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A Cross-Sectional Study to Assess Prevalence and Management of Acute Gastroenteritis in Pediatric Inpatients of A Large Teaching Hospital

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ABSTRACT
BACKGROUND: *In India, diarrheal diseases are the second leading cause of child mortality (20%) after acute respiratory infections (30%). Indian Academy of Pediatrics (IAP) 2006 recommendations about low osmolarity ORS with zinc supplements, antimicrobials in dysentery, antiemetics in severe vomiting, lactobacillus strains as probiotic and awareness generation among care givers about the disease for the management of acute gastroenteritis in children should be followed for further improvement in management and prevention of AGE.*

METHODOLOGY: *A retrospective cross sectional study involving analysis of prescriptions of pediatric inpatients diagnosed and treated for acute gastroenteritis, using prevalence and patient profile documentation forms for a study period of 6 monthsi.e from July 2013 to December 2013.*

RESULTS: *Of the total 210 inpatients, AGE was common in males (53.6%) than compared to female (46.6%) patients. AGE was most prevalent in children less than 2 years (81.4%). 69% of the patients suffered from some dehydration, 19% from severe dehydration and 12% with no dehydration. There were 2.8% cases of dysentery, 3.8% had their stool culture proven to be protozoal and 7.14% cases of secondary lactose intolerance. The hospital shows adherence to recommendations of IAP, 2006 i.e. P>0.005 except antimicrobials i.e. 78.1% (p < 0.001).*
CONCLUSION: *The study demonstrates that hospital shows adherence to almost all the recommendations of IAP except antimicrobials. Persistence of fever >38ºC and diarrhea for more than 3 days was the common parameter for prescribing antimicrobials empherically and prophylactically.*

KEYWORDS: *Acute gastroenteritis, Pediatrics, Prevalence, Management, IAP 2006, Patient awareness.*

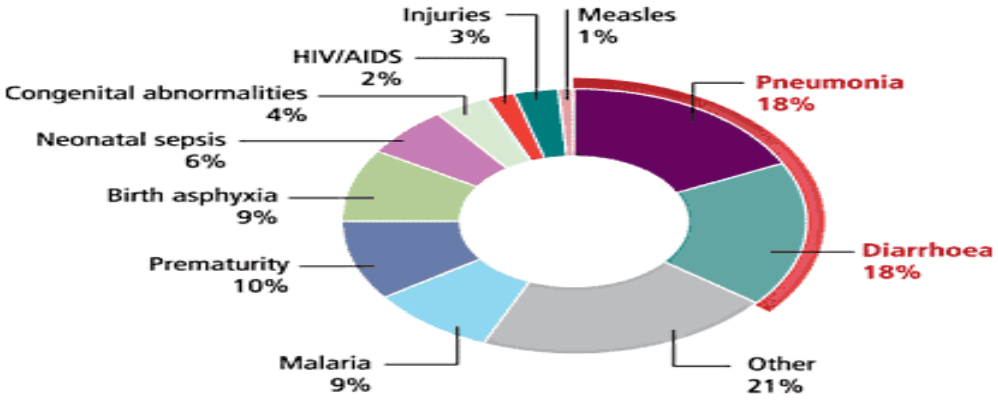
I. INTRODUCTION

Acute gastroenteritis (AGE) or acute enteritis refers to diarrhea, which is abnormal frequency and liquidity of fecal discharges i.e. more than three loose stools per day. Diarrhea is caused by many different infectious or inflammatory processes in the intestine. These processes directly affect enterocyte secretory and absorptive function.[1]Acute gastroenteritis i.e. acute inflammation of gastrointestinal tract involves both the stomach ("gastro") and the small intestine ("entero") resulting in some combination of diarrhea with vomiting, fever and abdominal pain. In children, viral pathogens such as Rotavirus accounts for 70-80% of all diarrheal episodes globally, 20-30% is due to bacteria and only 0-5 % is due to other parasites. These enteropathogens get transmitted in the body via contaminated food or water, unhygenic conditions like lack of hand hygiene and travel to endemic areas etc. Sometimes seafood, dairy, poultry and bakery products also results in acute gastroenteritis. [2][3]

Epidemiology : Acute Gastroenteritis (AGE) though often considered a benign disease, remains a major cause of pediatric morbidity and mortality around the world, accounting for 1.87 million deaths annually in children younger than 5 years i.e. roughly 19% of all child deaths.[4]

Scenario in Developing Countries : According to World Health Statistics 2011, the prevalence of Diarrhoea accounts for 18% in developing Countries **(FIGURE 1).**

FIGURE 1: Prevalence of Diarrhoea in developing countries



Rotavirus alone causes two million hospitalizations and 600000- 875000 deaths per year. Young children are affected the most, experiencing 3 to 10 episodes of diarrhea per subject per year, a rate that decreases to one episode annually for children over five years of age and adults. Deaths are usually as a result of dehydration, but malnutrition also plays an important role which increases the incidence and severity of diarrhea, as well as other infections. [2]

Scenario in Hyderabad, India:

According to recent study conducted in Hyderabad, A.P/Telangana, by IHS, 150 cases of Acute Gastroenteritis were reported during the survey with an overall weekly incidence of 22.23 per 1000 population (CI ± 3.50). Incidence was significantly higher in slum areas compared to non slum areas. Slum areas of Moinbhag (39.53 ± 10.30) and Serilingampalli (40.11 ±14.6) reported highest incidence rates. 57% of the cases were females. 13.33% of the cases were under five years of age group. Nearly 50% of the cases were in the 5-24 years age group. [5]

