IJPSR (2025), Volume 16, Issue 2 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 18 September 2024; received in revised form, 29 October 2024; accepted, 06 November 2024; published 01 February 2025

A STUDY TO EVALUATE THE PREVALENCE AND PRESCRIPTION PATTERN OF ACUTE GASTROENTERITIS IN PAEDIATRIC PATIENTS IN A TERTIARY CARE HOSPITAL

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Keywords:

Acute gastroenteritis (AGE), Gastrointestinal (GI), Prevalence, Prescription pattern, Prescribing indicators, Oral rehydration solution (ORS)

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ABSTRACT: Background: Acute gastroenteritis is usually considered - a benign disease, remains a major cause of pediatric morbidity and mortality around the world. **Materials and Methods:** An observational cross-sectional study conducted in indoor / outdoor patient department of Pediatrics in Government Medical College and Rajindra Hospital, Patiala for 6 months. Demographic data and complete prescriptions of patients suffering from acute gastroenteritis (age >1month to 6 years) were collected and analyzed by using five World Health Organization Core prescribing indicators. Categorical data was analyzed by chi-square test and quantitative data was analyzed by descriptive method. Prevalence of disease was calculated. **Results:** In total 60 patients, male patients (58.33%) were found to be more infected than female patients (41.67%). In age group of 0-2 years more males 82.86%, and in age group of 2-5 years and 5-6 years more females i.e., 80% and 12%, respectively were found to be infected with acute gastroenteritis. Most prescribed class of drug was drugs acting on gastrointestinal tract (51.46%) followed by fluid & electrolytes (22.7%), antimicrobials (11.6%), vitamins (7.84%) and non- steroidal anti-inflammatory drugs (6.4%). Prevalence of disease was 2.67 %. **Conclusion:** In present study, male patients in age group of 0-2 years were more infected with acute gastroenteritis. Most prescribed class of drug was related to gastrointestinal tract i.e., elemental zinc followed by ORS. In antimicrobials, ceftriaxone was the most prescribed drug.

INTRODUCTION: Acute gastroenteritis is a common cause of morbidity and mortality in infants and children [1]. Acute gastroenteritis denotes to diarrhoea, which is abnormal frequency and liquidity of fecal discharges i.e., > 3 loose stools per day [2]. Gastroenteritis in pediatric group accounts for approximately 10 % of pediatric deaths and is the second cause of death globally.

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.16(2).522-30

This article can be accessed online on www.ijpsr.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.16(2).522-30

The most common cause in infants younger than 24 months is rotavirus, and after the age of 24 months, Shigella shifts it to second most common. The most affected pediatric population is children under 5 years of age, and diarrhoeal episodes occur more commonly in Asia and Africa, attributes 80% of annual incidence [3].

Recently, United Nations International Children's Emergency Fund (UNICEF) revealed that deaths among children under 5 years of age, are mostly due to malnourishment (45%), Pneumonia (15%) diarrhoea (8%), malaria (5%) and others (9%). Besides, diarrhoea is the major cause of malnutrition that confers third major cause of

mortality under five especially in developing countries [4]. Further, worldwide 1.7 billion children are affected by diarrhoea and out of that more than half millions of children die annually. Five countries India, Nigeria, Congo, Pakistan, and China together accounts for half of the diarrhoea related deaths among children (i.e. 4.249 million) in year 2008 [5].

The treatment of Acute gastroenteritis includes rehydration; anti-infective therapy; additional treatment of diarrhoea to abate its duration and severity; and nutritional therapy [1]. According to recommendations of the Indian Academy of Pediatrics (IAP) National Task Force (2006), low/reduced osmolarity ORS should be prescribed for all ages in all types of diarrhoea along with zinc supplementation (20 mg/day for >6 months and 10 mg/day for younger than 6 months) for 2 weeks. Despite the efforts of the Government of India and IAP to raise awareness among medical practitioners regarding suitable therapy of this disease, irrational use of drugs is prevalent [6]. WHO guidelines precisely discourage the use of antibiotics for treatment of acute diarrhoea as these are not effective in many diarrhoeal episodes, with non-bacterial etiology. Use of antibiotics for non-bacterial illnesses leads to antimicrobial resistance, rise healthcare costs, and may cause increased morbidity [7].

