

# Clinical Outcomes in 3343 Children and Adults with Rheumatic Heart Disease from 14 Low and Middle Income Countries: 2-Year Follow-up of the Global Rheumatic Heart Disease Registry (the REMEDY study).

[Zühlke L](#)<sup>1</sup>, [Karthikeyan G](#)<sup>2</sup>, [Engel ME](#)<sup>3</sup>, [Rangarajan S](#)<sup>4</sup>, [Mackie P](#)<sup>4</sup>, [Cupido B](#)<sup>3</sup>, [Mauff K](#)<sup>5</sup>, [Islam S](#)<sup>4</sup>, [Daniels R](#)<sup>3</sup>, [Francis V](#)<sup>3</sup>, [Ogendo S](#)<sup>6</sup>, [Gitura B](#)<sup>7</sup>, [Mondo C](#)<sup>8</sup>, [Okello E](#)<sup>9</sup>, [Lwabi P](#)<sup>9</sup>, [Al-Kebsi MM](#)<sup>10</sup>, [Hugo-Hamman C](#)<sup>11</sup>, [Sheta SS](#)<sup>12</sup>, [Haileamlak A](#)<sup>13</sup>, [Daniel W](#)<sup>13</sup>, [Goshu DY](#)<sup>14</sup>, [Abdissa SG](#)<sup>14</sup>, [Desta AG](#)<sup>14</sup>, [Shasho BA](#)<sup>14</sup>, [Begna DM](#)<sup>14</sup>, [ElSayed A](#)<sup>15</sup>, [Ibrahim AS](#)<sup>15</sup>, [Musuku J](#)<sup>16</sup>, [Bode-Thomas F](#)<sup>17</sup>, [Yilgwan CC](#)<sup>17</sup>, [Amusa GA](#)<sup>17</sup>, [Ige O](#)<sup>17</sup>, [Okeahialam B](#)<sup>17</sup>, [Sutton C](#)<sup>18</sup>, [Misra R](#)<sup>19</sup>, [Abul Fadl A](#)<sup>20</sup>, [Kennedy N](#)<sup>21</sup>, [Damasceno A](#)<sup>22</sup>, [Sani MU](#)<sup>23</sup>, [Ogah OS](#)<sup>24</sup>, [Olunuga T](#)<sup>25</sup>, [ElHassan H](#)<sup>26</sup>, [Mocumbi AO](#)<sup>27</sup>, [Adeoye AM](#)<sup>28</sup>, [Mntla PS](#)<sup>29</sup>, [Ojji DB](#)<sup>30</sup>, [Mucumbitsi J](#)<sup>31</sup>, [Teo K](#)<sup>4</sup>, [Yusuf S](#)<sup>4</sup>, [Mayosi BM](#)<sup>32</sup>.

