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CLINICAL AUDIT ON USE OF ORAL VERSUS INTRAVENOUS PARACETAMOL IN FEBRILE PATIENTS AT PAEDIATRIC ONCOLOGY UNIT SHAUKAT KHANUM MEMORIAL CANCER HOSPITAL AND RESEARCH CENTER PESHAWAR

Original Research

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ABSTRACT

Background: Intravenous (IV) paracetamol is frequently administered to febrile pediatric patients despite oral formulations being equally efficacious, more cost-effective, and easier to administer. Inappropriate IV use not only increases healthcare costs but also exposes patients to unnecessary procedural risks and increases work burden on the nursing staff while administering the drug. In the absence of formal national guidelines, rational prescribing becomes a matter of local policy and practice adherence.

Objective: The main objectives of this audit was to look for the proportion of oral and IV paracetamol, to assess the appropriateness of IV paracetamol use in febrile patients in emergency and inpatient departments Pediatrics unit SKMCH Peshawar, to evaluate the impact of educational interventions on prescribing behavior.

Methods: A retrospective clinical audit was conducted at Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCH & RC), Peshawar. The first audit cycle included 173 febrile pediatric patients from October to December 2023, with data extracted from the hospital information system. Departmental standards defined justified IV use. A re-audit was conducted from July to September 2024 after implementing multi-level educational interventions for physicians, nurses, and pharmacists. Data were analyzed descriptively to assess the proportion of oral and IV paracetamol and to look for the proportion of justified versus unjustified IV paracetamol use.

Results: In the first cycle, 96.8% of patients in the emergency department and 92.3% in inpatient care received IV paracetamol, with only 4.3% and 0% justification rates, respectively. Post-intervention, oral paracetamol use improved from 3.2 % to 87 % in Emergency room and from 2.6 % to 70 % in Inpatient setting. IV paracetamol justification rates improved from 4.3 % to 71 % in emergency room while from 0 % to 79 % in inpatient settings. Monthly IV paracetamol consumption dropped from 372 doses (PKR 72,912) to 30 doses (PKR 5,880), reflecting enhanced adherence to standards.

Conclusion: Educational interventions improved rational prescribing of oral and IV paracetamol, both in inpatient and emergency settings. However, continuous monitoring, training, and system-level support are necessary to sustain evidence-based IV paracetamol use.

Keywords: Antipyretics, Audit, Cost Analysis, Intravenous Paracetamol, Oral Paracetamol, Pediatric Oncology, Prescribing Behavior, Quality Improvement, Rational Drug Use.

INTRODUCTION

Intravenous (IV) paracetamol has increasingly become a common intervention in pediatric clinical settings, particularly in emergency assessment rooms and inpatient departments, often being administered as an antipyretic to febrile patients (1). While its use may appear to offer convenience and faster symptomatic relief, questions arise about whether its use is always clinically justified. Evidence suggests that oral paracetamol, being significantly less expensive and simpler to administer, provides comparable efficacy and onset of action in most cases, with only minimal clinical difference in effect compared to the IV route (2, 3). IV paracetamol costs approximately 250 to 350 times more than oral formulations, depending on the brand. Which further underscores the need to critically evaluate its use in resource-limited settings (4, 5). Oral paracetamol is generally well-tolerated and effective, making it a rational first-line choice for fever management in children. However, there are selected clinical situations where IV paracetamol administration may be appropriate. These include cases involving persistent vomiting, severe gastrointestinal mucositis, neutropenic colitis, or when children are nil per oral (NPO) for procedures or surgical interventions, particularly where anesthesia is involved or when postoperative gastrointestinal motility is impaired (6-8). Beyond these specific indications, continued use of IV paracetamol lacks justification and risks contributing to unnecessary healthcare expenditures without improving patient outcomes (9).

Despite its widespread use, there are currently no established national or international guidelines specifically regulating the use of IV paracetamol in pediatric practice. However, the pediatric department at Shaukat Khanum Memorial Cancer Hospital and Research Centre, collaborated with its pharmacy team to establish local standards for using oral and IV paracetamol. The aim of this audit was to find the proportion of oral and IV paracetamol use in febrile children in SKMCH & RC Peshawar. It also sought to evaluate the justification rate of IV paracetamol and explore the areas where intervention can be made to ultimately shift the trend back to oral paracetamol where clinically appropriate, reducing unjustified IV use and reinforcing stewardship in pediatric pharmacotherapy.

