

Determinants of Outcome in Febrile Children Admitted into the Emergency Rooms of Two Tertiary Hospitals in Enugu Southeast Nigeria

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Abstract

Introduction: Febrile illnesses have continued to be the highest causes of mortalities in children admitted to the children emergency rooms in Nigeria. This study was carried out to review the determinants of outcome in children admitted for febrile illness into the emergency rooms of two tertiary institutions in Enugu, Nigeria. **Materials and Methods:** This was a retrospective study of 335 children who presented with fever to the emergency rooms over one year (January–December 2018). Their case records were retrieved, and the necessary information was obtained using a structured questionnaire. Statistical analysis included odds ratio and Chi-square test. **Results:** The mean age of the children was 43.20 ± 50.30 months. The mean temperature at presentation was $38.2^\circ\text{C} \pm 0.9^\circ\text{C}$. Fever of 39.0°C or above at presentation and fever duration of >2 days were significantly associated with fatal outcome. Children residing in rural areas or referred from other health facilities were more likely to die. The risk of dying from fever was highest when it was associated with diarrhea, weakness, pallor, convulsions, unconsciousness, and difficult/fast breathing. **Conclusion:** Most of the factors responsible for mortality in febrile children are largely preventable and treatable when the presentation is early.

Keywords: Determinants, emergency room, febrile children, Nigeria, outcome

INTRODUCTION

Fever is one of the most common presenting features of illness in pediatric practice, especially in children under the age of five years. In both developed and developing countries, febrile illnesses are probably the most common reason for presentation to the pediatric emergency department.^[1-3]

Fever is an elevation of body temperature above normal and is an adaptive response by the body. Fever can be beneficial because it retards the growth and reproduction of infective organisms in the body, enhances neutrophil production and T-lymphocyte proliferation, and also aids in the acute-phase reaction.^[4,5] The degree of fever may not always correlate with the severity of illness, and in some cases, severely ill children may present with hypothermia rather than fever.^[4]

Fever in children is associated with a high level of anxiety among caregivers who often resort to the use of antipyretic and other medications, often at inappropriate doses prior to

presentation at the health facilities.^[6,7] This anxiety has also led to the use of the term “fever phobia” by some researchers.^[6,7]

Most febrile illnesses are a result of infectious diseases, of which malaria accounts for over 50% in our environment.^[8] Febrile illnesses such as malaria, sepsis, meningitis, pneumonia, and acute gastroenteritis are the highest causes of mortalities in children admitted to the emergency rooms of Nigerian hospitals.^[2,3,9,10] This pattern of mortality seems to have remained constant over the years despite the progress made in technology and workforce in dealing with these diseases.^[2,11]

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How to cite this article: Igbokwe OO, Iloh ON, Edelu BO, Nduagubam OC, Ndu IK. Determinants of outcome in febrile children admitted into the emergency rooms of two tertiary hospitals in Enugu, Southeast Nigeria. *Niger J Med* 2020;29:486-90.

Submitted: 09-Jun-2020

Revised: 24-Jun-2020

Accepted: 11-Jul-2020

Published: 18-Sep-2020

Access this article online

Quick Response Code:



Website:
www.njmonline.org

DOI:
10.4103/NJM.NJM_101_20

This study was conducted to determine the factors that influence the outcome in children admitted for febrile illnesses in the two tertiary institutions in Enugu, Southeast Nigeria.

MATERIALS AND METHODS

This retrospective study was carried out over a 12-month period (January–December 2018), during which case records of febrile children who presented to the children emergency rooms of the two tertiary hospitals in Enugu (Enugu State University Teaching Hospital and the University of Nigeria Teaching Hospital [UNTH]), Southeast Nigeria, were obtained. Both the hospitals receive cases from all over the state as well as nearby communities in the neighboring states. Ethical approval was obtained from the UNTH's research and ethics committee prior to commencement of the study.