Management of acute gastroenteritis

Oral rehydration therapy (ORT): Oral rehydration therapy (ORT) involves giving water with modest amounts of sugar and salts i.e. Oral rehydration solution (ORS) with the aim of preventing or treating dehydration. A key element of ORT is that water is still absorbed from the gastrointestinal tract into the body, even with loss of fluid through diarrhea or vomiting. The WHO has also recommended a range of acceptable ORS formulations **(TABLE 1)** [6, 7]

TABLE 1: The current recommendation for of ORS by WHO

Constituents	mmol/L
Sodium	75
Chloride	65
Glucose, anhydrous	75
Potassium	20
Citrate	10
Total osmolarity	**245**

Intravenous (IV) fluids : In case of severe dehydration or shock or failure of ORT or the child is vomiting leading to inadequate ORT, the IV fluids are given, these usually includes, Normal Saline (NS) i.e. 0.90% w/v of sodium chloride(NaCl), Half-normal saline (N/2) i.e. 0.45% NaCl, Ringers lactate (RL) i.e. each 100 mL RL USP contains Sodium Chloride 0.6 g; Sodium Lactate 0.31 g, Potassium Chloride 0.03 g; Calcium Chloride Dihydrate 0.02 g, Water for Injection qs and Dextrose Normal Saline (DNS) i.e. D5W (5% dextrose in water i.e. 278 mmol/L dextrose, D5NS (5% dextrose with 0.90% w/v of NaCl) and D5 1/2NS (5% dextrose with 0.45% w/v of NaCl). An initial IV bolus of 20-50ml/kg is given in first 30-60mins with reassessment and repeat if necessary and then the maintenance fluids are given over 8 hrs depending on severity of dehydration. ORS (about 5 ml/kg/hour) is continued along with IV fluids as soon as the child is able to take orally. [1, 8, 9]

Role of potassium chloride (KCL) in rehydration : A 20meq /L of KCL is added to IV infusion of NS or DNS , usually 3-5ml of KCL, once the child begins to urinate to provide needed potassium cation (K+), as extracellular fluid contains low levels of K+(3.5-4.5meq/L) and 80% of K+ is lost in urine and the deficiency of either K+ or CL will lead to deficiency of the other electrolytes .Each mL of KCL ,USP ,contains 2 mEq (150 mg) of KCL. The 24 hour total dose should not exceed 200mEq/L. [10]

Probiotics : Probiotics are "viable mono- or mixed culture of microorganisms which confers beneficial affects to the host by improving the properties of the indigenous microflora." [11] It is recommended that probiotics be considered as adjunctive therapy, as they have been shown to reduce the duration of diarrhea and reduction in risk of having a protracted diarrhea and reduction of duration of hospitalization by one day . The commercial oral preparations contain following probiotics strains:

- Strains of Lactobacillus ,most commonly ,Lactobacillus Rhamnosus (LGG)
- Saccharomyces boulardii
- Bacillus clausii
- a mixture including L. bulgaricus, S. thermophiles, L. acidophilus and B. bifidum

It has been demonstrated that only Lactobacillus rhamnosus (LGG) at a dose of at least 10^{10} colony forming units per day (CFU/day) for 5 to 7 days was effective in reducing duration and severity of diarrhea. The effect is highly significant among patients with watery diarrhea and viral gastroenteritis, but not among those with invasive bacterial diarrhea. It is very important to see that LGG strain is present as its evidence of efficacy is more compared to other probiotic preparations. [12][13]The risk for bacteremia and sepsis after LGG ingestion has been reported in some case reports involving infants and children with severe underlying diseases such as short-gut syndrome, prematurity, cerebral palsy and cardiac surgical diseases. [11, 14, 7]

Zinc supplements: Zinc deficiency is common in developing countries. In May 2004, WHO and UNICEF issued a joint statement, recommending the incorporation of zinc supplementation together with new low osmolarity ORS as the most effective approach to managing diarrhea. With complete implementation of these new recommendations, it has been estimated that almost 90% of diarrhea deaths could be prevented. [15] Zinc improves the absorption of water and electrolytes, improves regeneration of the intestinal epithelium, increases the levels of brush border enzymes and enhances the immune response, allowing for a better clearance of the pathogens. Acceptable zinc salt formulations are Zinc sulfate, Zinc acetate and Zinc gluconate.

- In infants (under 6 months): 10 mg daily for 10 – 14 days
- In children (6 months - 5 yrs): 20 mg daily for 10 -14 days. [7,16, 17]

Dosing of Zn, >40mg can pose certain risks. Too much zinc will probably interfere with absorption of other essential minerals in the body like iron, magnesium, and copper .Oral zinc sulfate supplements can also cause side effects such as stomach upset, heartburn, and nausea. Rare side effects include fever, sore throat, mouth sores, weakness, and fatigue. [18, 19, 20]

Antimicrobials : Most infectious causes of diarrhea in children are self-limited. It is recommended that antimicrobial therapies not be used except for cases of culture-proven pathology. [7, 20, 21,22].Antibiotic treatment is recommended for only some bacterial and parasitic causes of diarrhea **(TABLE 2).** Management of viral and most bacterial causes of diarrhea is primarily supportive and consists of correcting dehydration and managing secondary complications resulting from mucosal injury. [1, 7, 23, 24, 25]