Therefore, it is important to encourage and improve prescription behaviour of physicians for effective control of acute gastroenteritis. Hence, this study was conducted with the objectives to evaluate the prevalence and prescription pattern of acute gastroenteritis in paediatric patients in our institute at Rajindra Hospital, Patiala, Punjab.

MATERIALS AND METHODS:

Study Design: It was an observational cross-sectional study.

Study Site: This study was conducted in indoor and outdoor patient department of Pediatrics in Government Medical College and Rajindra Hospital, Patiala, Punjab, India.

Study Duration: This study was conducted over a period of 6 months from the date of approval from Ethics Committee of Government Medical College and Rajindra Hospital, Patiala.

Study Population: Children who were suffering from acute gastroenteritis with age >1 month to 6 years.

Inclusion Criteria:

1. Children of either gender and age >1 month to 6 years.
2. Children with complaints of acute diarrhoea.
3. Children's parents who gave written informed consent.

Exclusion Criteria:

1. Children suffering from other Gastrointestinal diseases.
2. Children are admitted in neonatal intensive care units.
3. Patients have insufficient data or records.

Data Collection: All the demographic data and complete prescriptions of children (patients) suffering from acute gastroenteritis admitted in the Pediatrics indoor department or attended outdoor patient department collected on predesigned semi-structured proforma. Thus, prescriptions of patients were analyzed by using five WHO Core prescribing indicators [8] *i.e.*

1. Average number of drugs per prescription.
2. Percentage of drugs prescribed by generic name.
3. Percentage of prescriptions with an antibiotic prescribed.
4. Percentage of prescriptions with an injection prescribed.
5. Percentage of drugs prescribed from an Essential Medicine List [8].

Prevalence of acute gastroenteritis was calculated by number of cases of a disease that were present in a pediatric population at a given time.

Prevalence = Person with the given health indicator during specified time period / Population × 100

Study Procedure: All the acute gastroenteritis patients attended the Pediatric indoor or outdoor department were screened according to inclusion/exclusion criteria. Patients who were eligible for study, enrolled after explaining the aim

of the study. Written informed consent was obtained from each patient's parents. Prior approval of Institutional Ethics Committee, Hospital superintendent and from the head of the Pediatric department was obtained. Patient's demographic details, chief complaints, history, diagnosis, and prescribed drugs were collected from prescription slips and medical records of the patients and documented in suitably designed data collection form. Prevalence of the disease was calculated.

Statistical Analysis: Data analyzed by using IBM SPSS 22 version. Quantitative data analyzed by descriptive method as mean and standard deviation. Categorical data analyzed by Chi square test.

RESULTS AND DISCUSSION:

TABLE 1: BASIC DEMOGRAPHIC CHARACTERISTICS OF STUDY POPULATION (N=60)

Domains	Variables	Number of Patients (n)	Percentage (%)
Age	0-2 Years	39	65%
	2-5 Years	14	23.33%
	5-6 Years	7	11.67%
	Total	60	100%
	Mean±SD	2.12±1.81	
	Median	1.42	
	Range	3 Months 6 Years	
Gender	Female	25	41.67%
	Male	35	58.33%

TABLE 2: DISTRIBUTION OF CHILDREN BASED ON DIFFERENT AGE GROUP AND GENDER IN STUDY POPULATION

Age (Years)	Female		Male		X^2	p value
	Patients	Percentage	Patients	Percentage		
0-2 Years	10	40%	29	82.86%		
2-5 Years	12	80%	02	5.71%		
5-6Years	03	12%	04	11.43%	45.257	0.028(S)
Total	25	100%	35	100%		