The admission register was used to identify all the children who presented with fever within the period of study. Their case records were retrieved, and the necessary information was obtained using a structured questionnaire. The information included biodata, presenting symptoms, relevant history, examination findings, results of laboratory investigations conducted, diagnoses, and outcomes (discharged, transferred, or died). The inclusion criteria were all children admitted for at least 24 h with fever as a presenting complaint, either alone or with other symptoms. Those with incomplete case records were excluded from the analysis. Data were entered and analyzed using the Statistical Package for Social Sciences (SPSS) version 20 (Chicago, IL, USA). The analysis was mainly descriptive. Continuous variables were expressed as mean \pm standard deviation. The relationship between variables was tested for significance using Pearson's Chi-square or Fisher's exact test. $P < 0.05$ was regarded as significant (two-tailed test). The association between variables (such as age, residence, height, and duration of fever, associated clinical features and prior treatment) and outcome was measured using the odds ratio. The results were presented as percentages and proportions in forms of prose and tables.

RESULTS

A total of 1405 children presented to the two emergency rooms within the period of study, of which 982 (69.9%) were admitted. Of the admitted cases, a total of 335 cases fulfilled the inclusion criteria. There were 197 males, with a male-to-female ratio of 1.4:1. Their ages ranged from 1 month to 205 months (17 years), with a mean age of 43.20 ± 50.30 months and a median age of 19 months. A total of 253 (75.5%) children were under the age of 60 months (5 years). Most of the study subjects (224) resided in urban and semi-urban areas, while the others (111) resided in rural areas. The age and sex distributions are as shown in Table 1.

Fever duration prior to presentation ranged from a few hours to 21 days, with a mean of 3.95 ± 3.54 days. Fever duration of >2 days prior to presentation was significantly associated with death ($P = 0.03$ $\chi^2 = 4.57$).

Table 1: Age and sex distribution of the patients

Variable	n (%)
Age	
<12	95 (28.4)
12-23	79 (23.6)
24-35	32 (9.6)
36-47	31 (9.3)
48-59	16 (4.8)
60-119	37 (11.0)
120-168	45 (13.4)
Sex	
Males	197 (58.8)
Females	138 (41.2)

The axillary temperature at presentation ranged from 36.2°C to 42°C , with a mean of $38.2^\circ\text{C} \pm 0.9^\circ\text{C}$. Fifty-six (17%) did not have a fever ($\geq 37.6^\circ\text{C}$) at presentation. A total of 301 children (89.9%) had received an antipyretic prior to presentation, with the most common antipyretic being paracetamol (269, 89.4%). Sixteen (5.3%) received nonsteroidal anti-inflammatory drugs (NSAID) such as Ibuprofen, while 13 (4.3%) used a combination of paracetamol and NSAID. In addition to the antipyretic, 201 (60%) had received some form of treatment before presentation, mostly antimalarials alone (47, 23.7%), antibiotics alone (50, 24.9%), and a combination of both (45, 22.4%). Other medications taken prior to presentation included cough syrups, hematinic, and multivitamins (14, 7%). The rest (45, 22.4%) did not know the names of drugs administered. Only 33 subjects (9.9%) were referred from other health facilities.

None of the study participants presented with fever alone. The associated symptoms included vomiting (42.2%), diarrhea (31.1%), and cough (33.4%). Other clinical features include tachycardia (66.3%), tachypnea (45.4%), and hepatomegaly (29.3%). The risk of dying from fever was higher when it was associated with diarrhea, weakness, pallor, convulsions, loss of consciousness, and difficult/fast breathing [Table 2].

The common investigations carried out for these subjects to aid the diagnoses included malaria rapid diagnostic test/malaria microscopy, full blood count, random blood glucose, and urinalysis.

Table 3 shows the diagnoses made in these febrile children. The most common diagnoses were malaria and sepsis/bacteremia, which constituted about 52% of all the cases. Meningitis, sepsis, and typhoid fever, however, had the highest case fatality rates.

There were a total of 42 deaths (12.5% mortality) and 7 were discharged against medical advice. The rest were either discharged home or transferred to the ward after stabilization in the emergency room.

