Update on epidemiology & burden of RF internationally

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Proudly supported by the people of Western Australia through Channel 7's Telethon



Outline

- Brief introduction to RF/RHD
- Incidence/prevalence
- Major associations with burden
- Emerging issues in developing countries







- 5 yo Aboriginal girl from a remote community in the tropical north
- Presents to the community clinic with a 2 day history of fever and joint pains of her right hip and left knee. Also noted to be short of breath.
- Evacuated by plane to hospital





On admission

- Temp 38.5 C
- RR 80.
- SaO2 88%.
- Insp and exp crepitations
- Cardiomegaly
- Hepatomegaly
- No arthritis, rash, nodules, abnormal movements
- Murmur of severe mitral regurgitation





Other investigations

- Echo
 - Severe mitral regurgitation
 - Mitral valve leaflets markedly thickened
- WBC count 15.4
- CRP 130
- ESR 110
- ASOT 800 IU/ml
- AntiDNase B 1560 IU/ml
- Multiple blood cultures all no growth





- Oxygen, diuretics, fluid restriction.
- SaO2 still hovering in low 90s.
- \rightarrow ICU for intubation.
- \rightarrow urgent valve surgery







In the 1930s and 1940s, RHD was the leading cause of death of American school-aged children. Paediatric wards were full of children with the disease and whole hospitals were devoted to its care.

Trends in Incidence of Rheumatic Fever





Rheumatic Fever, Narula J, Reddy KS, Tandon R, Virmani R, eds American Registry of Pathology. Publications, Washington DC, 1999.



RF mortality, USA



Gordis L. The virtual disappearance of rheumatic fever in the United States: lessons in the rise and fall of disease. T Duckett Jones Memorial Lecture. Circulation (1985) 72:1155-1162



Summary of estimated global burden of RF/RHD

Disease	Number of existing cases	Number of new cases each	Number of deaths each	
		year	year	
Rheumatic heart disease	15.6 million	282,000	233,000	
History of acute rheumatic fever without carditis, requiring secondary prophylaxis	1.88 million	188,000		
RHD-related infective endocarditis		34,000	8,000	
RHD-related stroke	640,000	144,000	108,000	
Total	>18 million	>640,000	~350,000	

Lancet Infect Dis 2005;5:685-94



Recent GBD Estimates 2013

	1990	2005	2010	2013
Prevalence	29.2 million	33.5 million	34.2 million	33.9 million
YLL	13.3 million	9.7 million	8.7 million	7.7 million
YLD	1.2 million	1.4 million	1.4 million	1.8 million
DALY	14.4 million	11 million	10.1 million	9.5 million
Deaths	463,000	364,000	345,000	275,000

Compared to previous 2005 publication: 15.6 million cases 233,000 deaths



Global Burden of RHD



Figure 1 | **The global burden of RHD**. Number of prevalent cases of rheumatic heart disease (RHD) in 2013 by country, as well as the change in age-standardized RHD prevalence from 1990 to 2013. Data from REF. 9. Image courtesy of R. Seth, Telethon Kids Institute, Perth, Australia.

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RHD mortality in NT, Australia

Table 1. Northern Territory Age-Specific RHD* Deaths, 1977–2005

Sex	Indigenous			Non-Indigenous		Rate Ratio [†]			
Age Group, y	n	Rate‡	CI	n	Rate	СІ	RR	СІ	
Male									
0 to 4	1	1.0	0.2 to 7.3	0	0.0	na	—	na	
5 to 24	34	10.7	7.6 to 14.9	3	0.5	0.2 to 1.7	19.7	6.2 to 100.2	
25 to 44	42	22.8	16.9 to 30.9	1	0.1	0.0 to 1.0	162.4	27.6 to 6565.8	
45 to 64	20	30.1	19.4 to 46.7	4	1.2	0.4 to 3.1	26.0	8.7 to 104.8	
≥65	5	31.4	13.1 to 75.4	6	10.5	4.7 to 23.1	3.0	0.7 to 11.7	
Female									
0 to 4	2	2.1	0.5 to 8.4	0	0.0	na	_	na	
5 to 24	26	8.2	5.6 to 12.0	1	0.2	0.0 to 1.4	40.5	6.6 to 1659.0	
25 to 44	64	33.6	26.3 to 42.9	1	0.2	0.2 to 1.2	206.2	35.7 to 8269.5	
45 to 64	45	57.2	42.7 to 76.6	2	0.8	0.2 to 3.28	69.7	18.2 to 592.7	
≥65	14	67.4	39.9 to 113.8	9	19.2	10.0 to 36.8	3.5	1.1 to 9.2	
Persons									
0 to 4	3	1.6	0.5 to 4.8	0	0.0	na	_	na	
5 to 24	60	9.4	7.3 to 12.1	4	0.4	0.1 to 1.0	24.7	9.2 to 93.6	
25 to 44	106	28.3	23.4 to 34.2	2	0.2	0.0 to 0.6	187.6	50.7 to 1568.8	
45 to 64	65	44.8	35.1 to 57.1	6	1.0	0.5 to 2.3	44.0	19.2 to 124.3	.ETHON
≥65	19	51.8	33.0 to 81.1	15	14.2	8.7 to 23.9	3.6	1.7 to 7.5	1 BC

Colquhoun S, J Am Heart Assoc 2015 Discover. Prevent. Cure.

