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Infant morbidity in an Indian slum birth cohort

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Abstract

Objective—To establish incidence rates, clinic referrals, hospitalisations, mortality rates and baseline determinants of morbidity among infants in an Indian slum.

Design—A community-based birth cohort with twice-weekly surveillance.

Setting—Vellore, South India.

Subjects—452 newborns recruited over 18 months, followed through infancy.

Main outcome measures—Incidence rates of gastrointestinal illness, respiratory illness, undifferentiated fever, other infections and non-infectious morbidity; rates of community-based diagnoses, clinic visits and hospitalisation; and rate ratios of baseline factors for morbidity.

Results—Infants experienced 12 episodes (95% confidence interval (CI) 11 to 13) of illness, spending about one fifth of their infancy with an illness. Respiratory and gastrointestinal symptoms were most common with incidence rates (95% CI) of 7.4 (6.9 to 7.9) and 3.6 (3.3 to 3.9) episodes per child-year. Factors independently associated with a higher incidence of respiratory and gastrointestinal illness were age (3-5 months), male sex, cold/wet season and household involved in beedi work. The rate (95% CI) of hospitalisation, mainly for respiratory and gastrointestinal illness, was 0.28 (0.22 to 0.35) per child-year.

Conclusions—The morbidity burden due to respiratory and gastrointestinal illness is high in a South Indian urban slum, with children ill for approximately one fifth of infancy, mainly with respiratory and gastrointestinal illnesses. The risk factors identified were younger age, male sex, cold/wet season and household involvement in beedi work.

The Global Burden of Disease Study ranks India second only to sub-Saharan Africa, with more than 36% of the burden due to childhood diseases.1 With increasing emphasis on meeting the Millennium Development Goal targets by 2015, denominator-based data on infectious disease burden among Indian children are required.2 These data are difficult to capture through governmental reporting systems in developing countries.3

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Data from cohorts of children followed from birth are important for understanding the incidence and evolution of illness. In India, about 40% of the population lives in conditions that may facilitate the enhanced spread of infection.1 A large-scale, community-based prospective longitudinal study was conducted in urban slums in Vellore, South India between March 2002 and August 2006, and the follow-up data from birth to 12 months of age analysed for morbidity outcomes and risk factors are presented here.

METHODS

Study site

The study was based at three adjacent urban slums in Vellore: Ramnaickanpalayam, Chinnallapuram and Kaspa, covering 2.2 km^2. Vellore municipality had an estimated population density of 1660 per km^2 in 2001; however, population density in the slums was approximately 17 000 per km^2.4

Mean annual rainfall is approximately 1050 mm, peaking between August and November. Piped water for drinking is supplied at intervals of 2-28 days by the municipality. During summer, temperatures are above 40°C.

The population comprises families resident in the area for multiple generations and some migrants who move in search of employment. Migration is limited and is <4% annually. The most common occupation is the manual production of tobacco-based cigarette-like products (called beedi work). Beedi leaves and tobacco are stacked in small, single-room warehouses and stored in households. There is no known source of industrial pollution within a 5 km radius. Other residents are employed as unskilled workers in the leather industry in towns 15-40 km away, as domestic servants, as sweepers, and as small traders, with a small number in skilled employment.

There is access to free government health services, with a physician-run urban health centre (UHC) in the area and a government hospital approximately 5 km away. There are also numerous private general practitioners and hospitals, including the Christian Medical College Hospital (CMC) and the Community Health and Development Hospital (CHAD), which are non-profit making. Community-based surveillance conducted by the UHC showed a birth rate of 18.5 live births per 1000 population per year and an infant mortality rate of 38 deaths per 1000 live births per year in the study area from 1995 to 2003, with 23% of infant deaths attributed to diarrhoea.5

Study design

The primary aim of setting up the birth cohort was to study rotavirus infections, which will be reported on completion of analysis. A household baseline survey was conducted between November 2001 and August 2002. Women of child-bearing age were visited to identify new pregnancies. Children of pregnant women intending to remain in the area for 3 years were eligible for enrolment unless they lived in a brick-built house with five or more rooms (n = 46). Babies with a birth weight of less than 1500 g were excluded (n = 2). Recruitment was consecutive and followed written informed consent. A physician-run clinic was set up in June 2002 to provide free health care to study children in response to requests from their parents who asked that a clinic be established near their homes instead of the free health care provided at CHAD.