TABLE 2: Antibiotic therapy for infectious diarrhea

ORGANISM	TREATMENT	COMMENT
Salmonella typhi, Salmonella paratyphi	Ampicillin, chloramphenicol, TMP-SMZ, cefotaxime, ciprofloxacin	Invasive, bacteremic disease (typhoid fever or enteric fever)
Nontyphoidal Salmonella	Usually none (if ≥ 3 months old); Ampicillin, cefotaxime, ciprofloxacin	Treatment indicated if < 3 months old, malignancy, sickle cell disease, HIV/AIDS, or evidence of nongastrointestinal foci of infection is present
Shigella	Children: Third-generation cephalosporin, TMP-SMZ	High prevalence of resistance to amoxicillin
Escherichia coli		
Enterotoxigenic	Usually none if endemic; TMP-SMZ or ciprofloxacin for traveler's diarrhea	Prevention of traveler's diarrhea with bismuth subsalicylate, doxycycline, or ciprofloxacin
Enteroinvasive	TMP-SMZ, Ampicillin if susceptible	

Enteropathogenic	TMP-SMZ or aminoglycoside	
Enterohemorrhagic	Usually none	No treatment if HUS is suspected
Enteroaggregative	TMP-SMZ or an aminoglycoside	
Campylobacter jejuni	Mild disease needs no treatment; erythromycin or azithromycin for diarrhea; aminoglycoside, ciprofloxacin, meropenem, or imipenem for systemic illness	If started early (days 1-3), treatment reduces symptoms and fecal organisms
Yersinia enterocolitica	None for uncomplicated diarrhea;TMP-SMZ; gentamicin or cefotaxime for extraintestinal disease	Value of treatment of mesenteric lymphadenitis with antibiotics is not established
Vibrio cholera	Tetracycline, doxycycline, TMP-SMZ	Fluid maintenance crucial
Clostridium difficile	Oral metronidazole, oral vancomycin	C. difficile is agent of antibiotic-associated diarrhea
Entamoeba histolytica	Metronidazole[§] followed by iodoquinol to treat luminal infection	Treatment determined by degree of tissue invasion
Giardia lamblia	Metronidazole, quinacrine, furazolidone, others	Furazolidone as oral liquid
Cryptosporidium parvum	azithromycin /paromomycin & octreotide in persons with HIV/AIDS	A serious infection in immunocompromised persons

Antiemetics : It is recommended that antiemetics not be routinely used in the management of children with AGE. [26] However, vomiting from gastroenteritis is distressing to patients and their families. In addition, many physicians believe that vomiting is a contraindication to ORT. Physicians who provide care to pediatric patients in the emergency department (ED) consistently favor intravenous fluid (IVF) for mild or moderate dehydration when vomiting is the major symptom. [27] The most commonly prescribed antiemetic drugs are:

- **Ondansetron:** It is a serotonin 5-HT_3 receptor antagonist, trials in emergency department settings support the use of ondansetron to reduce vomiting associated with gastroenteritis and dehydration. [28][29] It is given 15-30min before commencement of rehydration therapy as for 1-2 days followed by *sos* (as and when) required at a dose depending upon age of child as, 6 months to 1 year: 1.6 mg, 1-3years old: 3.2mg, 4-12 years old: 4mg **.Maximum dose :**16 mg/ day**.**

Note: On 9/15/2011, the U.S. FDA notified the healthcare community that ondansetron may increase the risk of developing prolongation of the QT interval of the electrocardiogram. [30]

- **Domeperidone:** It is a dopamine antagonist. Its antiemetic effect is due to a combination of gastrokinetic effects and antagonism of central dopamine receptors in the chemoreceptor trigger zone. **Dosing:** Infants and children (<12 years of age and weighing less than 35kg :0.25 – 0.5 mg/kg three to four times per day with a maximum daily dose of 2.4 mg/kg, Maximum dose: 80 mg per day). [31,32]

Others: Promethazine was the most commonly prescribed antiemetic agent for children as recently as 2003, with metoclopramide, trimethobenzamide, and prochlorperazine prescribed less frequently. However, widespread use of these medications became controversial because of reports of important adverse effects, including sedation and extrapyramidal reactions. These concerns caused the FDA to recommend against the use of promethazine in children younger than 2 years and many pediatricians have stopped using these antiemetic medications in all children. [26, 27]

Antipyretics : Diarrhea in children is commonly caused by viral organisms and is usually not considered as a major source of fever than compared to bacterial cause like infection with species of Salmonella, Campylobacter, Shigella, Yersinia, or toxic strains of Escherichia coli. The final diagnosis can be made only by obtaining stool cultures. Reduction of fever is used to help comfort the child as well as provide for the optimal examination conditions. [33].NSAIDS (Non Steroidal Anti inflammatory Drugs) like Acetaminophen (10-15mg/kg every 6^{th} hourly) and Ibuprofen (10mg/kg/6^{th} hourly) have both been used for fever control during diarrhea. These drugs are sometimes alternated to achieve an overlapping period of fever control. Some studies suggest that acetaminophen may reduce fever more quickly, while ibuprofen may have a longer-lasting effect on fever reduction. In a study of children aged 6 months to 6 years whose fever could be managed at home (37.5-41°C) Hay et al, found that the use of acetaminophen and ibuprofen improved time without fever during the first 4 hours and was superior to acetaminophen alone, but not ibuprofen alone.[34][35]

Other drugs

- **Racedotril with ORS**: Racecadotril, an antisecretory given as 1.5 mg/kg 3 times daily was found to effective in both rotavirus-positive and rotavirus-negative infants and children. Racecadotril is an oral enkephalinase inhibitor for use in the treatment of acute diarrhoea. Racecadotril (100 to 200mg 3 times daily for 2 to 4 weeks) was superior to placebo at relieving chronic diarrhoea in patients with HIV infection. It is a prodrug that is rapidly absorbed from the gut and hydrolyzed in the plasma to its active metabolite thiorphan which facilitates the antisecretory activity. But there is less strong evidence for effectiveness of Racedotril in acute diarrhea. [37][38]

- **Drugs to treat diaper rash:** Diaper rash is common in diarrhea as stools become acidic. Zinc based ointment for local application was found to be effective in treating diaper rash.