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Applying Australian RHD mortality rates to world population (2000 estimates)

More developed regions

		Male		Female		
Age	Popul'n	Rate	Number	Popul'n	Rate	Number
0-4	33821	0	0	32119	0	0
5 - 24	160752	0.5	804	153718	0.2	307
25-44	178781	0.1	179	175731	0.2	351
45-64	138847	1.2	1666	147330	0.8	1179
65+	67327	10.5	7069	103005	19.2	19777
All ages			9718			21614

Less developed regions

		Male		Female			
Age	Popul'n	Rate	Number	Popul'n	Rate	Number	
0-4	281129	1	2811	266410	2.1	5595	
5 - 24	1000221	10.7	107024	948638	8.2	77788	
25-44	720252	22.8	164217	691666	33.6	232400	
45-64	356366	30.1	107266	352515	57.2	201639	
65+	113604	31.4	35672	134485	67.4	90643	
All ages			416990			608064	

Total: ~1 million RHD deaths per year (cf 275,000 in GBD 2013)

Risk ratios of having acute rheumatic fever – NT of Australia

Aboriginal vs non-Aboriginal 124 (55-279)

Rural vs urban (Aboriginal) 3.3 (2.2-5.0)

Females vs males (Aboriginal) 1.3 (1.0-1.7)

RF risk factors

Average annual RF first admission rates by household crowding, deprivation, income



Source: Jaine, Baker, Venugopal. Paed Infect Dis J 2011;30:315-9



Characteristics, complications, and gaps in evidence-based interventions in rheumatic heart disease: the Global Rheumatic Heart Disease **Registry (the REMEDY study)**



Figure 2 Utilization of valve surgery and valvuloplasty in children and adults from low-income, lower-middle-income, and upper-middle-income countries.



European Heart Journal doi:10.1093/eurhearti/ehu507 **EDITORIAL**

The stark reality of rheumatic heart disease

Jonathan R. Carapetis*

What the REMEDY study tells us about Box 1 rheumatic heart disease in low and middle income countries

- People with RHD are first diagnosed when they have advanced disease.
- Surgery is a luxury available mainly to those living in high income countries.
- Most RHD patients do not receive adequate secondary prophylaxis.
- Delivery and monitoring of anticoagulation is inadequate, leading to high rates of stroke and bleeding.
- The burden of RHD in women is underappreciated, leading to high maternal and fetal mortality.
- Leadership in RHD control is emerging from the countries that bear the greatest disease burden.





Mortality

- Annual mortality after RHD diagnosis:
 - Ethiopia: 12.1%
 - Pakistan: 6.8%
 - Other data from Africa and Pacific suggest similar or higher mortality



Lancet 2006, Trop Med Int Health 2011



Maternal Mortality – MDG5

- 'Other indirect causes' of maternal mortality:
 - 16.7% in of deaths in Africa, 12.5% in Asia, 3.9%
 in Latin America and the Caribbean
- RHD a significant cause of these deaths.
 - e.g 41% of indirect obstetric deaths in South Africa were associated with heart disease, predominantly RHD (71-84%)
 - Senegal: 50 pregnant women with heart disease,
 46 had RHD, 17 maternal deaths (34%), 6 foetal
 deaths, 5 therapeutic abortions.

Khan et al., Lancet 2006; Watkins et al, BMC Cardiovascular Disorders 2012; Diao, Arch Cardiovasc Disord 2911





ARF outbreak in an NT community Hardie, ASID 2015

Number of cases of confirmed ARF in 2014



- 9 of 13 definite ARF cases swabbed GAS only in 1 (*emm* 91.0).
- 81 contacts screened (including 6 highly suspected ARF): GAS from 46% skin and 4% throat swabs.
- 9 of 14 contact isolates typed: 5 different *emm* types (54.1, 88.5, 87, 104.0, 108.0).
- Household-complexes: 2 contacts with emm 88.5; 2 contacts with 108.0.



ARF outbreak, Western Australia



TELETHON KIDS INSTITUTE Discover, Prevent, Cure,

Yearly Incidence APSGN





RF and TB

Mortality | Rheumatic Fever





FIGURE 7. Crude death rates from rheumatic fever, United States, 1910–1977.



Mean annual death rate from respiratory tuberculosis, England and Wales. Kass 1971



Gordis L. The virtual disappearance of rheumatic fever in the United States: lessons in the rise and fall of disease. T Duckett Jones Memorial Lecture. Circulation (1985) 72:1155-1162



RF and TB in NZ

Incidence | Rheumatic Fever



Incidence | Tuberculosis





Notification annual incidence of ARF in NZ 2002 – 2011 then projected 2012 – 2012 (Office of the Deputy PM better public services targets 2012)
 Notification of TB in New Zealand 1980 – 2010 (ESR surveillance report – TB in NZ 2010)



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Summary

- Challenge of poor data in highest burden settings.
- GBD data on prevalence (33 million cases) appears to be reasonable
- GBD data on mortality (275,000) likely underestimate
- Outbreaks ? Changing epidemiology
- Overall data can hide hotspots in developing countries where RHD is very different from Australia/NZ
- Need to use burden data to mobilise awareness and control efforts globally

