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## Comprehensive Analysis of Demographics, Radiology Utilization and Prescription Trends in Pediatric Patients at a Tertiary Care Hospital

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### ABSTRACT

Understanding trends in radiology utilisation and drug prescriptions is essential for improving patient care in the challenging discipline of paediatric healthcare. Diagnostic and therapeutic strategies are influenced by the clinical problems that paediatric patients present with and their demographics. Understanding these patterns and correlations can help optimize drug use, ensure more accurate diagnoses, and improve clinical practices ultimately improving patient outcomes. Data for this observational and retrospective study was taken from the medical records of 420 Paediatric patients who received treatment at a tertiary care hospital. Patient demographics, radiology procedures and their indications, as well as drug prescriptions and antibiotic usage, were noted Results: The study analysed 420 paediatric patients, with 18.6% under 1 year, 30.7% 1-5 years, 22.4% 6-10 years and 28.3% 11-15 years old, with 81.9% fully vaccinated and 29.3% malnourished. Among these 81.9% fully vaccinated and 29.3% malnourished with nearly equal gender distribution. The most common radiological procedures for children aged 0-1 years (50.0%) and for 1-5 years (67.4%) were ultrasound whereas X-rays for the 6-10-year group (68.1%) and CT scans for the 11-15-year group (52.1%). Most of these procedures being performed due to trauma (42%) and gastrointestinal issues (31%). Antibacterials being the most frequently prescribed class, accounting for 32.62% of cases followed by gastrointestinal drugs (29.05%). 64% of prescriptions of antibacterial drugs were beta-lactams. In conclusion, this study highlights the major clinical and demographic variables affecting the outcomes of paediatric treatment. The study found that most patients were vaccinated and had normal nutritional status, with trauma and gastrointestinal issues leading to radiology procedures. The study highlighted the importance of gastrointestinal drugs and antibacterials in treatment, with beta-lactams being the most prescribed antibiotics. By understanding these trends, medical professionals can improve care, personalise treatment plans, and improve patient outcomes in paediatric settings.

## INTRODUCTION

The unique physiological and developmental distinctions between children and adults necessitate specialised approaches to diagnosis and treatment in paediatric healthcare<sup>[1]</sup>. Understanding demographic variables such as age, gender, immunisation history, and nutritional status is essential for comprehending the conditions in which paediatric treatment is delivered<sup>[2,3]</sup>. These components help in identifying areas where clinical procedures need to be improved and offer insightful information about the healthcare requirements for specific populations. In paediatric diagnostics, radiological procedures are crucial because they help identify and treat a variety of illnesses<sup>[4]</sup>. Utilisation patterns in radiology, including the selection of imaging modalities like ultrasound, X-rays and CT scans, varied greatly throughout paediatric age groups and their clinical conditions. Understanding these variations is crucial for optimizing radiology use and minimizing radiation exposure<sup>[4,5]</sup>. It is important to learn about the distribution patterns of the main drug classes used in paediatric treatment to optimise drugs use in children. This helps in determining common prescribing trends and potential areas for improving treatment measures to improve patient outcomes<sup>[6,7]</sup>. Paediatric healthcare faces significant antibiotic use risks due to antibiotic resistance. For effective management and risk reduction, evaluation of antibiotic classes is essential<sup>[8,9]</sup>. This study aims to investigate the distinctive aspects of paediatric healthcare like demographic traits, radiography utilisation, clinical associations, prescription prescribing trends, and antibiotic use. The results will offer valuable insights for raising diagnostic precision, maximising therapeutic outcomes and improving patient care in paediatric settings.

**Aim of the Study:** The aim of this study is to analyze demographics as well as the drug and radiology utilization patterns in pediatric patients.

Objectives:

- To Analyse the demographic characteristics of paediatric patients in the study population.
- To determine the radiology utilization patterns among different paediatric age groups.
- To evaluate the association between radiology procedures and specific clinical conditions in paediatric patients.
- To assess the trends in distribution of major drug groups prescribed to pediatric patients.
- To examine the distribution and use of specific antibiotic classes among the study population.