Each household in the cohort was visited soon after delivery to obtain baseline information on demography, socio-economic indicators, health-seeking behaviour, environment, diet and the delivery and birth. Socio-economic status was assessed on a five-point scale modified from the Kuppuswamy scale6 and hygiene on a 24-point scale.7

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After birth, fieldworkers visited each household twice weekly and observed the study child. They interviewed the caregiver about any illness on each day since the last visit. Field workers were trained to use standard definitions to identify common morbidities, and to refer infants when they had any concerns about the child's health. Mothers were encouraged to bring the infant to the clinic for any illness they felt might be serious. Any child who needed hospital admission was referred to CHAD or CMC as necessary. Physicians at these hospitals managed these children as per their routine practice. The costs of care were borne by the study. Visits to any other health facility and physician-based diagnoses for each visit were recorded. The data collected by field workers were validated in a 10% random subsample on revisits by the study supervisor and/or the physician.

For the analyses, morbidity was classified into broad categories. Gastrointestinal illnesses were defined as diarrhoea (three watery stools in a 24 h period) or vomiting lasting for at least 24 h, respiratory illnesses as runny nose or cough either with or without fever lasting at least 72 h, and undifferentiated fever as fever not associated with other symptoms lasting at least 48 h. Lower respiratory tract infection included bronchitis or pneumonia as diagnosed by the study physician and confirmed by a paediatrician. A new episode of gastrointestinal illness was defined if it occurred at least 48 h after the last episode. The interval for new episodes was 72 h for the other categories.8 9

Statistical methods

Incidence rates were calculated as the number of episodes divided by the child-years of follow-up. The total person-time at risk was calculated as total days under surveillance minus time spent ill and time following the illness for which a new episode could not be defined, until the end of follow-up. To account for multiple failures within a child, frailty Poisson survival models were fitted to obtain the variance-corrected incidence rates and rate ratios. We investigated risk factors for overall morbidity and for gastrointestinal and respiratory illness separately. p Values were obtained from the likelihood ratio test or Wald tests of individual parameters. Data were double entered using Epi Info 6.4. software (CDC, Atlanta, GA, USA) and analysed using STATA version 8.0 (Stata, College Station, TX, USA).

RESULTS

A total 914 pregnant women were identified, from whom 452 newborns were recruited. Non-recruitment was due mainly women following the traditional practice of going to their mothers' homes for 3 months after delivery. These women did not differ significantly from those recruited in terms of socio-economic status, age of the mother, birth weight and gender of the child. Baseline characteristics of the cohort are given in table 1. The mean (SD) birth weight of 441 children was 2.92 (0.43) kg, with 223 males having a mean (SD) of 2.95 (0.42) kg and 218 females, 2.89 (0.43) kg, with 11 children born at home with no birth weight recorded.

Of 43 061 home visits during the first year of life, infants were not at home for 1031 (2.4%) visits and information was collected either by proxy or with a recall of >3 days during 1784 (4.1%) visits. The median (range) interval between two home visits was 3 (3-4) days. Breast feeding commenced in 445 children and the Kaplan-Meier estimate of median duration of breast feeding was 17.0 months (interquartile range (IQR) 11.3-22.4 months), with the median age at weaning being 3.0 months (IQR 1.9-4.0 months).

A total of 391 children had complete follow-up for their first year of life, and of these only one had no episodes of morbidity. For these 391 children, the median (IQR) days spent ill per infant were 73 (42-112).