- **Antidiarrheal and Antimotility drugs :** Antidiarrheal drugs like kaolin-pectin and antimotility drugs like loperamide, metoclopramide , diphenoxylate etc are usually not recommended in the management of acute diarrhea in children due lack of benefit and increased risk of side effects like drowsiness, and nausea. [7,39,40]

Rotavirus vaccine :It is live, attenuated oral vaccine indicated for immunization in infants and children for rotavirus gastroenteritis prophylaxis which stimulates antirotavirus IgA antibodies and replicates in small intestine and induces immunity. CDC recommends routine vaccination of infants with either RotaTeq or Rotarix vaccines to infants and young children with severe rotaviral diarrhea. [41, 42]RotaTeq is given as 3 Dose Regimen, total of three 2 mL doses are administered orally, first dose given at 6-12 weeks of age and subsequent doses are administered at 4-10 week intervals and third dose should not be given after 32 weeks of age. [43][44]Rotarix is given as 2 dose regimen, total of two 1 mL doses administered orally, first dose at the beginning at 6 weeks of age and second dose after an interval of at least 4 weeks and prior to 24 weeks of age. [45, 46]Onset of action was seen as antirotavirus IgA antibodies noted 1-2 months in 77-87% of infants after 2 doses administered for Rotarix and after 3 doses in 93-100% of infants for RotaTeq. [47]

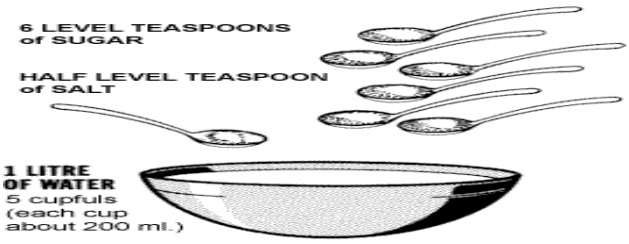
Suspected adverse events after administration of any vaccine may be reported to Vaccine Adverse Events Reporting System (VAERS), 1-800-822-7967 within 42 days of any dose as:>10%: Diarrhea (24.1%), Vomiting (15.2%), Otitis media (14.5%) Fever (17-43%), Fussiness/irritability (3-52%) .The risks versus benefits of the available vaccines need to be evaluated for each individual patient. It is generally accepted that the benefits of the vaccines significantly outweigh the risks of the vaccines including that of intussusceptions. [48, 49, 50]

Awareness about the disease: For control of diarrheal diseases, the main strategy should be awareness generation among the mothers, particularly those with low literacy levels, regarding the importance of early initiation of management. [59] Parents should be instructed to look for the various signs of dehydration like:

- less or no urine output in 8-12 hours
- dry mucous membranes
- absence of tears
- sunken eyes
- unusually drowsy or change in mental status
- extreme thirst
- skin pinch goes back slowly

Parents should be educated about making ORS at home (**FIGURE 2)** and to seek medical attention if above signs of dehydration are seen and oral intake is inadequate or if child develops worsening abdominal pain, fever >101°F or prolonged diarrhea lasting longer than 14 days. Adequate parents teaching about do's and don'ts is needed.

Figure 2: Making ORS at home



Take 1 liter of boiled and then cooled drinking water in a big bowel. Add 6 teaspoons of sugar add ½ teaspoon of salt. Stir the mixture until salt and sugar dissolves completely and feed to the child with the help of spoon or cup throughout the day as accepted by the child. If needed, prepare a fresh ORS solution after every 24hour. [51, 52, 53]

II. OBJECTIVES

The present study will be carried out :

- To assess the prevalence of acute gastroenteritis in inpatient department of pediatrics, among different age groups.
- To assess the management to evaluate adherence to standard treatment guidelines given by Indian Academy of Pediatrics, 2006.

III. JUSTIFICATION

Diarrhoea accounts for 20% of all pediatric deaths in India. Despite WHO recommendations and IAP treatment guidelines (2006), only few children suffering from acute diarrhoea in India receive low osmolarity ORS along with zinc from health care providers. The main aim was to determine the levels of adherence to IAP treatment guidelines for the management of acute diarrhoea in children up to 18 years and further to explore the factors affecting irrational prescribing of antibiotics and other drugs. [6, 7, 8, 9]

IV. PLAN OF WORK

- Review of IAP guidelines 2006 and evidence based recommendations on management of acute gastroenteritis in pediatrics.
- Assess the prevalence
- Collect the case sheets of pediatric in patients diagnosed and treated for acute gastroenteritis.
- Statistical analysis of data collected and documentation of results

V. MATERIALS AND METHODOLOGY

Study Site: Inpatient department of pediatrics, Princess Esra Hospital, old Hyderabad, Telangana, India.
Princess Esra hospital (Owaisi group of hospitals) is a large teaching that has a very well defined team of dedicated doctors, Para-medical staff backed by the latest technologically advanced equipments to offer high standards of patient satisfaction. It has filled the long pending demand of the people of Hyderabad by providing the best medicare services at the down to earth prices irrespective of their economic status.