## MATERIALS AND METHODS

**Study Setting:** The RVM Institute of Medical Sciences in Laxmakkapalli Village, Siddipet District, Telangana, was the site of a study evaluating radiology utilization,

drug prescription patterns, and their associations with clinical and demographic factors in paediatric patients. The hospital's advanced facilities and diverse patient population provided a robust platform for comprehensive research in paediatric patients.

**Study Design:** This observational retrospective study examines patient records to assess clinical conditions, drug prescription trends, antibiotic use, demographic traits and radiology utilisation patterns in paediatric patients receiving treatment at a tertiary care hospital.

**Study Population:** This study conducted a retrospective analysis of 420 paediatric patients who were treated at RVM Institute of Medical Sciences.

**Study Period:** The study analysed data from July 2023 to June 2024 and carried out a thorough review of patient records over a one-year period.

**Inclusion Criteria:** Children aged 0-15 years who were treated at the RVM Institute of Medical Sciences during the study period were included in this study. It included medical records that documented medicine prescriptions, antibiotic use, radiological procedures, patient demographics and indications for these procedures.

**Exclusion Criteria:** Patients who weren't hospitalised during the study period at this hospital or whose medical records were incomplete were excluded. To maintain the focus on typical paediatric care and treatment patterns, individuals with illnesses that went outside of the scope of this study and required specialised care were also excluded.

**Data Collection:** A retrospective review of patient records was carried out for this study to collect thorough information on paediatric patients treated at the RVM Institute of Medical Sciences. The study collected demographic data on patients, including age, gender, vaccination history and nutritional status. It also examined radiological procedures, their indications, and prescribed medications, including antibiotic usage.

**Statistical Analysis:** The demographic characteristics of paediatric patients were analysed using descriptive statistics. comparative study was carried out to assess radiology utilization patterns, clinical indications for radiology procedures, the distribution of major drug groups and use of specific antibiotic classes prescribed to paediatric patients across different age groups. To explore the associations between clinical conditions and radiology use, correlation analysis was utilised.

**Ethical Considerations:** All data were anonymized, indicating that no personal identifiers were used during the data collecting or analysis process, to protect participant privacy and confidentiality.

**RESULTS AND DISCUSSIONS**

This study evaluated 420 paediatric patients, analysing demographic characteristics, radiology utilization patterns, clinical indications, drug prescription trends, and antibiotic use. Key findings are summarised in (Table 1-4).

The demographic details of the paediatric patients are shown in (Table 1). There was no statistically significant gender-based difference among the 420 patients, with 212 (50.5%) being male and 208 (49.5%) being female ( $p > 0.05$ ). Patients were divided into four age groups for the study: <1 year (78 patients, 18.6%), 1-5 years (129 patients, 30.7%), 6-10 years (94 patients, 22.4%), and 11-15 years (119 patients, 28.3%). Immunisation status disclosed of the patients, 344 (81.9%) patients were fully vaccinated, 66 (15.7%) partially vaccinated, and 10 (2.4%) non-vaccinated. Analysis of nutritional status revealed that 263 (62.6%) had adequate nutrition, 123 (29.3%) were malnourished and 34 (8.1%) were overweight.

**Table1: Comprehensive Demographic and Health Analysis of Paediatric Patients**

Variable	Subcategory	Number of Patients (n, %)
Age Group (Years)	<1	78 (18.6%)
	1-5	129 (30.7%)
	6-10	94 (22.4%)
	11-15	119 (28.3%)
Gender	Male	212 (50.5%)
	Female	208 (49.5%)
Vaccination Status	Fully vaccinated	344 (81.9%)
	Partially vaccinated	66 (15.7%)
	Non-vaccinated	10 (2.4%)
Nutritional Status	Malnourished	123 (29.3%)
	Normal	263 (62.6%)
	Overweight/Obese	34 (8.1%)