Respiratory illnesses were the most common morbidity, at a rate (95% CI) of 7.4 (6.9 to 7.9) per child-year. Of these, 6.0% were attributable to lower respiratory infection, an incidence rate per child-year of 0.4 (95% CI 0.3 to 0.7). Of the upper respiratory tract illnesses, 618 (30%) were cough/runny nose with fever and 1100 (68%) of those without fever lasted only for a week or less. Gastrointestinal illnesses were the next most common (table 2). An infant spent a median (IQR) of 8 (3-18) days of illness per child-year with gastrointestinal illness and 43 (15-82) days with respiratory illness. Other infections and undifferentiated fever accounted for 17.4% of all episodes.

In Poisson regression models fitted for overall morbidity, gastrointestinal and respiratory illnesses, age (3-5 months), masculine gender and family involvement with beedi work were independently associated with increased risk, after adjustment for other baseline characteristics such as birth weight, socio-economic status, household size, etc (tables 3 and 4). There was increased risk of respiratory illnesses in the cold/wet season and of gastrointestinal illnesses in the hot/dry season (table 4). Infants exclusively breastfed for at least 4 months had a 15% lower risk of respiratory illnesses (table 4).

There were 207 cases of non-infectious morbidities, including injuries (45), anaemia (1), congenital disease (3), convulsions (6), neonatal jaundice (13), birth related morbidities (5), loss of appetite (52), malnutrition (43) and others (39). The incidence rate of non-infectious morbidities was 0.52 (IQR 0.43-0.64) per child-year and the incidence rate of injury-related illness was 0.12 (IQR 0.07-0.19) per child-year.

A total of 3370 hospital visits were made for 2525 episodes of illness and the most common diagnoses were acute respiratory infections (1593, 47.3%), diarrhoea (889, 26.4%), ear infections (309, 9.2%) and fever (165, 4.9%) (table 5). There were a total of 106 hospitalisations, a rate of 28 (IQR 22-35) per 100 child-years. Lower respiratory tract infections and diarrhoea accounted for the majority of admissions.

It seems that treatment was sought more frequently for boys (1388/2580 episodes, 53.8%) than for girls (1137/2257 episodes, 50.4%) (Wald test, $p = 0.12$). There was a slightly higher proportion of health care seeking for male children, even among educated mothers and households of higher socio-economic status (individual data not shown). Interestingly, despite more morbidity in boys, girls were hospitalised on more occasions (49, 2.5%) than boys (57, 1.9%).

There were four deaths. One girl child died in hospital due to a congenital cardiopulmonary disorder at 6 months. Three other deaths (two girls, one boy) were due to diarrhoea at 1, 4 and 7 months of age. Two deaths occurred at home, while the third happened at a traditional place of healing. Thus the infant mortality rate (95% CI) for this cohort was 19.9 (9.1 to 37.5) per 1000 live births, when the neonatal mortality rate of 9.9/1000 live births among the women identified for recruitment was included.

DISCUSSION

Data from a birth cohort of 452 children under intensive surveillance and provided with free and easy access to health care show a high disease burden, with children ill for at least 2 months of their infancy. These data are unique in incorporating morbidity data collected for a developing country birth cohort at all levels of health care.

These data have the limitations inherent in a community-based design, which have been partially addressed. Morbidity classifications were broad to allow field workers to collect data, but their data collection was validated by the 10% random revisits by the study supervisor or physician. Diagnoses for outpatient visits and hospitalisations were made by

the study physician and a paediatrician. In large cities, morbidity data can be significantly impacted by migratory populations with less access to health care, but the study area has limited migration. Since follow-up during the first 3 months was important, women who went to their mothers' homes after delivery were not recruited, but this was unlikely to have distorted the picture.