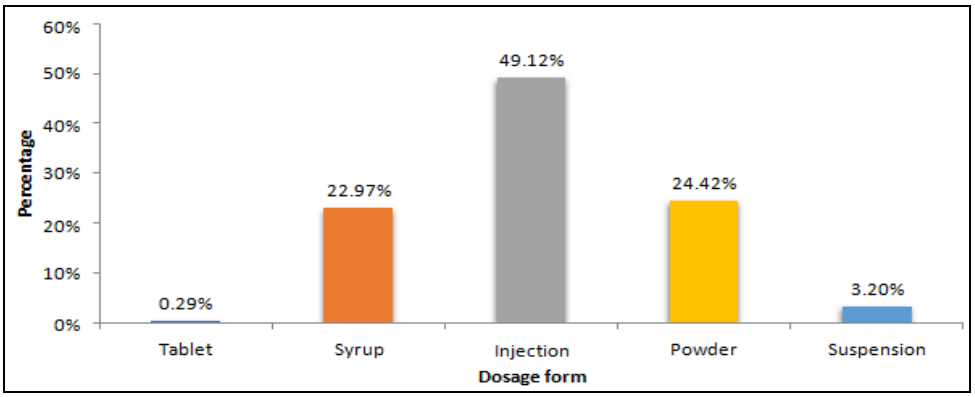

FIG. 1: DISTRIBUTION OF DOSAGE FORMS PRESCRIBED IN STUDY POPULATION

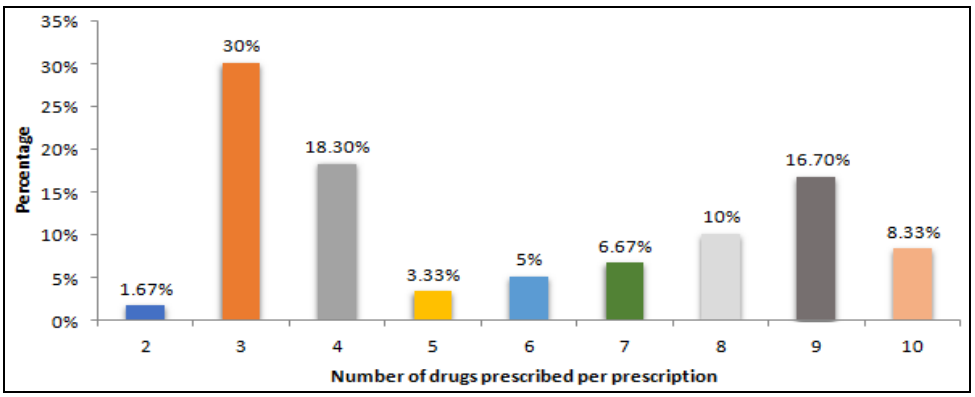

FIG. 2: DISTRIBUTION OF DRUGS PRESCRIBED PER PRESCRIPTION IN STUDY POPULATION

TABLE 3: VARIOUS CLASS OF DRUGS PRESCRIBED AS POLYTHERAPY IN STUDY POPULATION

Various Class of drugs	Name of drugs	Frequency	Percentage
Antimicrobials [Total = 40 (11.6%)]	Ceftriaxone	26	7.56%
	Cefixime	5	1.45%
	Cefotaxime	2	0.58%
	Cefpodoxime	2	0.58%
	Ofloxacin + Metronidazole	2	0.58%
	Nitazoxanide	3	0.87%
Drugs Acting on GI [Total = 177 (51.46%)]	Elemental Zinc	51	14.82%
	ORS	47	13.66%
	Ondansetron	24	6.97%
	Ranitidine	02	0.58%
	Lansoprazole	02	0.58%
	Dicyclomine + Simethicone	02	0.58%
	Pantoprazole	01	0.30%
	≥4 Probiotics combination + Zinc	24	6.97%
	Probiotic (Single ingredient)	24	6.97%
Fluid & Electrolytes[Total = 78 (22.7%)]	Ringer Lactate	08	2.32%
	Normal Saline	14	4.10%
	DNS/2	28	8.14%
	KCl	28	8.14%
NSAID's	Paracetamol	22	6.40%
Vitamins and Minerals	Vitamin K	27	7.84%
Total		344	100%