Study duration: Study was carried out for a period of 6 months i.e. from July 2013 to December 2013.

Study design: A single-centered retrospective cross-sectional analysis, to assess the prevalence and management of AGE in hospitalized children.

Sample size: 210 pediatric inpatients diagnosed and treated for AGE were enrolled during the duration of 6 months i.e. July 2013 to December 2013.

Source of Data: The prevalence data of AGE in children was documented using the prevalence demographic profile form. The data from the discharged case sheets of pediatric inpatients diagnosed and treated for AGE to assess the management.

Study criteria: The study criteria were designed before collecting the discharged case sheets of the pediatric inpatients suffering from AGE.

Inclusions criteria:

- Patients diagnosed with acute gastroenteritis.
- Pediatric inpatients of age 3 months to 18 years.

Exclusions criteria:

- Patients diagnosed with comorbid conditions like AGE with LRTI (lower respiratory tract infections).
- Previously diagnosed disorders those affecting major organ systems (congenital heart disease).
- Diarrhea due to chronic OR metabolic disorders.

VI. STATISTICAL ANALYSIS

The data obtained was statistically analyzed taking each objective as a variable and accordingly central tendency measures (mean) and percentages were calculated and represented graphically using MS excel sheets.

Pearson's chi square test, one way and two way was applied, to the frequencies of the different variables to illustrate adherence to standard care i.e. IAP recommendations , 2006, for management of AGE in pediatric patients.

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

O = the frequencies observed

E = the frequencies expected

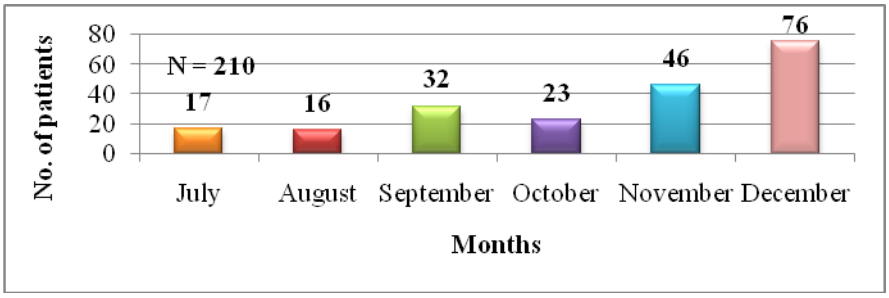
$\sum$ = the 'sum of'

VII. IAP RECOMMENDATIONS, 2006

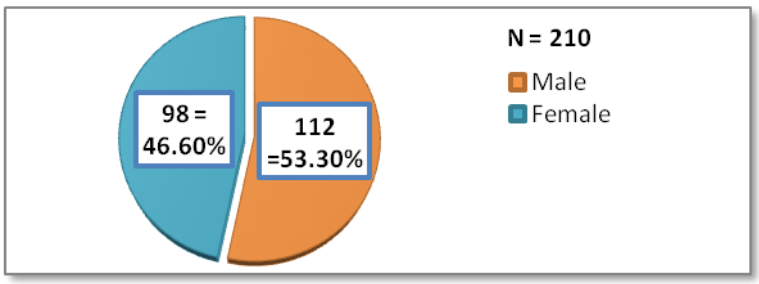
S.NO	MANAGEMENT	RECOMMENDATIONS
1	ORT	Universal WHO recommended low osmolarity i.e. 245mosmol/L ORS in all children of different age groups and in all types of diarrhea.
2	Zinc supplements	≤ 6 months:10 mg/day for 14 days ≥6 month-5 yrs:20mg/day for 14 days To be started during the period of diarrhea and continued upto 14 days even after cessation of diarrhea, in children older than 3 months.
3.	Probiotics	Insufficient evidence to recommend in treatment of acute diarrhea except certain strains of Lactobacillus species.
4.	Antiemetics	To be given only in presence of severe vomiting as it interferes with ORS intake. Domperidone is the safest with no central nervous system side effects and should be given as 0.1-0.3 mg/kg/dose.
5.	Antibiotics	To be prescribes only in presence of bloody diarrhea, septicemia, systemic infection, severely malnourished children and only after a stool culture. The drug of choice depends on microbial etiology.
6.	Antisecretory drugs (Racedotril),Antimotility drugs (ex:metaclopromide)	No strong evidence of effectiveness. Not recommended in diarrhea and sometimes contraindicated as they may worsen diarrhea

VIII. RESULTS

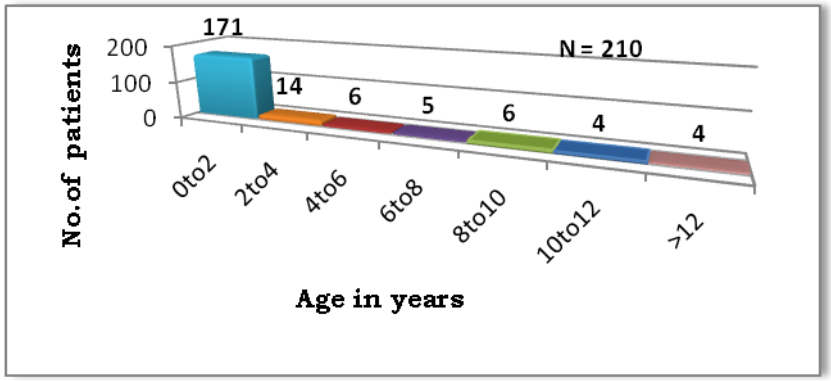
The prevalence of AGE from July 2013 to December 2013.



