

Title: Poor domestic smoke ventilation is associated with an increased risk of rheumatic heart disease in Sri Lankan children

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Recent epidemiological studies in the U.K. suggested a link between childhood exposure to domestic smoke and subsequent mortality from rheumatic heart disease (RHD). Because smoke inhalation is known to damage tissues and increase vulnerability to infection, smoke-exposed individuals may be more susceptible to systemic streptococcal infection and consequent RHD. High levels of domestic smoke exposure in resource-poor countries could explain the persistence of RHD in these areas. This study tested the hypothesis that domestic smoke exposure is a risk factor for rheumatic heart disease in Sri Lanka.
19 children with RHD and 13 healthy matched controls completed a detailed questionnaire on their home environments. Groups were similar in age, sex and geographical distribution. Measures included family income, number of people living in home, number of close contacts, distance to nearest neighbour (a measure of urbanisation), number of rooms in home, type of cooking fuel, presence of a chimney to vent cooking fumes, age, sex, and body weight.

Median (IQR) measures by group

	Case (n=19)	Control (n=13)	*P*
Age (y)	13 (11; 14)	13 (12; 14)	0.71
Female	12 (63%)	8 (62%)	0.93
Weight (kg)	30 (21; 36)	36 (29; 40)	0.17
Household annual income (SLR)	35,000 (25,000; 50,000)	30,000 (20,000; 60,000)	0.66
Number of people in home	5 (5; 7)	6 (5; 6)	0.90
Persons per room in home	**1.25 (1.00; 1.75)**	**1.00 (1.00; 1.20)**	**0.03**
Child's number of close contacts	5 (5; 10)	7 (4; 10)	0.82
Distance to nearest neighbour (m)	5 (1; 10)	5 (2; 6)	0.75
Kitchen chimney	**9 (47%)**	**12 (92%)**	**0.01**
Biomass fuel vs. gas	18 (95%)	11 (85%)	0.34

The table shows the median (25^{th}; 75^{th} centiles) characteristics of the two groups. Group comparison (Mann Whitney-U / X^2) showed that a higher ratio of people to rooms & lacking a chimney were linked to increased risk of RHD. The association of RHD with chimney use was little altered when tested in separate multiple logistic regression models that included each of the other potential predictors of RHD.

Preliminary data suggest that domestic smoke exposure may be an important and previously unrecognised risk factor for RHD. Although the study is currently small, these findings show that further investigation is warranted, as RHD can be a lifelong, debilitating condition and a significant cost to healthcare systems. If confirmed, investment in installing domestic chimneys would be relatively inexpensive at national level, and could be the subject of a cluster-randomised clinical trial.

Biography

Ida is a paediatric cardiology fellow in Melbourne, Australia. She has completed her Master of International Health and Tropical Medicine at the University of Oxford in 2017 as a John Monash Scholar, with a research thesis on rheumatic heart disease. Ida has worked and volunteered widely throughout Africa and the Asia-Pacific region, and also worked in paediatric cardiology at Great Ormond Street Hospital London. She has several publications and is currently engaged in research regarding rheumatic heart disease in Australia.

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