag is postcode 0872, which includes Alice Springs District, Nganampa and Ngaanyatjarra communities.

The cohort of children assessed at 12 to <15 months of age on 30 Jun 2010 were born between 1 Apr 2009 and 30 Jun 2009 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 2 doses of PRP-OMP Hib or 3 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) (latest doses due at 6 months of age). All vaccinations must have been administered by 12 months of age.

The cohort of children assessed at 24 to <27 months of age on 30 Jun 2010 were born between 1 Apr 2008 and 30 Jun 2008 inclusive. To be considered fully vaccinated, these children must have received 3 valid doses of vaccines containing diphtheria, tetanus, pertussis, and poliomyelitis antigens, either 3 doses of PRP-OMP Hib or 4 doses of another Hib vaccine, and 2 doses of hepatitis B vaccine (not including the birth dose) and 1 dose of measles, mumps, rubella vaccine (latest doses due at 12 months of age). All vaccinations must have been administered by 24 months of age.

The cohort of children assessed at 60 to <63 months of age on 30 Jun 2010 were born between 1 Apr 2005 and 30 Jun 2005 inclusive. To be considered fully vaccinated, these children must have received 4 valid doses of vaccines containing diphtheria, tetanus, pertussis antigens, 4 doses of poliomyelitis vaccine and 2 valid doses of measles, mumps, rubella vaccine (latest doses due at 4 years of age). All vaccinations must have been administered by 60 months (5 years) of age.

Interpretation

Immunisation coverage in NT children was below the national average across all three cohorts.

Immunisation coverage in Indigenous children in the NT was higher across all cohorts compared to the national coverage of Indigenous children. Indigenous NT children had lower coverage than non-Indigenous NT children in the 12 to <15 months cohort and higher coverage than non-Indigenous NT children in the 24 to <27 months and 60 to <63 months cohorts.

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NT malaria notifications April-June 2010

Merv Fairley, CDC, Darwin

1 notifications of malaria was received for the 2nd quarter of 2010. The following table provides details about where the infection was thought to be acquired, the infecting agent and whether chemoprophylaxis was used.

Number of cases	Origin of infection	Reason exposed	Agent	Chemoprophylaxis
1	East Timor	Holiday	*P. vivax*	No

NT malaria notifications July-September 2010

Merv Fairley, CDC, Darwin

2 notifications of malaria were received for the 3rd quarter of 2010. The following table provides details about where the infection was thought to be acquired, the infecting agent and whether chemoprophylaxis was used.

Number of cases	Origin of infection	Reason exposed	Agent	Chemoprophylaxis
1	At sea	Crew	*P. vivax*	No
1	Thailand	Holiday	*P. vivax*	No

Disease Control staff updates

Darwin

Patricia (Trish) Angco, administrative officer for Community Physician, will be assisting with the Surveillance data input while **Mary Verus** is on leave until 4/1/2011.

Michelle Harlock, OzFoodNet Epidemiologist**,** will commence 6 months maternity leave on 3 December. An EOI will be posted.

Farewell to **Ooanh Nguyen,** NT Blood Borne Virus Policy Officer for Darwin**,** as she leaves on 19 November to sail from Tasmania up the East Coast.

Florence Henaway, AHW Remote Sexual Health Coordinator, will commence 6 months maternity leave on 3 December.

Farewell to **Andre Wattiaux,** Head of Immunisation**,** who leaves the NT on 24 December to take up a Paediatric Registrar position at Westmead Hospital.

Eva Molanar, Technical Officer, joins Medical Entomology in Darwin.

Peter Whelan, Head of Entomology goes on 4 weeks long service leave from 4 December.

Farewell to **Shaneen Brady,** Administrative Officer for Head of Sexual Health & Blood Borne Virus (SHBBV)**,** as she begins her nursing studies in Rockhampton in 2011. She leaves on 3 December.

Nicole Wilson has joined the Trachoma Team in Darwin as the Public Health Nurse – Trachoma Top End.

Katherine

Welcome back to **Dale Thompson,** TB Public Health Nurse**,** who has returned from Mildura to work in the Katherine TB Unit for 2 months.

Thank you to **Helen Tindall** of Alice Springs CDC TB Unit who continues to travel from Alice Springs to support the Katherine TB unit.

Alice Springs

Carleigh Cowling has joined the Trachoma Team in Alice Springs as the Public Health Nurse – Trachoma Central Australia South.

Belinda Davis has been recruited to the Alice Springs SHBBV Remote Coordinator position and vacates the Darwin Clinic 34 CNC position. This position will be advertised.