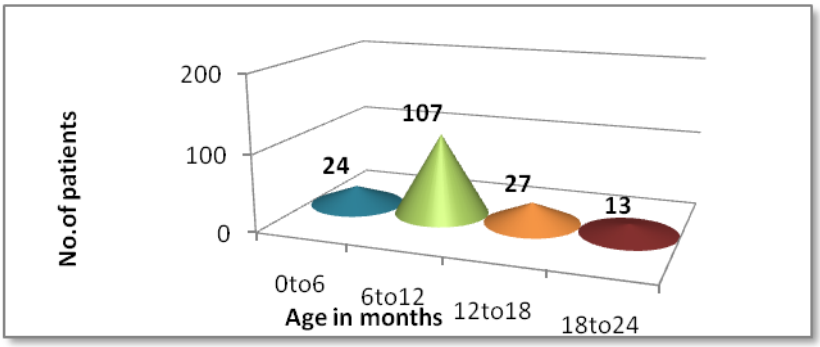
The prevalence of AGE according to gender



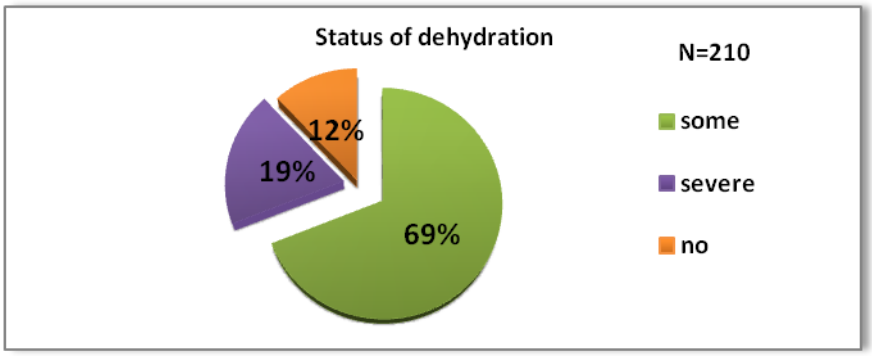
The prevalence of AGE in children of different age groups



Prevalence of acute gastroenteritis in children less than 2 years



Status of dehydration in the hospitalized children (Some/Severe/No dehydration)



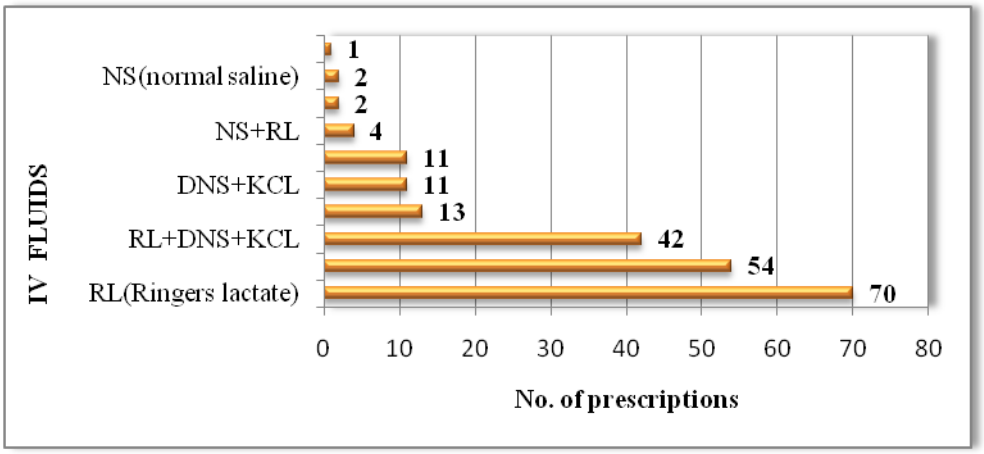
The chief complaints/symptoms seen in the patients

Symptoms	No.of patients (N=210)
Diarrhoea	210
Vomiting	136
Fever	150
Abdominal pain	12
Diaper rash	38
Sunken eyes	34
Decreased urination	18
Decreased skin turgor	16
Dry tongue	15

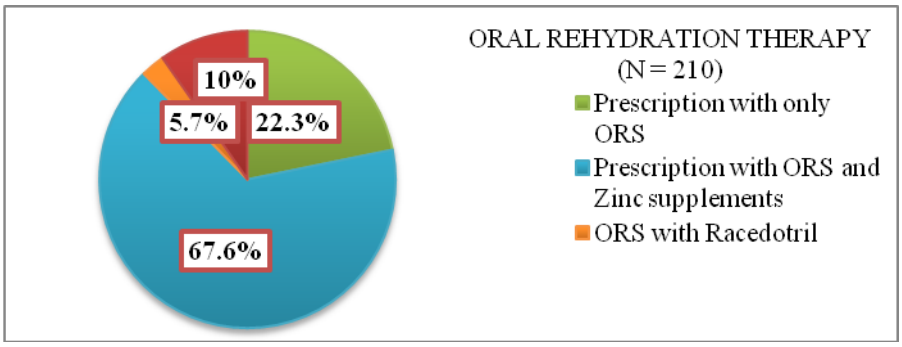
Drug distribution/Drug prescribed in the management of AGE

