Original Article

Coden USA: WJAMA3

OUTCOME OF EMPIRIC ANTIBIOTIC THERAPY IN FEBRILE CHILDREN: CROSS SECTIONAL STUDY CONDUCTED IN AL KHANSAA TEACHING HOSPITAL

[1*]Dr. Bakir Siddeeq Abdul Kareem, [2]Dr. Anas Aziz Mohammed, [3]Dr. Yusuf Mahmod Hasan

[1]M.B.Ch.B./C.A.B.M.S (Pediatrics), Al Khansa'a Teaching Hospital, Mosul, Iraq.
[2]M.B.Ch.B./C.A.B.M.S (Pediatrics), Al Batool Teaching Hospital, Mosul, Iraq.
[3]M.B.Ch.B./F.I.B.M.S (Pediatrics), Al Khansa'a Teaching Hospital, Mosul, Iraq.

ABSTRACT

Background: Fever is one of the most common presenting complaints in pediatric practice and is frequently managed with empiric antibiotic therapy, particularly in resource-limited settings where diagnostic uncertainty persists. **Objectives:** To evaluate the clinical outcomes of empiric antibiotic therapy in febrile children. **Methods:** This hospital-based cross-sectional study was conducted at Al-Khansaa Teaching Hospital, Mosul, Iraq, from March 2025 to February 2026. A total of 250 children aged ≤14 years presenting with fever (≥38°C) and receiving empiric antibiotic therapy were included. Demographic, clinical, laboratory, treatment, and outcome data were collected and analyzed using appropriate statistical tests. **Results:** The mean age was 36.2 ± 28.5 months, with a male predominance (56.4%). The majority of patients were aged 12–59 months (43.6%). Fever was present in 100% of cases, followed by cough (50.8%), poor feeding (40.8%), vomiting (36.4%), and diarrhea (30.8%). Leukocytosis was observed in 53.3% of tested patients, while 67.7% had positive C-reactive protein. Ceftriaxone was the most commonly prescribed antibiotic (48%), followed by ampicillin plus gentamicin (24.4%) and amoxicillin–clavulanate (15.6%). Clinical improvement within three days was achieved in 70.4% of patients, whereas 17.6% showed delayed improvement and 12% experienced treatment failure. The mortality rate was 3.2%. **Conclusion:** Empiric antibiotic therapy in febrile children produced generally positive short-term outcomes; however, the high rate of antibiotic use, as well as the presence of treatment failure and mortality, indicate the need for improved diagnostic tools and antimicrobial stewardship.

KEYWORDS: Antimicrobial resistance, Clinical outcomes, Empiric antibiotic therapy; Febrile children; Iraq; Pediatric infection.

1-INTRODUCTION

Fever is one of the most prevalent presenting complaints among children in both outpatient and inpatient settings.[1] It is frequently a symptom of underlying infectious processes, which range from self-limiting viral illnesses to severe bacterial infections (SBIs) such pneumonia, sepsis, urinary tract infections, and meningitis.[1-2] Differentiating between viral and bacterial infections in pediatric practice remains difficult, particularly in low- and middle-income countries, due to overlapping clinical characteristics and limited access to modern diagnostic technologies. As a result, empiric antibiotic therapy is commonly started in febrile children to avoid complications from untreated bacterial infections.[3-4] At the same time, bacterial infections that are not treated properly can cause significant morbidity and mortality. Thus, monitoring the results of empiric antibiotic therapy is critical for balancing the benefits as well as risks and to improve clinical decision-making.[5]

Empiric antibiotic therapy is the use of antimicrobial treatment based on clinical judgment prior to final microbiological confirmation. While this approach can save lives, especially in severe conditions, it also

involves hazards such as overuse of antibiotics, antimicrobial resistance, adverse medication responses, and higher healthcare costs.[6] In resource-limited environments such as Iraq, doctors frequently rely primarily on empiric treatment because; limited availability of culture and sensitivity testing, delayed lab results, high burden of infectious diseases and risk of rapid clinical deterioration in children.[7]

Despite the widespread use of empiric antibiotics in pediatric medicine in Iraq, there is little local data on their effectiveness and results. The majority of treatment decisions are made based on clinical judgment rather than defined protocols or microbiological confirmation. Therefore, the aim of this study is to evaluate the clinical outcomes of empiric antibiotic therapy in febrile children.

