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Risk factors and dynamics of household transmission of respiratory syncytial virus and other respiratory viruses in rural Nepal

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Abstract

Background Pneumonia is the leading cause of child mortality worldwide and respiratory viruses are an important cause of childhood pneumonia. However, household transmission of respiratory viruses is not well described in resource-limited settings and more information might guide preventative efforts by identifying individuals at risk of transmission. We aimed to characterise the transmission of respiratory viruses within households and identify risk factors for household transmission.

Methods We used data from a randomised controlled study of influenza vaccine in pregnant women in rural Nepal. Members of households were prospectively enrolled and surveyed weekly for symptoms of respiratory illness. At the time of illness, nasal swabs were collected, and subsequently tested by real-time PCR for nine respiratory viruses: respiratory syncytial virus (RSV), human metapneumovirus (hMPV), human rhinovirus (HRV), coronavirus, adenovirus, and parainfluenza virus (PIV) 1–4. Household transmission was defined as two or more household members with the same virus detected within 28 days. We used a multivariate logistic regression model to compare households with and without transmission.

Findings Between May, 2011, and May, 2012, 593 households were enrolled and 625 (54%) of 1156 illness episodes were positive for one or more of the included respiratory viruses. Most illness episodes occurred in children aged under 16 years ($n=952$; 82%). HRV was detected in 421 (67%) of virus-positive illness episodes. Household transmission was documented in 60 episodes in 51 (9%) households. HRV was the most commonly transmitted virus ($n=42$), followed by RSV (8), hMPV (7), PIV 1–3 (7), and coronavirus (3). The virus was first detected in children aged 1–4 years in 24 (40.0%) transmission episodes. Infants were involved in the transmission network in 7 (88%) RSV, 34 (79%) HRV, 4 (57%) PIV, and 3 (42%) hMPV episodes. A comparison of households with and without transmission showed that virus transmission was associated with presence of a low birthweight infant (39.2% vs 19.1%; OR 2.57, 95% CI 1.27–5.15), and more children aged 1–4 years (mean number of children 1.04 vs 0.71; 1.64, 1.11–2.43).

Interpretation In a household surveillance study in Nepal, children younger than 5 years were the most common introducer of respiratory viruses to households. Infants were frequently involved in RSV and HRV transmission networks. A vaccine strategy to immunise young children aged 1–4 years in the household to protect infants younger than 6 months should be considered to prevent RSV.

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Declaration of interests

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