International Journal of Contemporary Pediatrics
Pradhan P et al. Int J Contemp Pediatr. 2021 May;8(5):823-829
http://www.ijpediatrics.com
pISSN 2349-3283 | eISSN 2349-3291

DOI: https://dx.doi.org/10.18203/2349-3291.ijcp20211670

Original Research Article

Febrile infants in the emergency department of a public hospital in India: respiratory infections lead the pack

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Received: 13 February 2021
Revised: 25 March 2021
Accepted: 31 March 2021

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ABSTRACT

Background: The objective of study was to find the etiology, signs and symptoms of fever of 4-7 days in the age group of 91 days 2 years and their outcome following treatment in a tertiary care hospital.
Methods: This was a prospective study conducted at the Emergency Department (ED) of a public hospital in New Delhi between April, 2018 and January, 2019. 150 children aged 3 months to 2 years with 4-7 days of fever were included. Demographic, clinical and diagnostic data were collected, and children were managed using ACEE-INDIA guidelines, telephonic follow-up was done for those discharged from ED.
Results: Out of 150 children, respiratory tract infections were most common etiological group (64%), followed by gastrointestinal infections (16.7%) and CNS infections (9.3%). Fever with cough (with respiratory distress-27.3%) was the most common symptom in these children. Overall, 61% were admitted; majority (58%) being with respiratory problems. Median (IQR) duration of stay in admitted children was 2 (0, 3) days. Mortality was observed in 12 (8%) children. Mortality was 4 times higher in children with CNS infections as compared to other conditions [RR=4.14 (1.4 to 12.4); P=0.01].
Conclusions: Fever in the ED among Indian infants at a public hospital was mainly due to respiratory infection, which could be managed on outpatient-basis in the majority using the ACEE-INDIA (Academic College of Emergency Experts in India) guidelines. However, among those admitted, neurological conditions were the most common cause of death.

Keywords: Etiology, Mortality, Outcome, Symptoms

INTRODUCTION

Childhood fever is a common reason for hospital visits in children, and are reported to be responsible for 15-25% visits in primary care, and also presentations to the emergency departments (ED).[1-4] Most children are evaluated for at least one febrile illness before they complete three years.[5]

Children 3-24 months of age with fever, commonly have viral infections and may occasionally have an unidentified severe bacterial infection, without presenting with specific localizing signs.[2] Their poor ability to convey their symptoms verbally, further hinders an accurate diagnosis and management in the ED. Otherwise also, chances of a febrile illness in the pre-school age-group is higher than that in older children, although the evaluation required is less comprehensive than that in neonates and young infants (upto 90 days).[6]

Most fever guidelines also differentiate the approach to fever based on age, usually neonatal (upto 90 days),

infants (upto 2 or 3 years) and older children. In India the clinico-etiological profile of fever in the ED has been well reported for adults, but not much information for pediatric patients is available. ACEE-INDIA recently gave guidelines on the evaluation of fever in the pediatric ED.[7] We studied febrile infants, aged 3 months 2 years presenting to ED and managed with ACEE-INDIA guidelines.

METHODS

This cross-sectional study was conducted from April, 2018 to December, 2018 at the pediatric ED of Lok Nayak Hospital, New Delhi, after taking clearance from the Institutional Ethics Committee. Febrile children aged 3 months to 2 year, with fever of at least 4 days were considered for enrolment. A febrile child was defined as one with history of fever ≥38˚C recorded at least once at home in previous 24 hours. Those suffering for fever for >7 days, children with any underlying heart disease, and children with any diagnosed immunodeficiency disorder or any condition that predispose to recurrent infections (like type 1 diabetes, vesico-ureteric reflux) were excluded. Consecutive children were enrolled on one pre-fixed day every week.

After taking written informed consent from parents, enrolled children were evaluated clinically and initial management provided. Subsequently, based on history, and clinical and laboratory information they were managed, as inpatient (admission group) or outpatient (outpatient group) as per ACEE-INDIA guidelines. To ensure adequate representation of inpatients and outpatients, we decided a priority to enrolled only first three eligible patients of the outpatient group and all patients of the admitted group.

For all enrolled children, demographic details, contact information and details of education and income of parents were collected. History was taken regarding highest temperature recorded at home and any associated symptoms, treatment taken if any before presentation, relevant history of co-morbidities, immunization and feeding history. Socioeconomic status was assessed using the modified Kuppuswamy scale.[8] All the data were recorded in a structured pre-tested proforma. Rectal temperature was taken at presentation for all enrolled children, though at home either axillary or oral temperature was taken.