2-PATIENTS AND METHODS

This is a hospital-based observational study, carried out in Al-Khansaa Teaching Hospital in Mosul, Iraq, from March 2025 to February 2026. All children aged 14 years presenting with fever (≥38°C) and receiving empiric antibiotic therapy were included in this study. Patients with confirmed non-infectious causes of fever (for example, autoimmune diseases), patients with prior antibiotic use within 48–72 hours before presentation, those with known immunodeficiency disorders and patients with incomplete clinical data were excluded from the study.

The data collecting form included demographic information such as gender, age and residence. Clinical presentation such as duration of fever, associated symptoms (cough, diarrhea, vomiting, urinary symptoms, etc.), vital signs at presentation and clinical diagnosis (suspected source of infection). Laboratory tests such as complete blood count, C-reactive protein, urine analysis and other relevant investigation. Medication used such as type of empiric antibiotic used, route of administration, duration of therapy and modification of antibiotics if any. Lastly, patients' outcomes, which are clinical improvement within 48–72 hours, persistence of fever, change of antibiotic regimen, development of complications, length of hospital stay and mortality.

The statistical analysis was carried out using SPSS software (Statistical Packages for Social Sciences, version 30). The data were presented as frequencies and percentages.

3- RESULTS

The study includes a total of 250 children. The mean age was 36.2 ± 28.5 months. Moreover, 141 (56.4%) were males and 109 (43.6%) were females. With male to female ratio of 1.29:1. As shown in figure 1.
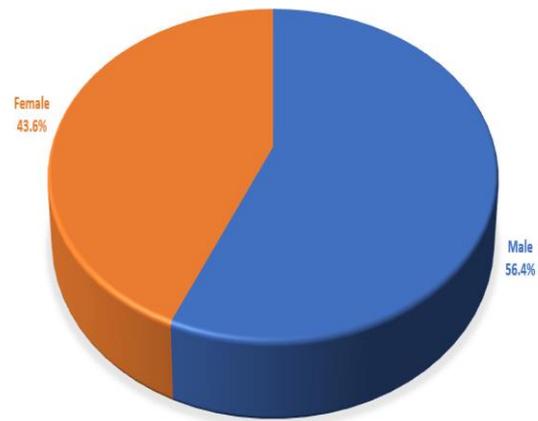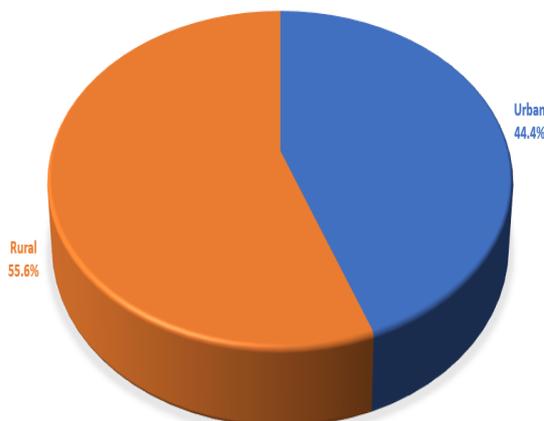

Figure 1: Distribution of the study patients according to their gender.

Table 1 shows age distribution of the study patients. The majority of patients were aged 12-59 months (43.6%), followed by those how aged less than 12 (28.4%) and more than 60 months (28%).

Table 1: Patients age category (number = 250).