STANDARDS FOR USING IV PARACETAMOL

The Pediatric Unit at Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCH&RC), Peshawar, developed the following standards for indications of IV paracetamol after collaboration with the pharmacy team.

According to these standards, all patients should receive oral paracetamol as the first-line treatment, except when oral or enteral administration of paracetamol is not feasible. This includes patients who cannot tolerate oral feeds, fluids, medications, or administration via a nasogastric (NG), percutaneous endoscopic gastrostomy (PEG), or jejunostomy tube. Such cases may include suspected intestinal obstruction, impaired intestinal absorption (e.g., severe oral mucositis or neutropenic colitis), swallowing difficulties or persistent vomiting. Secondly, IV paracetamol can be given in the surgical setting to achieve rapid analgesia. However, it should only be used perioperatively and/or 48 hours after surgery and its route reviewed later on. Thirdly, IV paracetamol can be considered for patients who are kept NPO for procedures, tests that need anesthesia. Outside of these indications, use of IV paracetamol is unjustified.

METHODS

Based upon taking the above standards for using IV paracetamol , retrospective clinical audit was conducted in the Emergency Assessment Room (EAR) and Inpatient Department (IPD) of the Pediatric Unit at Shaukat Khanum Memorial Cancer Hospital and Research Centre (SKMCH & RC), Peshawar, to look for the proportion of oral and IV paracetamol use and evaluate the appropriateness of intravenous (IV) paracetamol administration in febrile pediatric patients. The study spanned two separate audit cycles. The initial audit was carried out from October 1, 2023, to December 31, 2023, followed by a reaudit conducted between July 1, 2024, and September 30, 2024. The focus of both audit cycles was to assess whether IV paracetamol was administered according to predefined departmental standards and to determine whether targeted educational interventions could optimize prescribing behavior. The audit included all

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pediatric patients presenting with fever who received either oral or IV paracetamol during the respective audit periods. Patients were eligible for inclusion if they had an indication for antipyretic treatment, while those who receive antipyretics other than paracetamol or had incomplete medical records were excluded (10,11). Data was extracted retrospectively from the hospital information system (HIS), and strict anonymity was maintained by assigning unique enrollment identifiers to each patient. No names or medical record numbers were recorded, and no direct patient interaction occurred during the audit process.

The audit team evaluated each case to determine whether the use of IV paracetamol adhered to the locally developed guidelines for using oral and IV paracetamol. We set the quality benchmark for using IV paracetamol appropriately at 90 % which is our internal consensus rather than any international guidelines. Between the two audit cycles, structured interventions were introduced to improve practice. These included educational sessions for physicians to encourage evidence-based prescribing, nursing staff to prompt medication route changes once oral administration becomes feasible, and pharmacy-led interventions to recommend switching from IV to oral paracetamol when clinically appropriate. The data from the reaudit period were collected using the same inclusion criteria and evaluation process as in the initial cycle.

RESULTS

A total of 173 febrile pediatric patients were audited during the first audit cycle between October 1 and December 31, 2023. Among these, 95 patients were evaluated in the Emergency Assessment Room (EAR), while 78 were managed in the Inpatient Department (IPD), specifically in the pediatric oncology unit. In the EAR, 92 out of 95 patients (96.8%) received intravenous (IV) paracetamol, with only 4 cases (4.3%) meeting the departmental criteria for justified IV administration. The remaining 88 patients (95.7%) received IV paracetamol inappropriately based on established standards. Oral paracetamol was administered to only 3 patients (3.2%) in this setting. In the IPD cohort, 72 out of 78 patients (92.3%) received IV paracetamol, yet none of these cases were found to have justified indications according to the audit standards. Oral paracetamol was used in just 2 patients (2.6%), while 4 patients (5.1%) experienced resolution of fever through non-pharmacological measures. There was definite financial difference between routes of administration. A single dose of IV paracetamol cost between PKR 200–250, depending on the brand, while a single oral dose was available for under PKR 10, indicating a cost disparity of approximately 25 to 30 times.