Infants experienced 12 episodes of mainly respiratory and gastrointestinal illness. A study conducted in the same town in 196510 showed a rate of 17 illnesses per child-year, suggesting a 35% decline in disease burden, with no change in respiratory illness but a decline in gastrointestinal illnesses from 5.6 to 3.6 episodes per child-year in Vellore.10

Direct comparison of findings between studies is difficult because of differences in study design, study populations, timing and measures of disease burden. Given these differences, our estimates were in the same range of morbidity estimates from less detailed studies in a Bangladeshi slum, urban Kerala and rural Tamil Nadu.11-13

The finding that peak illness in our cohort occurred in the 3-5-month age group, when infants should be protected by maternal antibodies, could possibly be attributed to rapid waning of maternal antibodies or because by that time half of the children had started complementary foods. Our data support the fact that exclusive breast feeding for 4 months is protective,14 but we were not able to study the effect of the WHO recommendation of 6 months of exclusive breast feeding since almost all children had started complementary foods by then. Birth weight in this population was similar to that from other reports from India, and we found no evidence of different morbidity patterns among low birth weight and normal birth weight children.15 16 Tamil Nadu has high vaccination rates,3 so as coverage was 100% in this study, the effect of vaccination could not be studied. The male preponderance17 and seasonality18 of illness have been observed in other studies. The incidence of respiratory illnesses was lower among children of mothers with higher education but was confounded by other factors. Beedi work was associated with respiratory illness and we hypothesise that this could be through increased inhalation of dust or tobacco enhancing fungal allergens.19 The mechanism for increased risk of diarrhoeal disease in beedi work households is less obvious but could be a proxy for lower socio-economic status.

Boys had significantly higher rates of illness than girls. It was seen that given an illness, health care was sought more frequently for boys but girls were more likely to require admission. An explanation for this might be earlier intervention in boys resulting in less severe disease and less requirement for hospitalisation. Socio-cultural factors are known to determine health seeking in India, apparently at all socio-economic levels.20 21 A recent study on infant mortality in India has shown a 1.3 times higher mortality in girls.22

Lower respiratory infections were the most common cause of hospitalisation, in accordance with findings elsewhere.23 24 The very high burden from respiratory illness suggests that prevention is a priority in developing countries.25 Prevention is possible with new, but expensive, vaccines.26 Gastroenteritis was the second most common cause of hospitalisation but resulted in three of four deaths, and in all three cases the parents chose not to access mainstream health care, despite multiple requests from the study staff.

Although physicians at the two hospitals continued their routine management practices and no child not requiring admission was hospitalised, the hospitalisation rate in our cohort (28/100 child-years) was much higher than previously reported hospitalisation rates among Indian urban slums (1/100 child-years).27 The higher hospitalisation may have contributed to the finding that the death rate in our cohort was less than 20 per 1000 child-years. This was approximately half that expected, suggesting that good access to care, promotion of

additional vaccination and community screening by health care workers could have a remarkable impact on child survival in this setting.

This study shows that although children in poor communities in developing countries have a high morbidity burden, intensive monitoring, timely treatment and referral systems as part of a research study reduced mortality, when compared to the period immediately preceding the study in the same setting,5 even though government-provided free health care was available before, during and after the study. This report provides comprehensive measures of morbidity rates, hospital visits, hospital admissions and mortality as estimates of disease burden, by incorporating hospital records into community-based surveillance data.

What is already known on this topic

- Disease specific mortality data are available in South Asia, but there are limited morbidity data.
- Cross-sectional studies reveal a high prevalence of respiratory and gastrointestinal infections in urban slums.

What this study adds

- Longitudinal data on morbidity show seven respiratory and four gastrointestinal illnesses per child per year.
- Risk factors for morbidity among infants are male sex, younger age (3-5 months) and beedi work in the household.