## Author information

- <sup>1</sup>The Cardiac Clinic, Department of Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa & Division of Paediatric Cardiology, Department of Paediatrics and Child Health, Red Cross War Memorial Children's Hospital, University of Cape Town, Cape Town, South Africa.
- <sup>2</sup>Department of Cardiology, All India Institute of Medical Sciences, New Delhi, India.
- <sup>3</sup>The Cardiac Clinic, Department of Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa.
- <sup>4</sup>Population Health Research Institute, Hamilton Health Sciences, McMaster University, Hamilton, Ontario, Canada.
- <sup>5</sup>Department of Statistical Sciences, University of Cape Town, Cape Town, South Africa.
- <sup>6</sup>Department of Surgery, School of Medicine, College of Health Sciences, University of Nairobi, Kenya.
- <sup>7</sup>Cardiology Unit, Department of Medicine, Kenyatta National Teaching and Referral Hospital, Nairobi, Kenya.
- <sup>8</sup>Cardiology Unit, Department of Medicine, Mulago Hospital, Kampala, Uganda.
- <sup>9</sup>Uganda Heart Institute, Kampala, Uganda.
- <sup>10</sup>Faculty of Medicine and Surgery, University of Sana'a, Al-Thawrah Cardiac Center, Sana'a, Yemen.
- <sup>11</sup>Division of Paediatric Cardiology, Department of Paediatrics and Child Health, Red Cross War Memorial Children's Hospital, University of Cape Town, Cape Town, South Africa & Paediatric Cardiology Service, Windhoek Central Hospital, Windhoek, Namibia.
- <sup>12</sup>Department of Paediatrics, Division of Paediatric Cardiology, Faculty of Medicine, Cairo University Children's Hospital, Cairo, Egypt.
- <sup>13</sup>Department of Paediatrics and Child Health, Jimma University Hospital, Jimma, Ethiopia.
- <sup>14</sup>Department of Internal Medicine, Faculty of Medicine, Addis Ababa, Ethiopia.
- <sup>15</sup>Cardiothoracic Surgery Department, Al Shaab Teaching Hospital and Faculty of Medicine, Alzaiem Alazhari University, Khartoum, Sudan.
- <sup>16</sup>University Teaching Hospital, Department of Paediatrics and Child Health, University of Zambia, Lusaka, Zambia.
- <sup>17</sup>Departments of Paediatrics and Medicine, Jos University Teaching Hospital, Jos, Nigeria.
- <sup>18</sup>Department of Paediatrics and Child Health, University of Limpopo, Polokwane, South Africa.
- <sup>19</sup>Department of Internal Medicine, University of Limpopo, Polokwane, South Africa.
- <sup>20</sup>Faculty of Medicine, Benha University, Cairo, Egypt.
- <sup>21</sup>Department of Paediatrics and Child Health, College of Medicine, University of Malawi, Blantyre, Malawi.
- <sup>22</sup>Department of Medicine, Eduardo Mondlane University, Maputo, Mozambique.
- <sup>23</sup>Department of Medicine, Bayero University and Aminu Kano Teaching Hospital, Kano, Nigeria.
- <sup>24</sup>Division of Cardiology, Department of Medicine, University College Hospital, Ibadan, Nigeria; Nigeria Ministry of Health, Umuahia, Abia State, Nigeria; Department of Medicine, Federal Medical Centre, Abeokuta, Nigeria.
- <sup>25</sup>Department of Medicine, Federal Medical Centre, Abeokuta, Nigeria.
- <sup>26</sup>Ahmed Gasim Teaching Hospital, Khartoum, Sudan.
- <sup>27</sup>Instituto Nacional de Saúde and Eduardo Mondlane University, Maputo, Mozambique.
- <sup>28</sup>Division of Cardiology, Department of Medicine, University College Hospital, Ibadan, Nigeria.
- <sup>29</sup>Department of Cardiology, Dr. George Mukhari Hospital and Sefako Makgatho Health Sciences University, Tshwane, South Africa.
- <sup>30</sup>Cardiology Unit, Department of Medicine, University of Abuja Teaching Hospital, Abuja, Nigeria.
- <sup>31</sup>Paediatric Cardiology Unit, Department of Paediatrics, King Faisal Hospital, Kigali, Rwanda.
- <sup>32</sup>The Cardiac Clinic, Department of Medicine, Groote Schuur Hospital, University of Cape Town, Cape Town, South Africa bongani.mayosi@uct.ac.za.

## Abstract

### BACKGROUND:

-There are few contemporary data on the mortality and morbidity associated with rheumatic heart disease (RHD) or information on their predictors. We report the two year follow-up of individuals with RHD from 14 low and middle income countries in Africa and Asia.

### METHODS:

-Between January 2010 and November 2012, we enrolled 3343 patients from 25 centers in 14 countries and followed them for two years to assess mortality, congestive heart failure (CHF), stroke or transient ischemic attack (TIA), recurrent acute rheumatic fever (ARF), and infective endocarditis (IE).

### RESULTS:

-Vital status at 24 months was known for 2960 (88.5%) patients. Two thirds were female. Although patients were young (median age 28 years, interquartile range 18 to 40), the two year case fatality rate was high (500 deaths, 16.9%). Mortality rate was 116.3/1000 patient-years in the first year and 65.4/1000 patient-years in the second year. Median age at death was 28.7 years. Independent predictors of death were severe valve disease (hazard ratio (HR) 2.36, 95% confidence interval (CI) 1.80-3.11), CHF (HR 2.16, 95% CI 1.70-2.72), New York Heart Association functional class III/IV (HR 1.67, 95% CI 1.32-2.10), atrial fibrillation (AF) (HR 1.40, 95% CI 1.10-1.78) and older age (HR 1.02, 95% CI 1.01-1.02 per year increase) at enrolment. Post-primary education (HR 0.67, 95% CI 0.54-0.85) and female sex (HR 0.65, 95%CI 0.52-0.80) were associated with lower risk of death. 204 (6.9%) had new CHF (incidence, 38.42/1000 patient-years), 46 (1.6%) had a stroke or TIA (8.45/1000 patient-years), 19 (0.6%) had ARF (3.49/1000 patient-years), and 20 (0.7%) had IE (3.65/1000 patient-years). Previous stroke and older age were independent predictors of stroke/TIA or systemic embolism. Patients from low and lower-middle income countries had significantly higher age- and sex-adjusted mortality compared to patients from upper-middle income countries. Valve surgery was significantly more common in upper-middle income than in lower-middle- or low-income countries.

### CONCLUSIONS:

-Patients with clinical RHD have high mortality and morbidity despite being young; those from low and lower-middle income countries had a poorer prognosis associated with advanced disease and low education. Programs focused on early detection and treatment of clinical RHD are required to improve outcomes.

### KEYWORDS:

developing countries; morbidity/mortality; outcomes; rheumatic heart disease; valve