Table 4 shows the relationship between various variables and outcomes. There was no statistically significant difference in

Table 2: Outcome based on major clinical features associated with fever

Clinical features	Admission, frequency (% of total)	Deaths, frequency (% of symptom)	OR for mortality	95% CI	χ^2	P
Vomiting	142 (42.4)	17 (12)	0.91	0.47-1.77	0.07	0.79
Cough	111 (33.1)	10 (9.0)	0.59	0.28-1.26	1.89	0.17
Diarrhea	106 (31.6)	23 (21.7)	3.06	1.59-5.92	11.87	0.00
Catarrh	67 (20.0)	5 (7.5)	0.50	0.19-1.34	1.97	0.16
Fast/difficult breathing	67 (20.0)	19 (28.4)	4.22	2.13-8.34	19.12	0.00
Anorexia	54 (16.1)	11 (20.4)	1.76	0.82-3.80	2.14	0.14
Convulsions	45 (13.4)	17 (37.8)	6.44	3.11-13.34	30.20	0.00
Pallor	45 (13.4)	10 (22.2)	2.30	1.04-5.09	4.45	0.04
Weakness	37 (11.0)	10 (27.0)	3.06	1.36-6.89	7.85	0.01
Headache	21 (6.3)	1 (4.8)	0.33	0.04-2.55	1.24	0.27
LOC	13 (3.9)	10 (76.9)	30.21	7.90-115.47	51.13	0.00
Tachycardia	222 (66.3)	30 (13.5)	1.70	0.78-3.73	1.80	0.18
Hepatomegaly	98 (29.3)	27 (27.6)	5.63	2.84-11.17	28.48	0.00
Splenomegaly	20 (6.0)	4 (20.0)	1.82	0.58-5.74	1.08	0.30

OR: Odds ratio, CI: Confidence interval, LOC: Loss of consciousness

Table 3: Diagnosis made in the febrile children and outcome

Diagnosis	Frequency (% of total)	Mortality (CFR)
Severe malaria	92 (27.5)	6 (6.5)
Sepsis/bacteremia	66 (19.7)	24 (36.4)
Malaria/sepsis comorbidity	16 (4.8)	2 (12.5)
Acute gastroenteritis	43 (12.8)	2 (4.7)
Pharyngitis/tonsillitis	43 (12.8)	0 (0.0)
Pneumonia	28 (8.4)	2 (7.1)
Urinary tract infection	10 (3.0)	0 (0.0)
Meningitis	8 (2.4)	3 (37.5)
Typhoid fever	7 (2.1)	2 (28.6)
Bronchiolitis	39 (0.9)	0 (0.0)
Others	5 (1.5)	0 (0.0)
No diagnosis	14 (4.0)	1 (7.1)

CFR: Case fatality rate

the proportion of deaths between children under 5 years and those above 5 years, $P = 0.38$, $\chi^2 = 0.77$. However, residence in rural areas had more significant mortality when compared to urban and semi-urban areas ($P = 0.01$, $\chi^2 = 9.53$). Significant factors associated with increased mortality included referral from other health facilities ($\chi^2 = 7.25$, $P = 0.01$) and treatment before presentation to the emergency department ($\chi^2 = 0.01$, $P = 6.90$). Also, the presence of neutrophilia increases the risk of mortality ($\chi^2 = 11.96$, $P = 0.00$). Of the 106 children who had anemia, only 55 (51.9%) were severe enough to be transfused with blood. There was a significant association between blood transfusion and death in the children ($P = 0.00$, $\chi^2 = 16.44$).

DISCUSSION

Late presentation to health facilities has always been one of the factors that lead to negative health outcomes and poor prognosis.^[7,9,12,13] In this study, the mean duration of fever prior to presentation to the emergency department

was four days. Children who had a fever for >48 h before presentation were at higher risk of death than those who presented earlier. A number of them had visited other lower cadre health-care facilities or patent medicine vendors prior to presentation to the emergency room. Some lower and private health-care providers may delay in referring to other centers, probably as a result of inexperience or financial gains. In the current study, referral from other health-care facilities was associated with more deaths when compared to patients that came straight on their own. This may not be unconnected to worsening and complications of the disease as a result of failure to initiate the appropriate treatment early. Adequate, early treatment is an important predictor of outcome in infectious diseases.^[14]

Febrile children presenting from the rural areas were more likely to have a poorer outcome when compared to those in urban areas. An earlier study in Southeast Nigeria found that caregivers in rural arrears were more likely to patronize patent medicine dealers, herbal practitioners, and use leftover medications before seeking care in health facilities when the illness worsens. This is compounded by logistics problems (finance and transportation) that impede on early presentation to the health facilities.^[15]