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Table 1

Baseline characteristics of the study households and infants in a birth cohort of 452 children in South India

Characteristics of households	Number (%)	Characteristics of mother and infants	Number (%)
Religion		Age of the mother, years	
Hindu	206 (46)	≥23	228 (50)
Christian	19 (4)	>23	224 (50)
Muslim	227 (50)		
Usual health care provider		Education of the mother	
Private practitioner	306 (68)	None	139 (31)
Government hospital	106 (23)	Primary/middle school	232 (51)
Medical shop	39 (9)	Higher secondary/college	81 (18)
Traditional practitioner	1 (0)		
Type of family		Mode of delivery	
Joint	94 (21)	Normal vaginal	414 (92)
Extended	124 (27)	Caesarean	28 (6)
Nuclear	234 (52)	Instrumental	10 (2)
Members in household (n)		Sex of study child	
≤5	300 (66)	Male	227 (50)
>5	152 (34)	Female	225 (49)
Socio-economic status		Birth weight (kg)	
Class I	281 (62)	Missing	11 (2)
Class II	171 (38)	Low: ≤2.49	51 (12)
		Normal: ≥2.5	390 (86)
Household does beedi work		Place of birth	
Yes	206 (46)	Hospital	441 (98)
No	246 (54)	Home	11 (2)
Animals present in house		Number of siblings	
Yes	59 (13)	0	139 (31)
No	393 (87)	≥1	313 (69)

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Table 2

Summary of all morbidities during the first year of life among a birth cohort of 452 infants in South India

	Gastrointestinal illnesses	Respiratory illnesses, including lower respiratory infections	Other infections	Undifferentiated fever	Non-infectious morbidity	Overall morbidity
Total no. of sick child-years	15.2	68.3	15.0	2.1	3.3	96.7
No. of episodes (% of total episodes)	1345 (27.8%)	2442 (50.5%)	634 (13.1%)	210 (4.3%)	207 (4.3%)	4837 (100%)
Rate of episodes/child-year (95% CI)	3.6 (3.3 to 3.9)	7.4 (6.9 to 7.9)	1.7 (1.5 to 1.9)	0.5 (0.5 to 0.6)	0.5 (0.4 to 0.6)	12.0 (11.3 to 12.6)
Median (IQR) no. of episodes/child/year*	3 (1-5)	6 (3-8)	1 (0-2)	0 (0-1)	0 (0-1)	12 (7-16)
Median (IQR) duration per episode in days*	3 (2-5)	6 (4-12)	5 (3-10)	3 (2-4)	4 (3-7)	5 (3-9)

* n = 391 children completed 1 year of follow-up. IQR, interquartile range.

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Table 3

Factors associated with episodes of overall morbidity in univariate and multivariate analyses of longitudinal data from 452 infants in South India

			Rate ratio (95% CI)	
	Number of episodes	**Rate (95% CI)**	**Univariate**	**Multivariate**
Age in months				
0-2	1239	11.9 (11.1 to 12.8)	1	1
3-5	1337	12.9 (12.1 to 13.9)	1.1 (1.0 to 1.8)	1.1 (1.0 to 1.7), p = 0.05
6-8	1189	11.8 (11.0 to 12.7)	1.0 (0.9 to 1.1)	1.0 (0.9 to 1.1), p = 0.80
9-11	1072	11.1 (10.3 to 12.0)	0.94 (0.86 to 1.02)	0.9 (0.9 to 1.0), p = 0.14
Season				
Hot/dry (Mar-Aug)	1869	11.0 (10.4 to 11.8)	1	1
Cold/wet (Sept-Feb)	2968	12.6 (11.9 to 13.4)	1.1 (1.1 to 1.2)	1.1 (1.1 to 1.2), p<0.001
Gender				
Male	2580	14.4 (12.2 to 17.0)	1	1
Female	2257	12.7 (11.8 to 13.7)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0), p = 0.02
Beedi work				
No	2416	10.9 (10.1 to 11.7)	1	1
Yes	2421	13.3 (12.3 to 14.3)	1.2 (1.1 to 1.4)	1.2 (1.1 to 1.4), p<0.001
Mother's education *				
None	1557	13.0 (11.8 to 14.2)	1	
Primary/middle school	2502	11.8 (11.0 to 12.7)	0.9 (0.8 to 1.0)	-
Higher school/college	778	10.6 (9.4 to 12.1)	0.8 (0.7 to 1.0)	-

Variables with p>0.1 in univariate analyses were: birth weight, number of siblings, duration of exclusive breast feeding, socio-economic status, household size, age of the mother, religion, presence of a sibling aged <5 years, type of family and presence of an animal in the house.