Age category	Number	Percent
Less than 12 months	71	28.4%
12-59 months	109	43.6%
More than 60 months	70	28%

Rural residence was reported among 139 (55.6%) children, while urban residence was reported among 111 (44.4%) Children. As shown in figure 2.
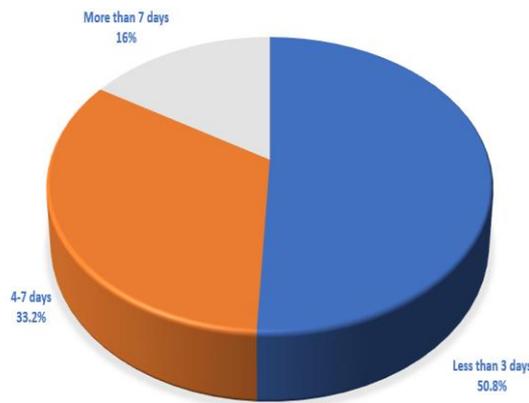

Figure 2: Distribution of the study patients according to their residency.

Table 2 shows clinical presentation of the study patients. fever was prevalent among 250 (100%) patients, followed by cough among 127 (50.8%) patients and poor feeding 102 (40.8%). While vomiting was prevalent among 91 (36.4%) patients, diarrhea among 77 (30.8%) and urinary symptoms among 36 (14.4%) patients.

Table 2: Clinical presentation of the study patients (number =250).

Symptoms	Number	Percent
Fever	250	100%
Cough	127	50.8%
Vomiting	91	36.4%
Diarrhea	77	30.8%
Urinary symptoms	36	14.4%
Poor feeding	102	40.8%

Figure 3 shows distribution of patients according to their duration of fever. The majority of patients (127 patients) had fever for less than 3 days, followed by those who had fever for 4-7 days (83 patients) and more than 7 days (40 patients).

Figure 3: Distribution of the study patients according to their duration of fever.

Among 133 patients did complete blood count, 71 (53.3%) had leukocytosis. Moreover, C-reactive protein was done for 90 patients and showed 61 (67.7%) positive results, Urine analysis was done for 81 patients and in 47 (58.02%) patients there was positive findings.

Table 3 shows antibiotics received but the patients. The majority of patients received ceftriaxone vial (48%) and to less extend Ampicillin + Gentamicin (24.4%) and Amoxicillin + Clavulanate in (15.6%). While treatments were prescribed for (12%) of the study patients.

**Table 3: Antibiotics prescribed for the study patients (number =250).**

Antibiotic	Number	Percent
Ceftriaxone	120	48%
Ampicillin + Gentamicin	61	24.4%
Amoxicillin + Clavulanate	39	15.6%
Other	30	12%

Table 4 shows patients' outcomes. The majority of patients (70.4%) improved within 3 days, while (17.6%) showed delayed improvement and (12%) showed treatment failure.

Table 4: Patients outcomes (number =250).

Outcomes	Number	Percent
Clinical improvement within less than 3 days	176	70.4%
Delayed improvement	44	17.6%
Treatment failure	30	12%

Figure 4 shows mortality rate of the study patients. It's evident that 8 (3.2%) patients were died among the study patients.
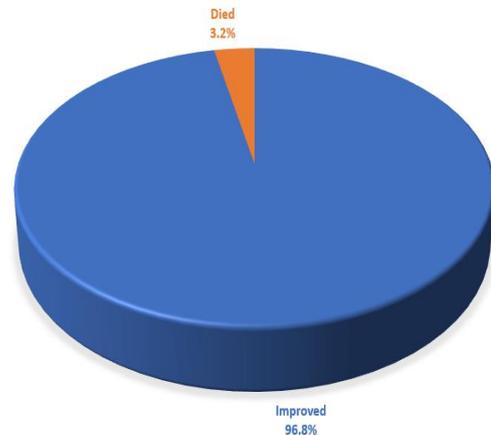
Figure 4: Distribution of the study patients according to their duration of fever.