Most of the children in this study received antipyretics before the presentation, the most common being paracetamol. Similarly, Pillar and Herzogin, Switzerland, observed a high use of antipyretics before a visit to the emergency department.^[16] Although fever may be a beneficial response in infections,^[4,5] high fever at presentation (>39.0°C) was associated with increased mortality in our study. Some authors^[4,5] believe that the severity of the fever does not always correlate with the severity of illness, whereas other authors^[17,18] have found a direct correlation between temperature and severity of the infection. In addition, the use of paracetamol for fever relief has been found to prolong fever clearance time in malaria.^[19]

Table 4: Relationship between tested variables and outcomes

Variable	Mortality, frequency (% of cases)	OR	95% CI	χ^2	P
Age (years)					
<5	34 (13.4)	1.44	0.64-3.24	0.77	0.38
≥ 5	8 (9.8)				
Sex					
Males	22 (11.2)	0.74	0.39-1.42	0.82	0.37
Females	20 (14.5)				
Residence					
Urban/semi-urban	22 (9.8)	2.02	1.05-3.89	9.53	0.01
Rural	20 (18.0)				
Duration of fever (days)					
≤ 2	12 (8.2)	2.13	1.23-3.73	4.57	0.03
> 2	30 (16.0)				
Temperature at presentation					
$< 39.0^\circ\text{C}$	23 (9.5)	2.28	1.43-3.64	5.84	0.02
$\geq 39.0^\circ\text{C}$	17 (19.3)				
Prior use of antimicrobial					
Yes	33 (16.4)	2.73	1.26-5.91	6.90	0.01
No	9 (6.7)				
Referral from another health facility					
Yes	9 (23.3)	3.06	1.31-7.13	7.25	0.01
No	33 (10.9)				
Presence of neutrophilia					
Yes	29 (23.2)	5.74	1.93-17.03	11.96	0.00
No	4 (5.0)				
Blood transfusion					
Yes	16 (29.1)	4.01	1.97-8.14	16.44	0.00
No	26 (9.3)				

OR: Odds ratio, CI: Confidence interval

Self-medication and patronage of patent medicine vendors are very common practices in our environment.^[15] They are often associated with inappropriate administration of medications, which can lead to worsening of the disease process and delayed presentation to the health facility, leading to increased morbidity and mortality, as found in previous studies.^[9,12]

Neutrophilia is often an indication of an ongoing acute infection. Moreover, in the current study, it was one of the determinants of poor outcome. It thus calls for early and appropriate use of antimicrobials when managing febrile children in the emergency room, even in the absence of a culture result.

Similar to what has been reported in earlier studies, the need for blood transfusion as a result of severe anemia was associated with increased mortality.^[20] Severe anemia in children, which could be a consequence of severe malaria or sepsis, can progress to anemic heart failure with attendant hemodynamic compromise, and can lead to death if not addressed urgently. Timely blood transfusion might in fact save lives.^[21] However, the challenges of urgent blood transfusion in our environment may further worsen the prognosis for such children in dire need of blood transfusion.

All the children had other presenting symptoms in addition to the fever. The additional symptoms that posed a greater risk of death

when associated with fever included diarrhea, weakness, pallor, convulsions, unconsciousness, and difficult/fast breathing. These symptoms are also regarded as severe features in the World Health Organization's Integrated Management of Childhood Illnesses;^[22] it is therefore expected that any febrile child presenting with any of these symptoms should receive prompt attention.

Although malaria had the highest frequency of presentation in our study, sepsis, meningitis, and typhoid fever had the highest case fatality rates and thus poorer prognoses. This is similar to the mortality pattern in other Nigerian studies.^[2,3,9,10] Pharyngotonsillitis had the best prognosis among the common febrile illnesses identified in the current study. This could be due to ready response to appropriate antibiotic therapy in the eradication of the bacterial organisms once the diagnosis, which is often clinical, is made.

The mortality rate of 12.5% may be considered high when compared to mortality rates (3.9% and 5.8%) from all causes of admission into the Children's emergency departments in the two study centers.^[2,10] This supports the fact that most of the childhood mortalities in our environment are due to infective causes which are largely preventable. Thus, policymakers and stakeholders in child health should devote their energies to infection prevention and control in the communities, as well as health education to improve care-seeking behaviors.

CONCLUSION

Fever is a significant cause of mortality in the children emergency departments. Most of the factors responsible for the mortality in febrile children are largely preventable and treatable when the presentation is early.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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