Weight, height and head circumference of all included children was recorded. Z-scores were calculated for the anthropometric parameters using Anthrocalc software. General appearance of the baby was assessed as toxic-looking or well-appearing. Toxic appearing infants were those who were pale or cyanotic, lethargic or inconsolably irritable, or with tachycardia, tachypnea or poor capillary filling time.[9] For admitted patients, 6-hourly temperature was recorded till discharge, and for outpatient group, parents were trained to measure axillary temperature and were requested to record it 6-hourly and maintain a diary. The clinical diagnoses were made and management carried out according to the departmental protocols guided by standard management guidelines.[10] Children who were admitted, were followed up till the time of leaving the hospital as discharged, death or leaving against medical advice (LAMA) and treatment were decided by the treating physicians. For children who were sent home from ED after initial management, advice regarding home-based management was provided and drugs dispensed from the hospital. They were followed up after 72 (±8) hours either in the outpatient department or telephonically.

Statistical analysis

Mean (SD) or median (IQR) were calculated for the baseline characteristics of the study population. Comparisons were done between the inpatient and outpatient group with respect to various patient and disease characteristics; sub-group analysis were done for immunization status and admission status, and mortality in different etiological groups. Proportions of outpatients requiring repeat consultation or admission was calculated. We used Epi Info (CDC, USA) for all calculations.

RESULTS

Table 1: Baseline characteristics of the study population (n=150).

Characteristics	Admission group	Outpatient group
Median age	12(15) months	12(11) months
No. of boys	55 (59.8%)	38 (65.5%)
Median Z-score of weight	-2.34 (1.74)	-1.76 (-1.54)
Median Z-score of height	-1.83 (-2.6)	-1.09 (-2.7)
Median Z-score of HC	-1.72 (-1.84)	-1.55 (-1.5)
Immunization status		
Partially immunized	12 (13%)	1 (1.7%)
Fully immunized	57 (62%)	49 (84.4%)
Not known	23 (25%)	8 (13.8%)
SES*		
Upper middle SES	12 (13%)	5 (8.6%)
Lower middle SES	39 (42.4%)	23 (39.7%)
Upper lower SES	41 (44.6%)	28 (48.3%)
Lower SES	0	2 (3.4%)
Maternal education		
Illiterate	26 (28.3%)	8 (13.8)
Primary school	12 (13%)	13 (22.4%)
Secondary school	51 (55.4%)	28 (48.3)
Graduate	3 (3.3%)	9 (15.5%)

#Median (IQR); HC- head circumference; *As per modified Kuppuswamy socioeconomic status scale for year 2018.

Table 2: Distribution of presenting complaints in the study population (N=150).

Presenting symptoms*	Admission group (*n*=92), No. (%)	Outpatient group (*n*=58), No. (%)	Total
Respiratory complaints	56 (60.9)	37 (63.8)	93 (62)
Cough/coryza	55 (59.8)	32 (55.1)	87 (58)
Respiratory Distress (with or without cough)	35 (38)	6 (10.3)	41 (27.3)
Gastrointestinal symptoms	23 (25)	14 (24.1)	37 (24.7)
Loose stools/ vomiting	18 (19.6)	13 (22.4)	31 (20.6)
Abdominal distension	5 (5.4)	1 (1.7)	6 (4)
Pain abdomen	2 (2.2)	0	2 (1.3)
Blood in stools	1 (1.1)	2 (3.4)	3 (2)
Jaundice	1 (1.1)	0	1 (0.7)
Neurological symptoms	25 (27.2)	2 (3.4)	27 (18)
Altered sensorium	14 (15.2)	0	14 (9.3)
Seizures	15 (16.3)	2 (3.4)	17 (11.3)
Others			
Decreased oral acceptance	11 (12)	7 (12)	18 (12)
Pallor	6 (6.5)	0	6 (4)
Swelling of the limb/body	5 (5.4)	1 (1.7)	6 (4)
Rash	5 (5.4)	1 (1.7)	6 (4)
Decreased movement of limb	4 (4.34)	0	4 (2.7)
Decreased urine output	2 (2.2)	0	2 (1.3)
Oral ulcers	1 (1.1)	0	(0.7)
Skin lesion	1 (1.1)	2 (3.4)	3 (2)
Ear discharge	1 (1.1)	0	1 (0.7)

*Many patients had more than one complaint, 3children had no other complaint except fever.