(Table 2) explores the radiology utilization across different paediatric age groups. Ultrasound was the most often utilised imaging modality among the 420 patients, particularly for infants under 1year old (39 patients, 50.0%) and those between 1-5 years old (87 patients, 67.4%). While CT scans were most frequently performed on adolescents aged 11-15 (62 patients, 52.1%), X-rays were most frequently performed on patients aged 6-10 (64 patients, 68.1%). According to age-specific preferences for diagnostic imaging modalities, there were statistically significant variations in radiology utilisation across age groups ( $p < 0.05$ ). Clinical indications for the use of radiography in paediatric patients are presented in (Figure 1).

**Table 2: Radiology Utilization by Age Group**

Age Group (Years)	Most Common Radiology Procedure	Number of Patients (% of Age Group)
0-1	Ultrasound	39 (50.0%)
1-5	Ultrasound	87 (67.4%)
6-10	X-ray	64 (68.1%)
11-15	CT scan	62 (52.1%)

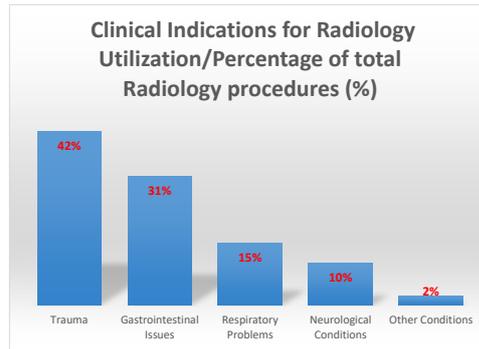


Fig. 1: Clinical Indications for Radiology Utilization

Radiological procedures were most frequently related to trauma (42%), followed by gastrointestinal disorders (31%) and respiratory difficulties (15%). 10% of the cases were neurological, with the remaining 2% for other conditions. The statistical significance ( $p < 0.05$ ) of the distribution of radiology procedures according to clinical indications underscores the significant role of trauma and gastrointestinal disorders in increasing the demand for radiological assessments. (Figure 1). (Table 3) lists the major drug groups that are prescribed to paediatric patients. The most given medications were antibacterials (32.62%), gastrointestinal medications (29.05%) and NSAIDs (25.00%). Cardiovascular medications (5.71%), Central Nervous System (CNS) drugs (9.76%) and miscellaneous categories (4.95%) were among the other drug classes.

**Table 3 : Major Groups of Drugs Prescribed in Paediatric Patients(420)**

Drug Group	Number of Patients (n)	Frequency of Prescription per Case (%)
Gastrointestinal Drugs (GIT)	122	29.05%
Antibacterials	137	32.62%
NSAIDs	105	25.00%
Cardiovascular Drugs (CVS)	24	5.71%
CNS Drugs	41	9.76%
Others	25	5.95%

Prescription frequency differences across drug groups were statistically significant ( $p < 0.05$ ), indicating that antibacterial and gastrointestinal medications are more commonly used in paediatric therapy. The distribution of antibiotic prescriptions among paediatric patients is summarized in (Table 4).

**Table 4 : Distribution of Antibiotic Prescriptions Among Paediatric Patients**

Antibiotic Class	Number of Patients (n)	Percentage of Total Antibacterial Prescriptions (%)
Beta-Lactams	90	64%
Aminoglycosides	22	14%
Quinolones	17	11%
Macrolides	8	7%
Others	5	4%

Prescriptions for beta-lactam antibiotics accounted for 90 (64%) of all antibiotic prescriptions, with aminoglycosides coming in second with 22 (14%), quinolones with 17 (11%), macrolides with 8 (7%) and others with 5 (4%). There was statistical significance ( $p < 0.05$ ) in the variations in usage of antibiotics, highlighting the preference for beta-lactams in the treatment of paediatric diseases.