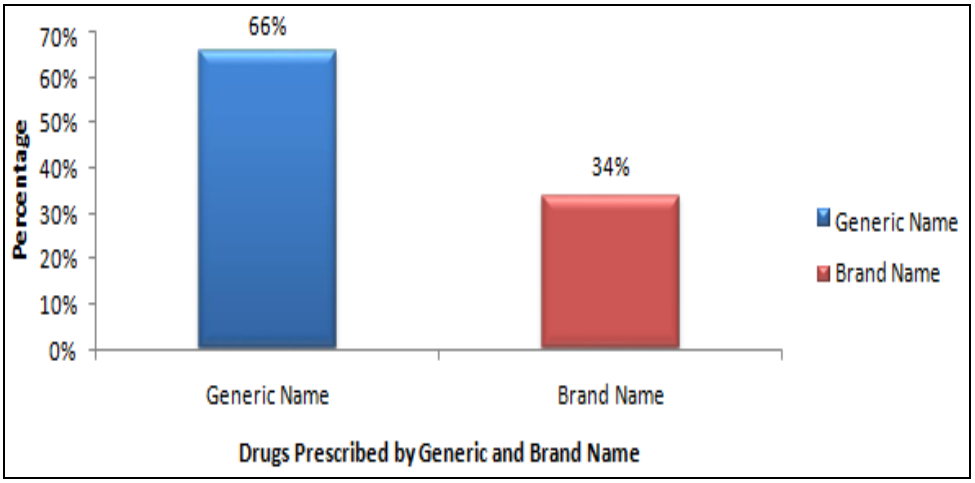

FIG. 3: DISTRIBUTION OF DRUGS PRESCRIBED BY GENERIC AND BRAND NAMES IN STUDY POPULATION

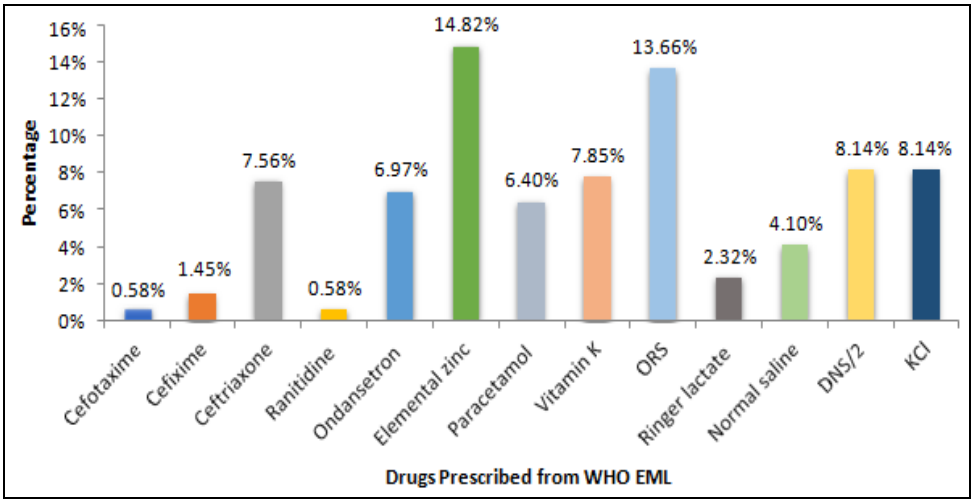

FIG. 4: DISTRIBUTION OF DRUGS PRESCRIBED FROM WHO ESSENTIAL MEDICINE LIST[9] = 82.6%

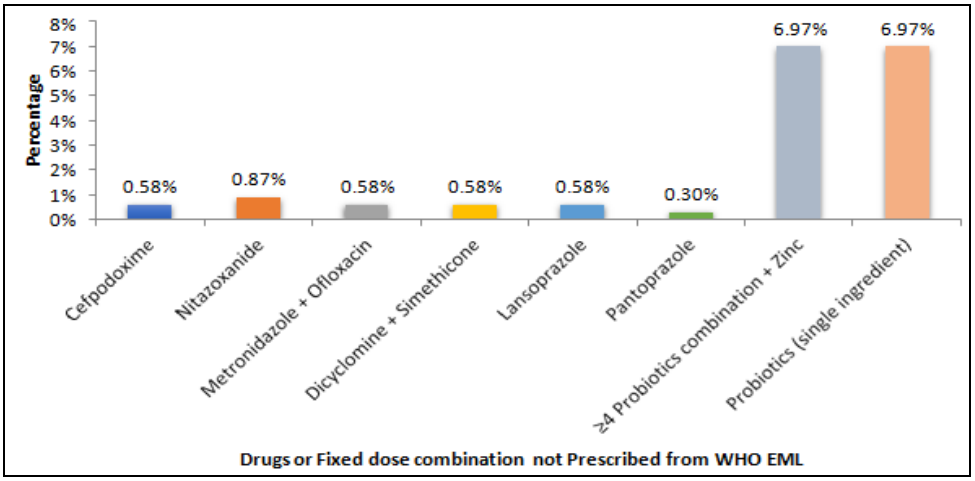

FIG. 5: DISTRIBUTION OF DRUGS OR FIXED DOSE COMBINATIONS NOT PRESCRIBED FROM WHO ESSENTIAL MEDICINE LIST[9] = 17.4%

TABLE 4: PRESCRIPTION PATTERN ANALYSIS BASED ON WHO PRESCRIBING INDICATOR'S[8]