A total of 150 children (38% girls) were enrolled, 92 of which were admitted. The mean (SD) age of the study population was 13.15 (7.03) months. Majority of children (65, 43.3%) belonged to the age group of 7-12 months. There was no statistically significant difference between the two study groups with respect to either the age (P=0.88) or gender (P=0.49). The median Z-scores for all anthropometric variables (weight, length and head circumference) were >-3. Majority (88%) of children belonged to the lower middle (III) and upper lower (IV) socioeconomic classes, and 70% of children were completely immunized. Majority of mothers (75%) had at least secondary school education, though 24% mothers were illiterate. Majority (72%) of parents had measured the child's temperature at home just prior to coming to ED; whereas only 100 children (67.3%) had fever documented in the ED. Other details of temperature measurement have previously been published.11 Only 26% of children came to the ED directly, rest (111, 74%), had taken prior treatment at another centre for the current illness. Baseline characteristics of study population are shown in Table 1.

Table 3: Etiology of fever in admitted children (N=92).

Diagnosis	No. (%)
Respiratory causes	**53 (57.6)**
Pneumonia	25 (27.1)
Pleural effusion	2 (2.2)
Empyema	4 (4.3)
Pneumothorax	6 (6.5)
Bronchiolitis/WALRI	8 (8.7)
FB in airway	1 (1.1)
Tonsillitis*	1 (1.1)
URI#	5 (5.4)
ASOM	1 (1.1)
CNS causes	**14 (15.2)**
Meningoencephalitis	6 (6.5)
Meningitis	6 (6.5)
Tubercular meningitis	2 (2.2)
GIT causes	**14 (15.2)**
AGE	8 (8.7)
Dysentry	1 (1.1)
Hepatitis	1 (1.1)
Liver abscess	1 (1.1)
Septic ileus	3 (3.3)
Urinary tract infection	**3 (3.3)**
Musckuloskeletal and soft tissue	**5 (5.4)**
Thigh abscess	1 (1.1)
Pyoderma$	2 (2.2)
Cellulitis	2 (2.2)
Others	**24 (25)**
Malaria	5 (5.4)
Enteric fever	2 (2.2)
Dengue	1 (1.1)
Measles	2 (2.2)
Herpes labialis	1 (1.1)
Osteomyelitis	1 (1.1)
Viral myositis	1 (1.1)
Viral myocarditis	1 (1.1)
Hematological malignancy±	1 (1.1)
Sepsis	8 (8.7)

*Tonsillitis-admitted due to decreased oral acceptance with apprehensive parents; #upper respiratory infection; asom acute suppurative otitis media-admitted as had associated pneumonia, $ multiple pyoderma, admitted for detailed work-up and IV antibiotics, ±suspected.

Along with fever, the most common presenting complaint was respiratory (62%) followed by gastrointestinal symptoms (around 25%) in both the groups and CNS symptoms (altered sensorium and seizures) in 18%. Only 5% of children did not have any focus of fever. Around half (58%) of children requiring admission were ill-appearing at presentation and most (81%) of the children sent back home from ED were well-appearing. Anemia was detected in 42.7%, leukocytosis (21%) was slightly more common than leukopenia (17%). Though jaundice was the complaint in one child only, but deranged LFTs were present in 19% of children. Blood culture was positive only in one child (empyema). The distribution of various symptoms is shown in Table 2.

Table 4: Etiology of fever in Outpatient group (N=58).

Diagnosis	No. (%)
Respiratory causes	**43 (74.1)**
Upper respiratory tract infection	19 (32.8)
Tonsillitis	8 (13.8)
Acute suppurative otitis media	1 (1.7)
WALRI/bronchiolitis	6 (10.3)
Pneumonia	9 (15.5)
Gastrointestinal causes	**11 (19)**
Acute gastroenteritis	9 (15.5)
Dysentry	2 (3.4)
Skin and soft tissue infections	**3 (5.2)**
Pyoderma	2 (3.4)
Cellulitis	1 (1.7)
Others	**5 (8.6)**
Malaria	3 (5.2)
Measles	1 (1.7)
Enteric fever	1 (1.7)

Table 5: Outcome after 72±8 hours in children discharged from ED (N=58).

Outcome*	No. (%)
Asymptomatic	46 (79.3)
Symptomatic	12[#] (20.7)
Still febrile	6 (50)
Same treatment continued	4 (66.6)
New treatment advised	2 (33.3)
Afebrile, with other symptoms	6 (50)
Same treatment continued	4 (66.6)
New treatment advised	2 (33.3)

*Follow-up done telephonically in 43%, #all patients did follow-up in person.