Following the initial audit, targeted educational interventions were implemented during early 2024 to correct prescribing trends. These included sensitization sessions for physicians regarding evidence-based standards, nursing support to communicate when patients could switch to oral therapy, and pharmacy interventions encouraging conversion to oral formulations where appropriate. A reaudit was performed from July 1 to September 30, 2024. Post-intervention data reflected improved adherence to guidelines, with a marked improvement in appropriate oral paracetamol prescription and reduction in unjustified IV paracetamol usage in both the EAR and IPD. The financial impact was also significant, with monthly IV paracetamol consumption declining from a peak of 372 doses (PKR 72,912) in February 2024 to a low of 30 doses (PKR 5,880) in November 2024. Despite regular educational efforts, the target benchmark of 90% justified IV use was not achieved in the first half of 2024, partly due to high turnover of junior medical staff. Based on the post-intervention audit data, oral paracetamol use improved from 3.2 %(3/95 patients) to 87 % (210/241) in Emergency room and from 2.6 % (2/78) to 70 % (45/64) in Inpatient setting, the justification rates for intravenous (IV) paracetamol use were analyzed separately for the Emergency Assessment Room (EAR) and Inpatient Department (IPD). In the EAR 31 febrile pediatric patients who received IV paracetamol, 22 cases (71%) met the criteria for justified use, while the remaining 9(21%) did not. In the IPD, 19 patients received IV paracetamol, of which 15 cases (79%) were justified according to the predetermined defined standards, whereas 4 cases (21%) were found to be inappropriate.

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Table 1: Patient Demographics

Variable	EAR	IPD	Total
Total Patients	95	78	173
Age Range (years)	1–12	2–14	1–14
Median Age (years)	5	6	5.5
Male (%)	52.6	56.4	54.3
Female (%)	47.4	43.6	45.7

Table 2: Route of Paracetamol Use (Initial Audit)

Department	Total Patients	IV Paracetamol (%)	Oral Paracetamol (%)	Non-Pharmacologic (%)
EAR	95	92	3	0
IPD	78	72	2	4

Table 3: IV Paracetamol Justification (Initial Audit)

Department	IV Paracetamol Given	Justified Use	Unjustified Use	Justified (%)
EAR	92	4	88	4.3
IPD	72	0	72	0.0

Table 4: IV Paracetamol Justification (Post-Intervention)

Department	IV Paracetamol Given	Justified Use	Unjustified Use	Justified (%)
EAR	31	22	9	71
IPD	19	15	4	79

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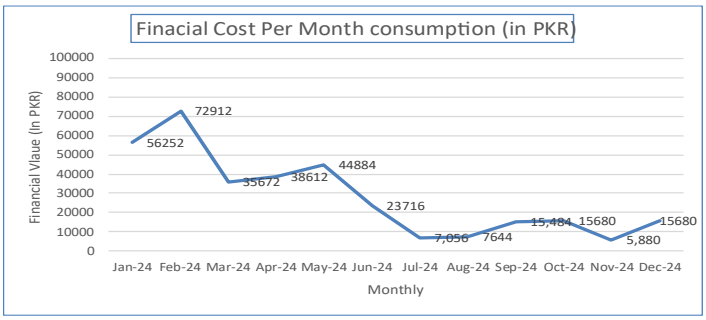


Figure 1 Financial Cost Per Month Consumption (in PKR)