Sr. no.	Name of the indicator	Result	Standard values [10]
1.	Average number of drugs per prescription	5.7	1.6 –1.8
2.	Percentage of prescriptions with an antibiotic prescribed	11.6%	20.0 – 26.8%
3.	Percentage of prescriptions with an injection prescribed	49.12%	13.4 – 24.1%
4.	Percentage of drugs prescribed by generic name	66%	100%
5.	Percentage of drugs prescribed from an Essential Medicine List	82.6%	100%

DISCUSSION: This was an observational cross-sectional study conducted in outdoor and indoor patient department of Paediatrics in Government Medical College and Rajindra Hospital, Patiala, Punjab, India, over a period of 6 months. Patients were enrolled according to inclusion and exclusion criteria. The demographic data and complete prescriptions of children suffering from acute gastroenteritis was collected and analyzed for prescription pattern. Prevalence of the disease was calculated.

Basic Demographic Characteristics of Study Population (n=60):

Age: The present study results showed that the mean age of the patients was 2.12±1.81 years. Majority of the patients (65%) were present in age group of 0-2 years **Table 1**. A study done by Abera MG *et al*, also showed that acute gastroenteritis (AGE) was most prevalent in children (25%) aged between 12 and 23 months i.e. 1 and 2 years old [11]. A study conducted by Ahmed MC *et al*, also showed that hospitalizations with diarrhoea in most of the children (31%) {Pre-vaccine Diarrhea/total hospitalizations N (%) i.e. 1159/3733 (31%)} were in the age group of 1 year < 2 years [12].

Gender: In this study, male patient's percentage was more as compared to females. i.e., 58.33% and 41.67%, respectively **Table 1**. A study conducted by Ahmed MC *et al*, also showed that majority of the patients were males (22.6%) than females (18.7%) [12]. A study done by Efunshile AM *et al*, showed that most of the children included were males (61.4%) than females (38.6%) [7].

Distribution of Children Based on Different Age Group and Gender: In present study, in the age group of 0-2 years most of the patients were male children (82.86%), in age group of 2-5 years and 5-6 years the percentage of females was more i.e., 80% and 12%, respectively; which shows the statistically significant difference in age group and gender of children infected by acute gastroenteritis (p=0.028) **Table 2**.

A study done by Kombat MY *et al*, also showed that diarrhoea was more prevalent in males (13.4%) as compared to females (9.7%). And most of the children (17.8%) with diarrhoea were present in the age group of 12 – 23 months or 1 year to <2 years [13].

Primary Objectives:

Prevalence of Acute Gastroenteritis (AGE) in Study Population:

-Patients (Children) with AGE = 60.

-Total Population (children) visited in Paediatrics department during present study = 2250.

Prevalence = Person with the given health indicator during specified time period/ Population × 100

i.e. 60/2250 × 100 = 2.67%

In present study, prevalence of acute gastroenteritis in study population was found to be 2.67%. According to National Family Health Survey- 4 (2015-2016) of Punjab and India, the prevalence of diarrhoea in children under age 5 years in both urban and rural areas was 6.6% [14] and 9.2% [15], respectively. And in the recent National Family Health Survey- 5 (2019-2021) of Punjab and India, the prevalence of diarrhoea in children under age 5 years in both urban and rural areas, is 4.9% [16] and 7.3% [17], respectively. A study conducted by Fenta A et al, and Chari S *et al,* presented that the prevalence of diarrhoea among children under five years was 14.5% [18] and 25.1% [19], respectively.

In this study, acute gastroenteritis with no dehydration was found in 40 children, with some dehydration in 4 children, with some dehydration associated with Protein Energy Malnutrition (PEM) in 6 children, and with severe dehydration associated with PEM in 10 children. A study was carried out by Ahmed F *et al,* showed that signs of no dehydration was found in 80.5% children, some dehydration in 14.3% and signs of severe dehydration in 5.2% children [20], which is not in accordance with our study results.