S.no	Drugs	No.of patients (N=210)
1	IV fluids	210
2	ORT (ORS)	189
3	Antimicrobials	210
4	Probiotics	187
5	Antiemetics(s)	136
6	Zinc supplements	142
7	Antipyretics	150
8	Lactose free infant formula	15
9	Racecadotril	12
10	Diuretic(Furosemide)	4
11	Antispasmodic (colic aid, dicyclomine)	10
12	Antireflux (pantoprazole, ranitidine, sucralfate)	15(7+4+4)
13	Vitamin B complex	8
14	Calcium+ Vitamin D3	5
15	Vitamin D3	4
16	KCL (potassium chloride)	12
17	Chloroquine	3
18	Multivitamins(MVT)+Multiminerals syrups	18
19	Zinc based ointments(to treat diaper rash)	38

Intravenous fluids prescribed



Oral rehydration therapy prescribed

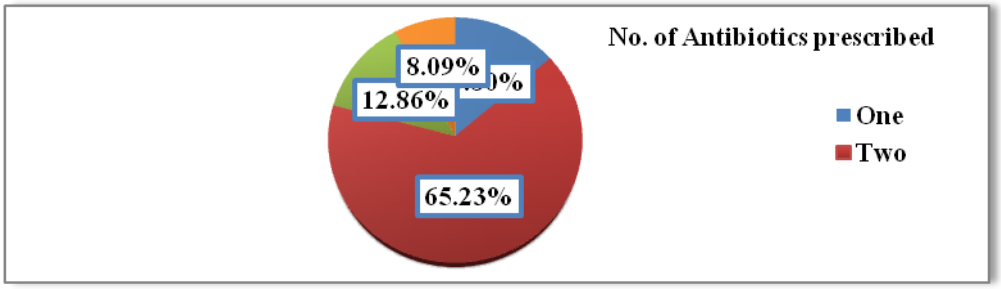


Oral Rehydration Therapy prescribed and their dosage regimen

ORT	No.of prescriptions	Dosage regimen
ORS prescribed as small sachets	140	The dose prescribed for all the available ORT was, as much as accepted by the patient. ORS prescribed as small commercial powder sachets to be dissolved in 200ml water before administration.
ORS prescribed as commercial liquid	49	
	Total = 189	

		The duration of ORT i.e. average no of days = 4 days

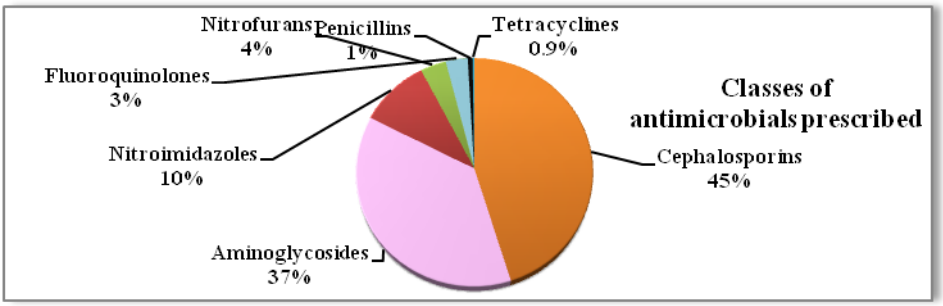
Number of antibiotics prescribed in the prescriptions



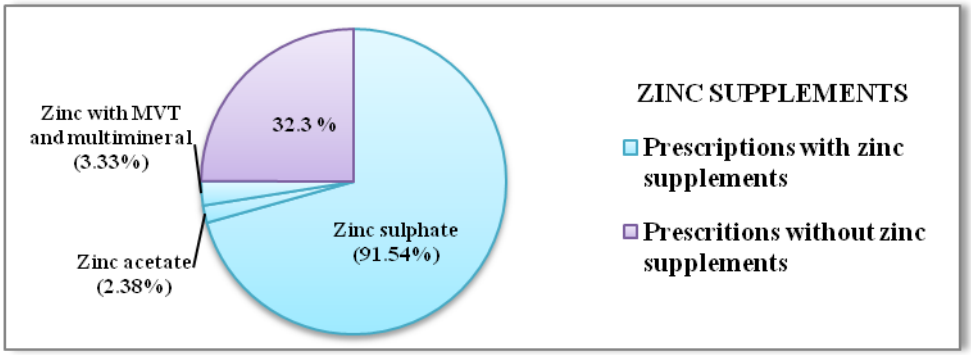
Antibiotics prescribed and their dosage regimen

Antibiotics prescribed	No.of prescriptions	Dosage regimen
Cefotaxime +Amikacin	110	The doses prescribed are given as: ➢ Cefotaxime, IV injection in dose of 50mg/kg, BD. ➢ Amikacin, IV injection in dose of 15mg/kg, BD. ➢ Metronidazole ,15-30mg/kg, BD as: • IV infusion with normal saline • Oral suspension available as 100mg/5ml • Oral syrup in combination with furazolidone. ➢ Furazolidone, as oral syrup in combination with metronidazole in a dose of 1.25 mg/kg, BD. ➢ Ceftriaxone, IM/ IV inj in dose of 50mg/kg, BD. ➢ Ofloxacin, as 50mg/5ml suspension was administered as 5ml, BD. ➢ Doxycycline, as oral suspension 25mg/5ml given as 2.2 mg/kg, BD. ➢ Piperacillin + Tazobactum was administered as IV injection as 100mg/kg, BD. ➢ Average duration of administration of all antibiotics was 5 days.
Cefotaxime	26	
Ceftriaxone + Amikacin	19	
Cefotaxime +Amikacin +Metronidazole	17	
Ceftriaxone+ Amikacin+ Metronidazole +Furazolidone	9	
Ceftriaxone +Amikacin+ Ofloxacin+ Metronidazole+ Furazolidone	7	
Ceftriaxone +Metronidazole	4	
Ofloxacin+ Inj Metronidazole	4	
Cefotaxime+ Amikacin+ Ofloxacin	3	
Ceftriaxone	3	
Ceftriaxone +Amikacin +Ofloxacin	4	
Amikacin +Metronidazole +Piperacillin +Tazobactum	2	
Cefotaxime +Amikacin +Doxycycline	1	
Cefotaxime +Amikacin +Metronidazole + Piperacillin +Tazobactum	1	
	Total = 210	