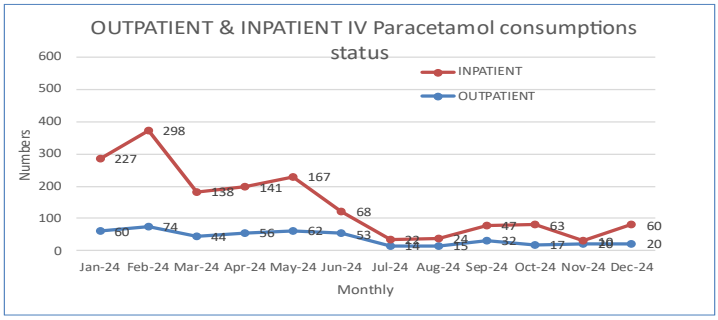


Figure 2 Outpatient &Inpatients IV Paracetamol Consumption

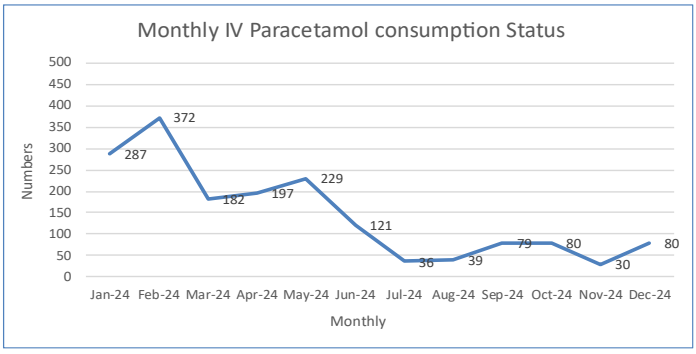


Figure 3 Monthly IV Paracetamol Consumption Status

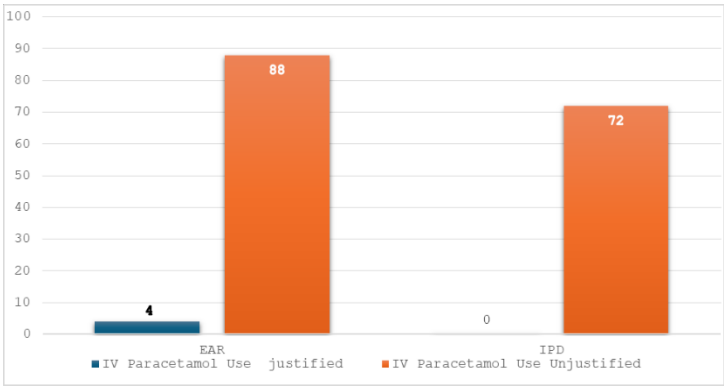


Figure 4 Initial audit: IV Paracetamol Use Justified Versus Unjustified