Prescription Pattern:

Distribution of Dosage forms: In present study, among 344 drugs prescribed, the most prescribed dosage form was injection i.e 49.12% and least prescribed was tablet i.e., 0.29% **Fig. 1**. A study conducted by Kaimal MR *et al,* also showed that injection (55.2%) was the most common prescribed dosage form and tablets (4.5%) were the least prescribed dosage form in study population [21], which is comparable with our study results.

Distribution of Drugs Prescribed per Prescription: In this study, total 344 drugs were prescribed in 60 patients. Mean number of drugs prescribed was 6.00±2.74. It was observed that maximum number of drugs *i.e.,* 10 drugs were prescribed in 8.33% (n=5) patients, followed by 9 drugs in 16.7% (n=10) patients, 8 drugs in 10% (n=6) patients, 7 drugs in 6.67% (n=4) patients, 6 drugs in 5% (n=3) patients, 5 drugs in 3.33% (n=2) patients, 4 drugs in 18.3% (n=11) patients, 3 drugs in 30% (n=18) patients and 2 drugs was prescribed only in 1.67% (n=1) patients **Fig. 2**.

So, based on results of prescription pattern evaluation, polypharmacy (use of multiple medications or average of ≥ 2 active ingredients per patient [22]) was observed in present study. A study conducted by Sontakke SD *et al,* showed that in their study maximum number of drugs *i.e.,* 5 drugs were prescribed in 2 prescriptions followed by 4 drugs in 13 prescriptions, 3 drugs in 108 prescriptions, 2 drugs in 76 prescriptions and 1 drug in only 1 prescription [23], which is not comparable with our study results.

Distribution of Various Class of Drugs Prescribed as Polytherapy: This study results showed that various class of drugs were prescribed in polytherapy; where most commonly prescribed class of drug was drugs acting on GI (51.46%) in which most commonly prescribed drug was elemental zinc (14.82%) followed by ORS (13.66%), ondansetron (6.97%), ≥ 4 probiotics + zinc combination (6.97%), probiotics (single ingredients) (6.97%), ranitidine (0.58%), lansoprazole (0.58%), dicyclomine + simethicone combination (as fixed dose combination) (0.58%) and pantoprazole (0.3%), respectively. After GI drugs, second most prescribed class of drugs was fluid & electrolytes (22.7%); where DNS/2 (8.14%) and KCL (8.14%) equally were most prescribed followed by normal saline (4.1%) and ringer lactate (2.32%), respectively **Table 3.**

Third most common prescribed class of drugs was antimicrobials (11.6%); in which most common prescribed drug was ceftriaxone (7.56%) followed by cefixime (1.45%), nitazoxanide (0.87%), cefotaxime (0.58%), cefpodoxime (0.58%) and ofloxacin + metronidazole (0.58%), respectively. Fourth most prescribed class of drugs was vitamins; in which only vitamin K was prescribed (7.85%). And least commonly prescribed class of drugs was non-steroidal anti-inflammatory drugs (NSAID's); where paracetamol was prescribed 6.40% **Table 3.**

A study conducted by Kesavan A *et al,* showed that ORS, Zinc, and antibiotics were used in 70.5%, 59% and 51.5%, respectively. The use of intravenous fluid (17%), pre/ probiotics (8.1%) and antisecretory drugs (6.8%) was less [24], which is not like the present study results. A study done by Ogbonna BO *et al,* showed that most common medication prescribed was Zinc (27.8%), followed by ORS (25.4%), followed by probiotic, *S. boulardii* (18.6%), antimicrobials ciprofloxacin (14.1%), cefixime (5.6%), azithromycin (2.4%), cefpodoxime (1.8%), amoxicillin + clavulanic acid (1.0%), clarithromycin (0.3%) and antiemetic (2.4%) [25], which is not in accordance with our study results.

Distribution of Drugs Prescribed by Generic and Brand Names: In present study, total 344 drugs were prescribed; out of which 66% (227) drugs were prescribed by generic names and 34% (117) drugs were prescribed by brand names **Fig. 3**. A study conducted by Mengistu G *et al,* showed that most of the drugs (88.3%) [26] were prescribed by generic names. These results are on the higher side as compare to our study results.