More than half of the children (57.6%) in the admission group (Table 3) and majority (33%) in referral group (Table 4), had a diagnosis related to respiratory system as the cause of fever, out of which 35% had a diagnosis of pneumonia. Next common etiology was CNS and GIT causes (both 14%) in admission group. Fever resolved in admitted children within median (IQR) of 2 (0,3) days. For majority (42%) of children fever subsided within 3 days of admission. The median (IQR) of duration of stay of children in hospital was 5 (3, 11.75) days. Majority of children (63%) got discharged within a week, and nearly 90% within two weeks. Of the 92 admitted children, 80% improved and were discharged, and 12 (13.1%) died (remaining left against medical advice) (Figure 1).

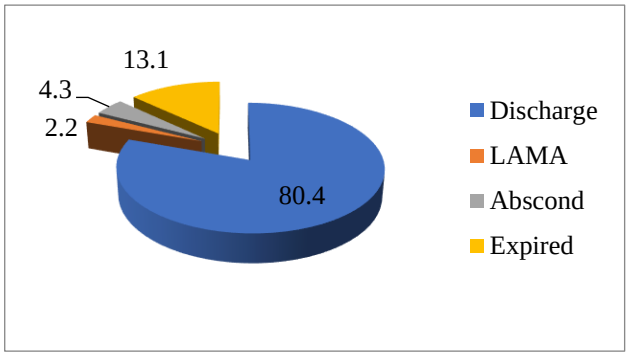

Figure 1: Outcome of the admission group.

Out of the 12 who died, four had pneumonia, three had meningoencephalitis, two had staphylococcal sepsis, and one each had pneumothorax, meningitis and tubercular meningitis. In the outpatient group, 12 were symptomatic at 72 hours of follow up (Table 5).

DISCUSSION

We studied 150 children aged 3months-24months presenting to a public hospital ED with fever of 4-7 days. Of these 92 were admitted and rest were sent home after management advice. Mortality in this study was 8%, all in the admission group, with only 12 of the 58 outpatient group children (20.7%) having persistent complaint 72 hours after presentation.

The mean Z-scores were significantly lower in the admitted group (P=0.02). This could have been due to the nine children with SAM admitted during the study period. Another reason for the low weights in the admitted group could be the well-described propensity of underweight children to be more susceptible to infections.[12] A previous Indian study on under five febrile children had only 20% of children below -2 Z-score, but the study was a community based one.[13] Another study done in acutely-ill patients coming to ED in Nigeria, again showed a large proportion (32.8%) children to be underweight.[14]

Among the study participants, 70% of the children were immunized as compared to the 62% in NFHS data 2015-16.[15] In a previous study from Telangana,[13] immunization rates were much higher at 96%; it was 78.7% in a recent hospital-based study in Chennai.[16] It could be because age-group included was much broader than the present study or due to true differences in immunization rates between those regions and our catchment area. The odds of an unimmunized child to get admitted was more than 3-times higher than an immunized child [OR (95% CI):

3.35 (1.46-7.64); P=0.004]. Maternal education showed a significant relation with the immunization status of the child (P=0.001), which is in contrast to previous studies on the topic from India and other countries.[17-20] Out of the 24% mothers who were illiterate, 54% did not get their child immunized, while 75% of mother having education of secondary school or more got their child fully immunized.

In our study, nearly three-fourth children had received some form of treatment before presenting to ED, either local practitioner or self-medication by parents, supporting reports by other researchers.[13,21,22] Naaraayan, et al. in Chennai showed 32% of parents self-medicate their children with either fever alone or fever with cough, cold being the most common complaint for which self-medication is done.[22] Similarly, a pediatric study from Yemen reported self-medication in 21.3% of children in 3-12 months of age, and 90% in 1-5 years old.[23] Similar trend was seen in adult studies done in India, where the common cause of self-medication was fever.[24]

The commonest complaints in our study were those localized to the respiratory system (62%). This is comparable with the majority of the older studies and studies done more recently, which show respiratory complaints or breathing difficulty was the most common cause of pediatric emergency visit.[25-29] Similarly, Singhi, et al. found cough and respiratory difficulty as the common causes (35%) after fever for presentation to the ED, while Devarajulu and Velusamy reported respiratory complaints to be the second most common enteric fever was most common diagnosis, possibly because the children enrolled were of older age-group and the duration of fever was longer (1-3 weeks).[16,30]