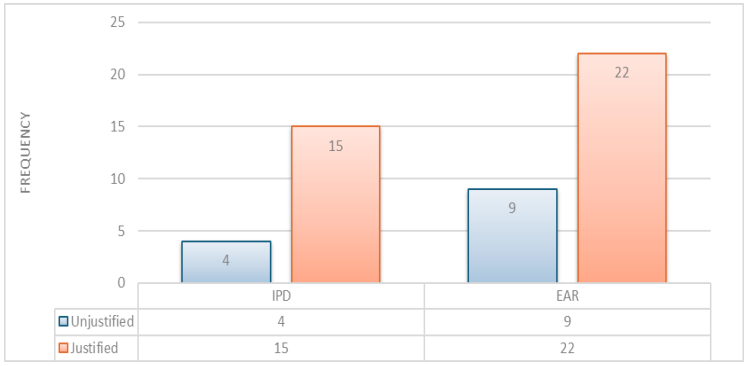
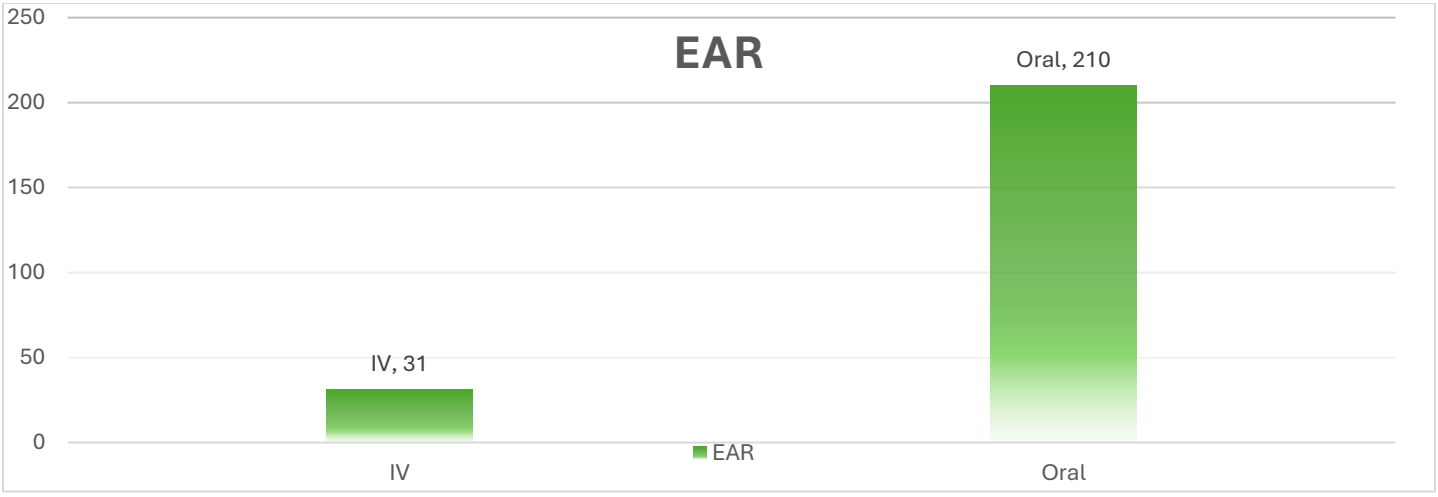
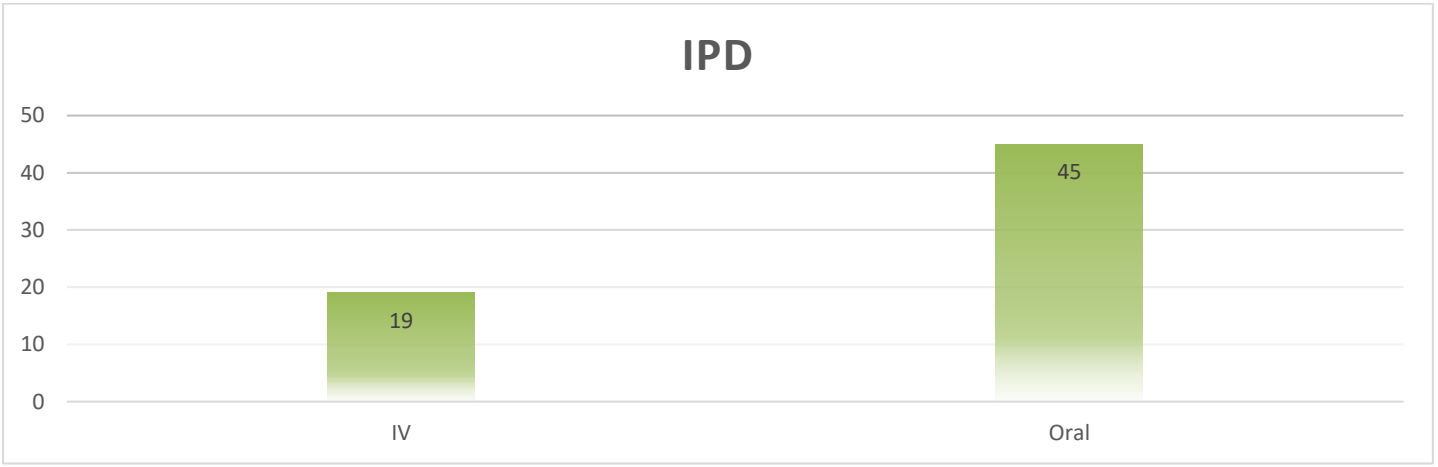


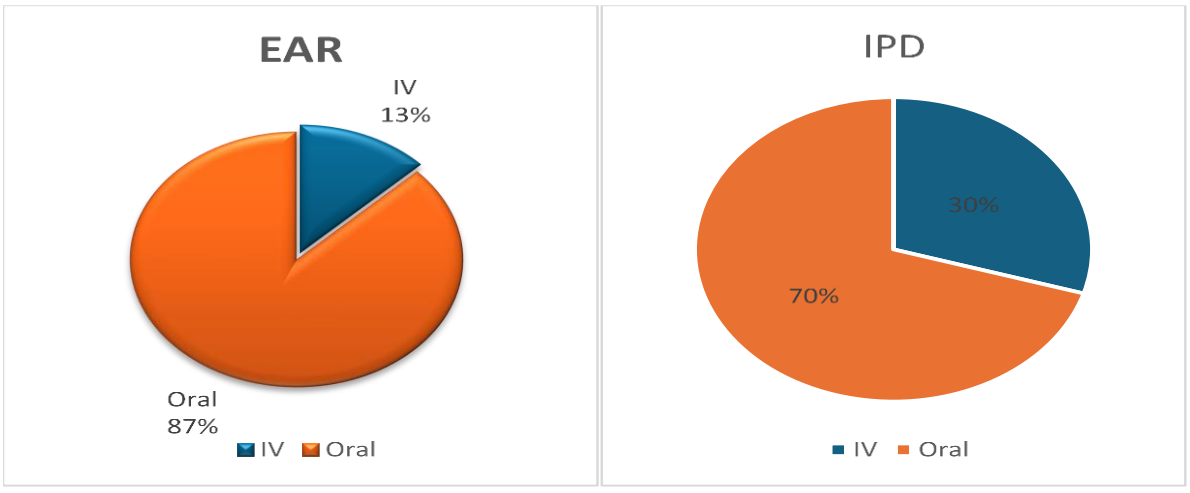
Figure 5 Post Intervention: IV Paracetamol Use Justified Versus Unjustified