4. DISCUSSION

This study evaluated at the clinical features, laboratory investigations, treatment strategies, and outcomes of pediatric patients with acute febrile illness.

The predominance of younger children, particularly those aged 12-59 months, is consistent with this age group's well-known vulnerability to infectious illnesses due to immature immune responses and higher exposure to environmental pathogens.[8-9] The minor male predominance found in this group has been documented in similar pediatric study, and it could be due to biological vulnerability or sociocultural healthcare seeking practices.[10]

As expected, fever was the most prevalent presenting symptom, followed by respiratory and gastrointestinal symptoms such as cough, vomiting, and diarrhea. This pattern is consistent with global data, which show that acute febrile illnesses in children are most commonly caused by viral or bacterial infections of the respiratory and gastrointestinal systems.[11-12] The relatively high proportion of patients presenting within the first three days of fever indicates good early healthcare utilization, which is critical for rapid diagnosis and management.

More than half of the patients tested positive for leukocytosis, and a significant number had increased inflammatory markers, indicating the existence of underlying infectious etiologies. However, the diversity

in laboratory testing—not all patients had a complete blood count, C-reactive protein, or urine analysis—highlights potential limits in resource availability or clinical decision-making in low-resource settings.[13] Similar challenges have been documented in developing countries, where diagnostic approaches are frequently guided by clinical intuition rather than defined protocols.[14]

The antibiotic prescription pattern seen in this study is heavily reliant on broad-spectrum drugs, primarily ceftriaxone, followed by combination therapy such as ampicillin and gentamicin. While this method may be warranted in moderate to severe cases, or when bacterial infection is suspected, it raises concerns about antibiotic overuse and the possibility of antimicrobial resistance.[15-16] The use of antibiotics in 88% of patients indicates a preference for empirical treatment, which has been extensively reported in pediatric practice, particularly in situations where rapid diagnostic tools are limited.[17]

Despite these difficulties, the clinical results were generally positive, with the majority of patients improving within three days. This outcome is consistent with earlier study demonstrating a satisfactory prognosis for most children febrile infections with proper supportive and antibiotic therapy.[18] However, the incidence of delayed recovery in 17.6% and treatment failure in 12% of instances suggests that a subset of patients may have more severe or resistant infections, necessitating careful monitoring and maybe more targeted therapies.

The mortality rate of 3.2% seen in this study, although relatively low, is nonetheless clinically significant. This conclusion is comparable with data from other healthcare settings, where febrile illnesses in children are frequently associated with delayed presentation, severe infections such as sepsis, or limited access to advanced care.[19-20] It emphasizes the necessity of early detection of high-risk cases, as well as the need for more effective diagnostic and therapeutic procedures.

Several limitations should be considered when evaluating the study's conclusions. First, the hospital-based design may limit the results' applicability to the larger population. Second, due to the study's cross-sectional design, causal links between clinical, laboratory, and outcome variables cannot be established. Third, not all patients underwent the same set of laboratory tests, which could create selection bias and restrict the comparability of outcomes among participants. Furthermore, the lack of microbiological evidence limits the ability to precisely identify the etiological agents of febrile illness, altering the interpretation of antibiotic use. The dependence on clinical judgment for diagnosis and management, while reflecting real-world practice in resource-limited settings, may add heterogeneity into treatment decisions. Finally, the study did not look at long-term outcomes, which made it unable to determine potential complications or relapse after discharge.

5- CONCLUSION
In conclusion, pediatric febrile illness in this cohort was characterized by a high prevalence of early presentation, frequent use of empirical antibiotic therapy, and generally favorable short-term outcomes, though a significant proportion of patients experienced delayed recovery, treatment failure, and measurable mortality. These findings underscore the persistent difficulty in managing febrile diseases in resource-limited settings, notably in terms of diagnostic limits and antimicrobial stewardship. To improve etiological identification and prevent needless antibiotic use, consistent clinical guidelines should be implemented in conjunction with easily accessible diagnostic technologies. Optimizing patient outcomes requires strengthening laboratory capacity, boosting adherence to evidence-based treatment procedures, and improving physician training. Future prospective studies should include microbiological testing and long-term follow-up to better understand disease patterns and improve pediatric treatment quality.