Distribution of Prescribed Drugs Based on WHO Essential Medicine List [9]: In our study, out of 344 drugs, 82.6% (284) drugs were prescribed from WHO essential medicine list (EML); in which most frequently prescribed drug was elemental zinc (14.82%) followed by ORS (13.66%). Other drugs which were prescribed from WHO essential medicine list are shown in **Fig. 4**. There was total 17.4% (60) drugs which were not prescribed from WHO essential medicine list; where most frequently prescribed drug was ≥4 probiotics + zinc combination (6.97%) followed by probiotics (single ingredients) (6.97%), equally. Other drugs which were not prescribed from WHO essential medicine list are shown in **Fig. 5.**

Prescription Pattern Analysis Based on WHO Prescribing Indicator's [8]: In present study, average number of drugs prescribed per prescription was 5.7. The percentage of prescriptions with an antibiotic and an injection prescribed was 11.6% and 49.12%, respectively. Percentage of drugs prescribed by generic name and from an WHO essential medicine list was 66% and 82.6%, respectively **Table 4**. A study conducted by Bhaveshaikh N *et al,* showed that in their study average number of drugs per prescription was 6.33, percentage of prescriptions with an antibiotic was 78.07% and with an injection was 97.11% and percentage of drugs prescribed by generic name was 1% [27] only, these results are not in accordance with our study results. A study done by Mishra A *et al,* showed that mean number of drugs per prescription was 4.587%, percentage of prescriptions with an antibiotic prescribed 65.217% and with an injection prescribed was 95.65%, percentage of drugs prescribed by generic name was 4.028% and from national list of essential medicines was 100% [28], which are not comparable to present study.

Secondary Objectives:

Most Common used Drugs in Acute Gastroenteritis: in present study, most common prescribed drug related to gastrointestinal tract was elemental zinc, in fluid & electrolytes- DNS/2 and KCl, in antimicrobials- ceftriaxone, in vitamins- vitamin K and in non-steroidal anti-inflammatory drugs- paracetamol.

A study conducted by Kaimal MR *et al,* also showed that zinc was the most prescribed GI related drugs in children with diarrhoea [21]. Many studies like Kaimal MR *et al,* and Bhaveshaikh N *et al,* showed that ceftriaxone was the most prescribed antibiotic in acute gastroenteritis in paediatric population [21, 27].

CONCLUSION: The present study was conducted in North India in the Malwa region of Punjab (Patiala) over the period of 6 months. From results of this study, following conclusions were drawn:

- Acute gastroenteritis was more prevalent in age group of 0-2 years of male patients.
- Prevalence of acute gastroenteritis in study population was found to be 2.67%.
- Most common dosage form used was injection (49.12%).
- Average number of drugs per prescription was 5.7.
- Most prescribed class of drug was drugs acting on gastrointestinal tract (51.46%); in which

most common was elemental zinc (14.82%) followed by ORS (13.66%).

- Most common antimicrobial was ceftriaxone (7.56%).
- Drugs prescribed by generic name were 66%.
- Drugs prescribed from WHO essential medicine list were 82.6%.
- Polypharmacy was found in prescription pattern.

Present study concluded that Prescription pattern is adhering to guidelines for management of diarrhoea issued by the Government of India and the Indian Academy of Pediatrics *i.e.*, zinc and ORS. There is need to promote the rational use of medicines by preventing polypharmacy, and prescribing more drugs by generic names and from the essential medicine list.

Limitations of Study: The main limitations of this study are the small sample size and short study duration.

ACKNOWLEDGEMENT: I sincerely thank and acknowledge Dr. Vijay Kumar, Professor and Head, Department of Pharmacology and Dr. Harjinder Singh, Associate Professor, Department of Pediatrics, Government Medical College and Rajindra Hospital, Patiala for consistently guiding me in completion of this research work.

Funding: No external funding was received for this research work.

Ethical Approval: Institutional Ethics Committee (IEC) approval number- NO.TRG.9 (310)/2019/2254

CONFLICTS OF INTEREST: The authors have no conflict of interest regarding the publication of this paper.

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How to cite this article:
Raju M, Kumar V, Singh H and Kaur J: A study to evaluate the prevalence and prescription pattern of acute gastroenteritis in paediatric patients in a Tertiary Care Hospital. Int J Pharm Sci & Res 2025; 16(2): 522-30. doi: 10.13040/IJPSR.0975-8232.16(2).522-30.