Post Intervention: Total number of patients presented to EAR and their Route of administration of Paracetamol in EAR



Post Intervention. No of patients with IV versus Oral paracetamol used in IPD



Post intervention: Route of administration of Paracetamol in Pediatric patients presented to EAR

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DISCUSSION

The initial audit revealed almost nill oral (0, 4%) paracetamol usage despite an alarmingly high rates of unjustified IV paracetamol use—96.8% in the Emergency Assessment Room (EAR) and 92.3% in the Inpatient Department (IPD). These findings align with existing literature which underscores that oral paracetamol provides comparable antipyretic effects with a similar onset of action and fewer associated costs (12,13). The primary justification for using IV paracetamol should stem from specific clinical indications such as persistent vomiting, gastrointestinal malabsorption, severe mucositis, or nil per oral (NPO) status for surgical or diagnostic procedures. However, in practice, these criteria were largely overlooked (14). Literature from high-income and low-middle-income countries consistently shows that unnecessary administration of IV formulations contributes to medication-related costs, resource strain, and exposes patients to avoidable risks associated with IV therapy, including infusion-related complications and nosocomial infections (15-17). This study's cost analysis further substantiated these concerns, revealing that a single IV dose costs approximately 25 to 30 times more than its oral counterpart, which carries broader implications for institutional budget planning and rational resource utilization.

The post-intervention findings demonstrated a dramatic shift in clinical practice , where oral paracetamol use improved from 3.2 % to 87 %) in Emergency room and from 2.6 % to 70 % in Inpatient setting while justification rate for IV paracetamol use increased from 4.3% to 71% in EAR and from 0 % to 79 % in IPD. indicating a positive impact of the targeted educational sessions and pharmacy interventions. Though we still couldn't achieve the 90 % bench mark for using IV paracetamol but prescribing practice of paracetamol route (oral /IV) according to appropriateness has tremendously changed postintervention. The Strengths of this audit include its clear standards for evaluating clinical appropriateness, institution-wide stakeholder involvement, and the inclusion of both emergency and inpatient settings, allowing for cross-departmental comparison. Furthermore, the inclusion of a financial cost analysis strengthens the argument for revising prescribing practices in terms of both clinical and economic outcomes. However, the audit's retrospective design limited the ability to compare the time to fever resolution and patient satisfaction with care in oral and IV paracetamol use.

Future efforts should incorporate regular audit-feedback cycles, integrate decision-support tools within electronic hospital information system, and enforce mandatory documentation of justification for IV drug administration. Moreover, a future shift toward prospective studies or randomized interventional audits may provide more robust insights into causality and intervention efficacy. Ultimately, this audit reinforces the importance of reinforcing stewardship principles, particularly in resource-sensitive healthcare environments. By continuously engaging physicians, nurses, and pharmacists in evidence-based practices and holding prescribing patterns accountable through regular audits, institutions can foster a culture of safe, efficient, and patient-centered care.

CONCLUSION

This audit highlighted a critical gap in the rational use of intravenous paracetamol in pediatric febrile management, revealing substantial overuse in both emergency and inpatient settings. Targeted educational and interprofessional interventions significantly improved prescribing behavior both in Inpatient and emergency settings, Sustained efforts, including regular audit cycles, clinical decision support, and ongoing staff training, are essential to ensure cost-effective and patient-centered antipyretic therapy.

AUTHOR CONTRIBUTION

Author	Contribution
Saira Uzma*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Bakht Jamal	Substantial Contribution to study design, acquisition and interpretation of Data

Author	Contribution
	Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Zeeshan Nawaz	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Abdul Wahab	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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