ACKNOWLEDGEMENT

Conflict of intertest
About this study, the authors disclose no conflicts of interest.

REFERENCES
1. Jayashree M, Parameswaran N, Nallasamy K, Chidambaram AC, Rajasegar R, Dhodapkar R, Chhabra M, Gupta N, Kaur H, Velayudhan A, Deol S. Approach to fever in children. Indian Journal of Medical Microbiology, 2024 Jul 1; 50: 100650.
2. Palaniraman R. Approach to short duration fever in children in office practice. Indian Journal of Pediatrics, 2025 May; 92(5): 511-8.
3. Tsao YT, Tsai YH, Liao WT, Shen CJ, Shen CF, Cheng CM. Differential Markers of Bacterial and Viral Infections in Children for Point-of-Care Testing. Trends Mol Med, 2020 Dec; 26(12): 1118-1132.
4. Chokkalla AK, Tam E, Liang R, Cruz AT, Devaraj S. Validation of a multi-analyte immunoassay for distinguishing bacterial vs. viral infections in a pediatric cohort. Clinica Chimica Acta, 2023 Jun 1; 546: 117387.
5. Xu S, Song Z, Han F, Zhang C. Effect of appropriate empirical antimicrobial therapy on mortality of patients with Gram-negative bloodstream infections:

a retrospective cohort study. BMC Infect Dis, 2023 May 23; 23(1): 344.

6. Ippolito M, Cortegiani A. Empirical decision-making for antimicrobial therapy in critically ill patients. BJA Educ, 2023 Dec; 23(12): 480-487.

7. Abou Fayad A, Rizk A, El Sayed S, Kaddoura M, Jawad NK, Al-Attar A, Dewachi O, Nguyen VK, Sater ZA. Antimicrobial resistance and the Iraq wars: armed conflict as an underinvestigated pathway with growing significance. BMJ Global Health, 2023 Jan 1; 7(Suppl 8): e010863.

8. McMullan BJ, et al. Fever in children: management and outcomes. Lancet Child Adolesc Health, 2022; 6(5): 355–364.

9. World Health Organization. Pocket book of hospital care for children, 2023 update.

10. GBD 2022 Child Mortality Collaborators. Global child health trends. Lancet, 2023; 402: 123–142.

11. Crump JA, et al. Etiology of febrile illness in children. N Engl J Med, 2022; 386: 151–162.

12. Baker JM, et al. Viral infections in pediatric febrile illness. Pediatrics, 2023; 151(2): e2022057890.

13. Rambaud-Althaus C, et al. Clinical algorithms for febrile illness. BMJ, 2022; 376: e068123.

14. Reyburn H, et al. Overdiagnosis in resource-limited settings. BMJ, 2022; 377: o1234.

15. Laxminarayan R, et al. Antimicrobial resistance. Lancet, 2022; 399: 629–655.

16. Klein EY, et al. Global antibiotic consumption trends. PNAS, 2023; 120(10): e2219123120.

17. O'Brien KL, et al. Empirical antibiotic therapy in children. Clin Infect Dis, 2022; 75(S2): S145–S152.

18. Pavlinac PB, et al. Outcomes of pediatric febrile illness. JAMA Netw Open, 2023; 6(4): e2312456.

19. Dondorp AM, et al. Sepsis in low-resource settings. Nat Rev Dis Primers, 2023; 9: 18.

20. Wiens MO, et al. Pediatric mortality predictors. BMJ Glob Health, 2022; 7: e009123.