

# High post discharge mortality in children of severe pneumonia in two states of Northern India

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Community acquired pneumonia (CAP) results in 14% of death in children under 5 years of age worldwide.<sup>1</sup> To achieve Sustainable development Goal (SDG), the Indian national target is to reduce under 5 mortality by 2030 to 23 per 1000 live birth<sup>2</sup> from 41.9 in 2021. Hence the objective of the current study was to follow-up children discharged after hospitalization for CAP in four districts of northern India to assess the post discharge mortality (PDM). The secondary objective was to identify socio demographic and clinical variables

present at the time of prior hospitalization associated with PDM.

Data was collected from a CAP surveillance network of 117 hospitals established in 2015 in four districts namely Lucknow, and Etawah in Uttar Pradesh, and Patna and Darbhanga in Bihar, India.<sup>3</sup> Inclusion criteria were: (i) 2–59 months of age; (ii) hospitalization with symptoms of WHO defined severe CAP; (iii) resident of project district; (iv) illness of <14 days; (v) no previous hospitalization for CAP or recruitment; and (vi) parental



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Variable (N = 934)	Dead n = 33, (%)	Model I <sup>a</sup> Dead/Alive <sup>ref</sup> Adjusted OR (95% CI)	Model II Dead/Alive <sup>ref</sup> Adjusted OR (95% CI)
Age (2–11 in months) (n = 593)	29 (87.9)	3.33 (1.14–9.72)	4.60 (1.36–15.63)
Residence (rural) (n = 426)	24 (72.7)	2.66 (1.19–5.93)	2.71 (1.15–6.40)
Breastfeed (n = 613)	23 (69.7)		
<sup>d</sup> Hypoxia (n = 587)	26 (78.8)		
Pallor (n = 443)	15 (45.5)		
<sup>b</sup> Co-morbidity (n = 17)	4 (12.1)	5.92 (1.60–21.92)	4.70 (1.22–18.16)
Chest x-ray (Radiological pneumonia)	15/31 (48.4)	–	3.30 (1.54–7.10)
<b>Districts</b>			
Lucknow (n = 437)	9 (27.3)		
Etawah (n = 209)	7 (21.2)		
Patna (n = 157)	7 (21.2)		
Darbhanga (n = 131)	10 (30.3)		
<b>Immunization status (excluding PCV)</b>			
Complete for age (n = 715)	24 (72.7)		
Incomplete/unimmunized (n = 219)	9 (27.3)		
<b><sup>c</sup>PCV13 immunity</b>			
Exposed PCV (n = 482)	13 (39.4)		
Unexposed PCV (n = 452)	20 (60.6)		
<b>Malnutrition status</b>			
Normal (n = 635)	13 (39.4)		
Malnutrition (n = 163)	8 (24.2)	2.18 (0.88–5.41)	2.31 (0.88–6.06)
Severe malnutrition (n = 136)	12 (36.4)	3.37 (1.43–7.93)	3.64 (1.48–8.96)

Abbreviation: PCV: Pneumococcal conjugate vaccine; OR: Odd ratio. Footnote: Step-wise backward logistic regression using statistical software (SPSS version 24). Variables in the model that had a univariate association with PDM with a p-value of <0.2. <sup>a</sup>Excluding chest x-ray variable. <sup>b</sup>Comorbidity: Congenital heart disease (n = 14), and history of fast breathing and cough  $\geq 3$  times in 6 months (n = 3). <sup>c</sup>PCV13 immunity: For children  $\leq 12$  months age >2 PCV doses and >12 months at least one dose of PCV. <sup>d</sup>Hypoxia: Oxygen saturation <90% on pulse oximetry or requiring oxygen supplementation.

**Table 1: Step-wise Backward Logistic regression analysis of sociodemographic and clinical variables associated with post discharge mortality.**

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consent to participate. Chest X-rays were collected from hospitals and interpreted by trained radiologists.<sup>3</sup> The study was approved by the Ethics Review Committee of each site. The caregivers/guardians of children gave written, informed consent for participation.

In 2022, 1295 cases were hospitalized for severe CAP of whom 1.9% (n = 25) died during index admission. Therefore, retrospective telephonic follow-up of remaining 1270 cases was done in June 2023 after a mean of 9.91 ( $\pm 3.56$ ) months of discharge. Loss to follow-up was 26.5% (n = 336), which is a limitation of the study. Thus, we analysed prior hospitalization data of 934 children. After discharge, 10.0% (93/934) were re-hospitalized of whom 25 died. Additionally, there were 8 more death at home (PDM = 3.5% (33/934)). PDM happened within 3 months of discharge in 72.7% (24/33). Step-wise backward logistic regression models of socio-demographic and clinical variables associated with PDM with (Model I) and without inclusion (Model II) of chest radiographic findings is given in [Table 1](#).

PDM was higher than hospital mortality (3.5% versus 1.9%) as reported earlier.<sup>4,5</sup> PDM was higher in infants, those with congenital heart disease, severe malnutrition, residing in rural areas and with radiological pneumonia. Hence discharged cases of severe CAP must be kept under medical active follow-up for at least for 3 months, with specific health systems interventions at the child, maternal and household levels<sup>5</sup> and these evaluated for contribution to achieving SDG.

## Contributors

The study was designed by SA. CAP study group performed data acquisition. AKP did statistical analysis. The paper is written by SA and AKP.

## Data sharing statement

The corresponding author has access to all data and the data may be made available on request.

## Declaration of interests

None to declare.

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