Most common cause of fever in our study were respiratory illnesses (64%), followed by gastrointestinal infections (16.7%) and CNS infections (9.3%). Similar results were seen in various studies done in the Western world on febrile children presenting to the ED which showed pneumonia (43.7%) as most common cause of fever in <13 years old febrile children, and others being diarrhoea (17.3%) and cellulitis/adenitis (13%).[30-32]

Finkelstein, et al. reported similar findings in 3-36 months old infants in the US.[5] Studies done in Indian children also showed respiratory and the gastrointestinal illnesses as the most common diagnosis in febrile children.[30,33,34] A recent study from Chennai showed enteric fever to be slightly more common than respiratory infections, possibly because it was done in children with 1-3 weeks fever.[16]

In our study, the mortality was 8%, most commonly due to CNS infections (41.6%) or pneumonia (33%). Odds of mortality was 4 times higher in inpatient children with CNS infections as compared to other conditions [RR=4.14 (1.4 to 12.4); P=0.01]. In study done by Jofiro, et al. to look for mortality in pediatric ED, most common cause of death was found to be pneumonia (17.8%), followed by sepsis and meningitis.[35]

Two studies from PGI, Chandigarh have reported on mortality in pediatric ED.[30,36] Although, the 1-year study showed respiratory distress as the most common complaint in febrile children who died, but the 5-year study showed CNS infections (21%) to be the commoner cause than pneumonia (18%). Similar results were found in study done by Singh, et al. in Lucknow, which showed a mortality of 3.2%, with CNS involvement being most common.[33]

The higher mortality in our study as compared to both these studies might be due to the difference in age group (<2 years in our study vs children till 13 years in other studies). Another reason could be the non-inclusion of all the outpatients in the enrolled group, which could have reduced the proportion. A similarly high mortality (12.2%) was seen in a study done previously in Madras Medical College, although they had also included neonates.[27]

In the children who were being followed on outpatient basis, 12 (20.7%) were still symptomatic at the follow-up done three days later. Similar persistence of fever was seen in study done at a PHC in Zanzibar, Tanzania where 11% children were febrile at follow-up on day 4.[37] In study by Mistry, et al. to determine the outcome of pediatric ED febrile illness, only 6.6% children were febrile at follow-up and re-consultation was seen in 10.5% children in study by de Bont, et al.[28,1] This difference is due to the fact that they did follow-up after 7 days while in our study it was done at just 72 hours.

Even though this was a descriptive study, the study results have important implications for practice and research. Our findings also suggest that majority of children <24 months presenting with short-duration fever will usually have an evident focus of infection, which can be determined on history and examination. Researchers need to address the research gaps identified here, including the lack of information on etiology and outcome of pediatric fever in different age groups in our country. Given that fever is a common cause of ED visits in young children, the lack of any guidelines for fever evaluation and management needs attention of policy makers and professional bodies.

In this study we did not include all children treated as outpatients, as the numbers were very high as compared to inpatients.

This may affect the generalizability of the study findings. However, we did plan a priori to enrol the first three ED patients on each day, so as to avoid bias.

Due to the non-availability of investigational facilities for most viral diseases, and issues related to collection, storage and transport of bacterial culture samples,

etiology of many conditions were not firmly established. Similarly, for children managed on outpatient basis, no investigations were carried out for majority except for those required for initial stabilization or diagnosis. We had decided on telephonic feedback of outpatients, which is known to have sub-optimal reliability, but we felt it was unethical to call parents to hospital, if fever had subsided.

CONCLUSION

This descriptive hospital-based study found respiratory conditions as the commonest reason for presentation to the emergency department (ED) and also, for admission to the hospital. Children requiring admission were more likely to be underweight and incompletely immunized as compared to those discharged home from the ED. Mortality was high in inpatients, most commonly due to neurological diseases. Majority of outpatients managed as per ACEE-INDIA guidelines had resolution of fever within 3 days. Absence of epidemiological data on childhood fever has previously been recognized as a research gap, and this study adds to the data on the same. Large multi-centric studies are needed to provide nationally-representative data on this important problem in the pediatric ED, so that guidelines for fever management in the Indian ED can be developed.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Departmental Research Committee and the Institutional Ethics committee (No. F No. 17/IEC/MAMC/2017/Peads/07 Dated October 10'2017).

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Cite this article as: Pradhan P, Mishra D, Juneja M, Kumar S. Febrile infants in the emergency department of a public hospital in India: respiratory infections lead the pack. Int J Contemp Pediatr 2021;8:823-9.