BMJ Paediatrics Open

Respiratory syncytial virus prevalence in children admitted to five Kenyan district hospitals: a cross-sectional study

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To cite: Le Geyt J, Hauck S, Lee M, *et al*. Respiratory syncytial virus prevalence in children admitted to five Kenyan district hospitals: a cross-sectional study. *BMJ Paediatrics Open* 2019;**3**:e000409. doi:10.1136/bmjpo-2018-000409

Received 25 November 2018
Revised 22 January 2019
Accepted 28 January 2019

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ABSTRACT

Acute respiratory infections (ARIs) are a leading cause of under-five mortality globally. In Kenya, the reported prevalence of respiratory syncytial virus (RSV) infections in single-centre studies has varied widely. Our study sought to determine the prevalence of RSV infection in children admitted with ARI fulfilling the WHO criteria for bronchiolitis. This was a prospective cross-sectional prevalence study in five hospitals across central and highland Kenya from April to June 2015. Two hundred and thirty-four participants were enrolled. The overall RSV positive rate was 8.1%, which is lower than in previous Kenyan studies. RSV-positive cases were on average 5 months younger than RSV-negative cases.

INTRODUCTION

Acute respiratory infection (ARI) is the leading infectious cause of under-five mortality worldwide.[1] Up to 40% of ARIs diagnosed and treated as bacterial pneumonias in the developing world are bronchiolitis caused by respiratory syncytial virus (RSV)[2]; antibiotics may be unnecessary. Studies in Kenya examining the burden of RSV in paediatric admissions, mainly from the rural coastal town of Kilifi, show a range between 15% and 34%.[3 4]

Seasonal epidemics, local climate, malnutrition, HIV, urbanisation and vaccination uptake are some factors affecting aetiology of ARIs within Africa.[2 5] Bronchiolitis aetiology and prevalence is thus likely to be influenced by varying geographical, temporal and population factors within the different regions of Kenya.

This study aimed to determine the prevalence of RSV infection in children admitted with bronchiolitis to five hospital sites within Kenya.

METHODS

A multi-centre prospective cross-sectional prevalence study was conducted across five hospitals within central and highland Kenya.

Children admitted to hospital younger than 24 months old fulfilling the WHO definition of bronchiolitis were eligible for this study.[6] Patients were recruited from April to June 2015, coinciding with the annual clinical peak of ARIs across all sites. Consented patients were tested for RSV at the bedside using RSV rapid immunochromatographic assay testing kits donated by US company Alere (BinaxNOW RSV card) on nasopharyngeal swab specimens.

Secondary data on demographics, symptomatology and clinical signs were collected.

Patient and Public Involvement (PPI)

Patients were not directly involved in the design of this study.

Figure 1 Map of Kenya showing participating hospitals. 1= Chogoria, 2= Karatina, 3= Nanyuki, 4 = Narok, 5= Kiambu. (Adapted from: https://upload.wikimedia.org/wikipedia/commons/b/b7/Un-kenya.png) (Copyright; labelled for reuse).

Table 1 Demographic characteristics and results of the five Kenyan study hospitals in 2015

Hospital	1. Chogoria	2. Karatina	3. Nanyuki	4. Narok	5. Kiambu	Total
Hospital type	Level 2 private missionary	Level 4 government referral	Level 4 government referral	Level 4 government referral	Level 4 government referral	
District population	365 300	693 558	400 000	820 920	1 623 282	
Annual paediatric admissions (approx.)	2000	1375	2800	1700	3600	11 475
Official paediatric bed capacity	43	24	24	32	49	172
Number declined	1	7	5	8	11	32
Number recruited	8	59	29	50	88	234
RSV positive cases	0 (0%)	1 (1.7%)	3 (10.3%)	7 (14%)	8 (9.1%)	19 (8.1%)
Main challenges encountered	Unable to recruit daily, needing paternal consent	Unable to recruit daily, parental concerns re: pain/bleeding	Language barriers (Maasai interpreters), needing paternal consent	Needing paternal consent	Availability of nasopharyngeal swabs, parental concerns regarding pain/ bleeding	

RESULTS

Two hundred and sixty-six patients were eligible to be recruited to the study. 12% of parents declined consent. Two hundred and thirty-four patients were successfully recruited. The overall RSV positive rate was 8.1%. Demographic, geographical and study data are shown in table 1 and figure 1.

RSV positive rates varied widely across study hospitals: 0% in Chogoria, 1.7% in Karatina, 10.3% in Nanyuki, 9% in Kiambu and 14% in Narok, respectively. However, the small number of positive cases was not enough to power statistical analysis between the sites (19/234 cases).

57.7% of participants were male. 41% were under 6 months of age. The mean average age of all participants was 8.7 months; average age of RSV-positive cases was 3.9 months and RSV-negative 9.2 months. Difficulty feeding was a positive predictor of RSV (OR=3.33, 95% CI (1.25 to 8.83), p<0.01); however, the sample size was not large enough to control for age. No other clinical signs were statistically significantly associated with an RSV-positive test.

DISCUSSION

This is the first published study to look at RSV prevalence rates in children admitted with bronchiolitis across central and highland Kenya. It found an RSV positive prevalence of 8.1%; this is much lower than previously reported rates in other Kenyan studies, including those also only using immunochromatographic testing. Prevalence also appears to vary significantly between regions, which could be explained by environment, altitude, climate, level of urbanisation, access to healthcare and tribal cultures. Although recruitment coincided with peak annual ARI cases, RSV epidemics could have occurred at other times.

The mean age of RSV-positive cases was 5 months younger than RSV-negative cases. The only statistically significant sign or symptom associated with RSV was difficulty in feeding; however, the sample size was not large enough to control for age. Sample size was limited due to availability of recruiting clinicians.

Given the burden of disease, further studies looking at the viral aetiologies of ARIs and timings of epidemics, are required across the different areas in Kenya. A better understanding of the epidemiology of RSV infections could help guide evidence-based guidelines, management (including antimicrobial stewardship) and public health planning, such as potential vaccine developments.

Collaborators Mr Peter Nash, Dr Sammy Kilonzo, Dr Grace Akechm, Dr Lydia Thuranira.

Contributors All persons listed as authors made substantial contributions to the conception of the work or interpretation of data for the work. Drafting the work or revising it critically for important intellectual content. Final approval of the version to be published. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Competing interests None declared.

Ethics approval Ethical approval was obtained from Princeton University Institutional Review Board (Protocol # 6760) and Kenya Medical Research Institute. KEMRI/RES/7/3/1.

Provenance and peer review Not commissioned; externally peer reviewed.

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