A comprehensive approach to medical care for children, paediatric healthcare considers each child's distinct physiological, developmental and emotional requirements to promote healthy growth and development<sup>[10,11]</sup>. This study focusses on important aspects such as medication prescription trends, radiology usage and antibiotic use patterns.

**Comprehensive Demographic and Health Analysis of Paediatric Patients:** This study examined the demographics of Paediatric patients and discovered that variables like complete vaccination and adequate nutritional status were very prevalent which is consistent with previous research<sup>[12]</sup>. Studies have demonstrated the benefits of immunization and adequate nutrition for lowering the prevalence of disease and improving children's health<sup>[13]</sup>. These conclusions emphasize the significance of public health programs that aim to improve immunization rates and nutrition to improve Paediatric health outcomes for a variety of communities.

**Radiology Utilization by Age Group:** The study reveals significant differences in radiological procedures. usage among age groups, with younger children using ultrasonography more frequently, while primarily X-rays and CT scans are used for older children. Our results are similar to some previous studies indicating that older patients often require complex imaging procedures like X-rays and CT scans for in-depth assessments, while younger paediatric patients often opt for non-invasive ultrasounds for disease identification<sup>[14,15]</sup>. Concerns over needless radiation exposure have been raised by several studies that indicate a growing tendency of misuse of imaging in paediatric populations<sup>[16]</sup>. Although radiation risks were not particularly covered in this study, the results emphasize the importance of using radiology cautiously and ensuring the imaging is suitable for the patient's age and clinical state to optimize healthcare delivery.

**Clinical Indications for Radiology Utilization:** Our study revealed that trauma and gastrointestinal issues are the most common clinical indications for radiological procedures in paediatric patients and this is similar to earlier studies<sup>[17,18]</sup>. However, due to geographical differences in disease load and clinical procedures, some studies have found a greater reliance on imaging for respiratory diseases<sup>[19]</sup>. Our study highlights the importance of prioritizing radiological resources for disorders with high potential for diagnosis and treatment.

**Major Groups of Drugs Prescribed in Paediatric Patients:** According to this study, the most given drugs class is antibacterials followed by gastrointestinal drugs

and NSAIDs reflecting the typical clinical presentations in paediatric therapy. Similar findings from earlier research have indicated that paediatric groups had a high incidence of antibiotic prescriptions<sup>[20]</sup>. Our findings highlight the significance of evidence-based prescribing practices for optimal therapeutic outcomes and risk reduction, in line with the general trend.

**Distribution of Antibiotic Prescriptions Among Paediatric Patients:** Based on our study, the most often given class of antibiotics were beta-lactams, which were followed by amino glycosides, quinolones, and macrolides. These results coincide with other studies showing that beta-lactams are widely used because of their broad-spectrum action and safety profile in paediatric populations<sup>[21]</sup>. Our findings reveal that people use antibiotics judiciously and opt for safer alternatives like beta-lactams, emphasizing the importance of antibiotic stewardship programs in reducing risks.

**Limitations and Areas for Future Research:** Although this study offers valuable insights on paediatric healthcare practices, it should be noted that it has few limitations. The study's retrospective design limits the capacity to demonstrate the causal relationship between therapeutic procedures and patient outcomes. The study's findings may not apply to larger paediatric populations due to their exclusivity to one institution and individuals with complex medical issues were also not included. Further research should include multicentred prospective studies with a wide range of sample sizes and thorough analyses of the influence of socioeconomic variables on utilisation and outcomes of paediatric healthcare.

### Conclusion

This study highlights the prevalence of immunisations adequate nutrition and age-specific radiological imaging patterns, providing significant insights into paediatric healthcare. The results demonstrate the widespread compliance with immunisation regimens and the typically favourable nutritional condition of children in this region. The age-related patterns in radiological use show that paediatric populations require a customised approach to diagnostic imaging. Furthermore, the most prescribed antibiotics are beta-lactams, which highlights the significance of cautious and efficient use of antibiotics. Future studies should concentrate on improving therapeutic and diagnostic approaches to further strengthen paediatric healthcare.

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