* p>0.05 in multivariate analysis.

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Table 4

Factors associated with gastrointestinal and respiratory illnesses in univariate and multivariate analyses in 452 infants in South India

Variable	Number of contributing children (%)	Episodes (n)	Rate (95% CI)	Univariate rate ratio (95% CI)	Multivariate rate ratio (95% CI)
Gastrointestinal illnesses					
Age (months)					
0-2	452 (100)	366	3.7 (3.3 to 4.2)	1	1
3-5	420 (93)	402	4.2 (3.8 to 4.7)	1.1 (1.0 to 1.3)	1.1 (1.0 to 1.3), p = 0.09
6-8	403 (89)	315	3.3 (2.9 to 3.8)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0), p = 0.14
9-11	398 (88)	262	2.9 (2.5 to 3.3)	0.8 (0.7 to 0.9)	0.8 (0.7 to 0.9), p = 0.001
Season					
Hot/dry	439 (97)	610	3.9 (3.5 to 4.3)	1	1
Cold/wet	437 (97)	735	3.3 (3.0 to 3.7)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0), p = 0.004
Duration of exclusive breast feeding *					
Censored †	37 (8)	18	3.0 (1.8 to 5.0)		-
≤4 months	319 (71)	309	3.6 (3.3 to 3.9)	1	-
>4 months	96 (21)	1019	3.5 (3.0 to 4.2)	1.0 (0.8 to 1.2)	-
Gender					
Male	227 (50)	737	4.7 (3.6 to 6.0)	1	1
Female	225 (50)	608	3.9 (3.5 to 4.3)	0.8 (0.7 to 1.0)	0.8 (0.7 to 1.0), p = 0.02
Mother's education *					
None	139 (31)	453	4.0 (3.5 to 4.6)	1	-
Primary/middle school	232 (51)	680	3.4 (3.1 to 3.8)	0.9 (0.7 to 1.0)	-
High school/college	81 (18)	212	3.1 (2.5 to 3.7)	0.8 (0.6 to 0.8)	-
Beedi work					
No	246 (55)	661	3.2 (2.8 to 3.5)	1	1
Yes	206 (45)	684	4.0 (3.6 to 4.5)	1.3 (1.1 to 1.5)	1.3 (1.1 to 1.5), p = 0.003
Respiratory illnesses					
Age					
0-2					
3-5	415 (100)	585	69 (6.3 to 7.7)	1	1
6-8	414 (100)	685	8.3 (7.5 to 9.1)	1.2 (1.1 to 1.3)	1.2 (1.1 to 1.3), p = 0.006

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Variable	Number of contributing children (%)	Episodes (n)	Rate (95% CI)	Univariate rate ratio (95% CI)	Multivariate rate ratio (95% CI)
9-11	403 (97)	623	7.8 (7.1 to 8.6)	1.1 (1.0 to 1.3)	1.1 (1.0 to 1.2), p = 0.07
Season	398 (96)	525	6.9 (6.2 to 7.7)	1.0 (0.9 to 1.1)	1.0 (0.9 to 1.1), p = 0.9
Hot/dry	413 (100)	805	5.7 (5.2 to 6.2)	1	1
Cold/wet	414 (100)	1613	8.9 (8.3 to 9.6)	1.6 (1.4 to 1.7)	1.6 (1.4 to 1.7), p<0.001
Duration of exclusive breast feeding *					
Censored †	37 (8)	24	4.1 (2.6 to 6.5)		
≤4 months	319 (71)	1908	7.8 (7.2 to 8.4)	1	
>4 months	96 (21)	509	6.6 (5.7 to 7.7)	0.9 (0.7 to 1.0)	0.8 (0.7 to 1.0), p = 0.04
Gender					
Male	207 (50)	1272	9.1 (7.3 to 11.3)	1	1
Female	208 (50)	1146	8.0 (7.2 to 8.8)	0.9 (0.8 to 1.0)	0.9 (0.8 to 1.0), p = 0.056
Mother's education *					
None	127 (31)	742	7.8 (6.9 to 8.9)	1	-
Primary/middle school	213 (51)	1282	7.6 (6.9 to 8.4)	1.0 (0.8 to 1.1)	-
High school/college	75 (18)	394	6.6 (5.6 to 7.7)	0.8 (0.7 to 1.0)	-
Beedi work					
No	228 (55)	1214	6.7 (6.1 to 7.4)	1	1
Yes	187 (45)	1204	8.5 (7.6 to 9.4)	1.3 (1.1 to 1.4)	1.3 (1.1 to 1.5), p = 0.001

Variables with p>0.1 for univariate analyses: (i) for gastrointestinal illnesses: birth weight, number of siblings, duration of exclusive breast feeding, socio-economic status, household size, religion, type of family and presence of animals in the house; (ii) for respiratory illnesses: birth weight, number of siblings, socio-economic status, household size, religion, type of family and presence of animals in the house.

Duration of any breast feeding was not used as a variable as 71% of children were being breastfed at the end of 12 months of follow-up.

* p>0.05 in multivariate analysis

† 37 infants not included in analysis as they were being exclusively breastfed at loss to follow-up (n = 31) and missing data (n = 6).

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Table 5

Rates and causes of outpatient visits and hospital admissions during infancy for 452 infants in South India

Diagnosis	No. of outpatient visits†	No. of admissions to hospital†	Hospitalisation rate per 100 child-years (95% CI)	Median (IQR) days stay in hospital
Acute respiratory illnesses	1593	11	2.9 (1.5 to 5.4)	3 (2-4)
Acute asthma/bronchiolitis*	92	15	3.9 (2.2 to 6.9)	4 (2-5.5)
Lower respiratory infections*	110	28	7.1 (4.2 to 12.0)	4 (3-6)
Diarrhoea	889	22	5.8 (3.8 to 8.8)	4 (2-6)
Skin infections	44	-	-	-
Eye infections	14	-	-	-
Injury/burns/bites	15	-	-	-
Ear discharge/ASOM*	309	4	1.0 (0.3 to 35.6)	2.5 (1.5-4)
Fever	165	2	0.5 (0.1 to 2.1)	2 (1-3)
CNS infections*	4	2	0.5 (0.1 to 2.1)	10.5 (6-15)
Convulsions due to non-infectious causes*	7	1	0.3 (0.04 to 1.9)	1 (1-1)
Neonatal conditions‡	-	13	3.5 (1.9 to 6.2)	4 (3-5)
Congenital anomalies*§	4	3	0.7 (0.04 to 12.0)	7 (5.5-11.5)
Anaemia/malnutrition*	92	2	0.5 (0.1 to 2.1)	7 (7-7)
Others*	32	2	0.5 (0.1 to 2.1)	2 (1-2)
Total	3370¶	106	28 (22 to 35)	4 (3-6)

*Physician confirmed diagnoses.

†Visits made to hospitals/clinics (government hospital, urban health centre, Christian Medical College, Community Health Department, study clinic and private physicians) for treatment, not requiring admission.

‡Neonatal conditions include asphyxia, neonatal sepsis and neonatal jaundice.

§Congenital conditions include meningocoele, Pierre-Robins syndrome and congenital cardiopulmonary disorder.

¶Includes follow-up visits per episode.