Classes of antimicrobials prescribed



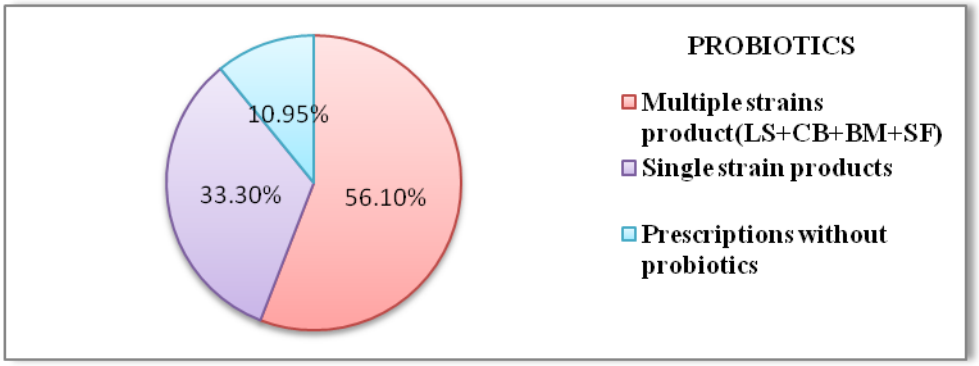
Zinc supplements prescribed



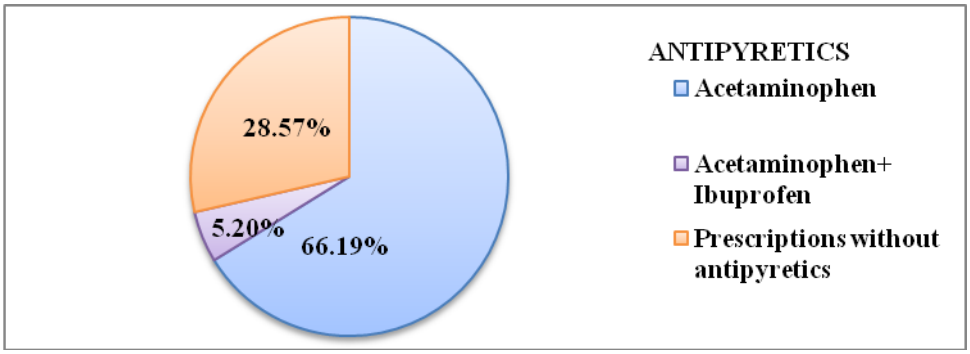
Probiotics prescribed

Probiotic strain (s)	No.of prescriptions	Dosage regimen
Multi strain product(s):	117	The probiotics were prescribed as : • < 1 year, ½ sachet , BD • >1 year , 1 sachet , BD To be dissolved in small amount of water or milk before administration For , Average no days of administration during hospital stay = 4 days
Lactobacillus sporogenes (LS) : 50 million cells, clostridium butyricum(CB): 2 million cells, bacillus mesentericus (BM) T-OA: 1 million cells, streptococcus faecalis (SF) T-110:30 million cells/0.5 g. (BIFILAC®)		
Single strain product(s):		
Lactobacillus : 1250 million spores. (DAROLAC ®)	3	
Bacillus clausii: 2 thousand million / 5ml Oral suspension. (ENTEROGERMINA ®)	12	
Lactic acid bacillus: lactobacillus sporogenes: 1500 lakhs (SPORLAC ®)	7	
Lyophilized Saccharomyces boulardii : 282.5mg (ECONORM®)	10	
Lactic Acid Bacillus: 150 Million Spores + Zinc Sulphate eq. to elemental. Zinc = 10 mg (SPOROLAC Z ®, DAROLAC Z ®)	38	
	Total = 187	

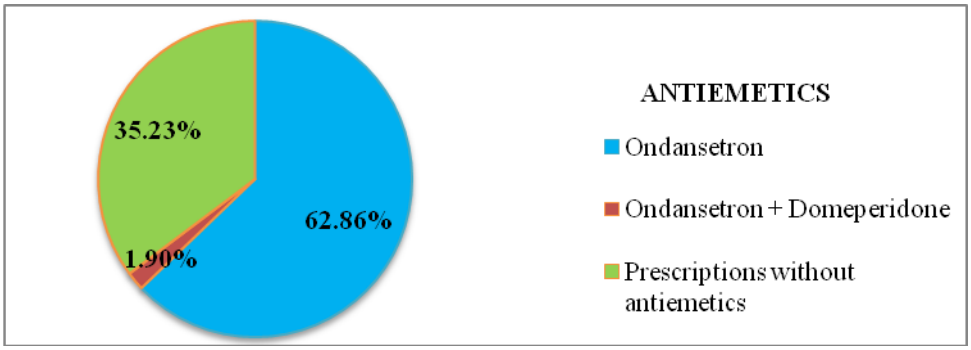
Probiotics Prescribed



Antipyretics prescribed



Antiemetics prescribed



Management of secondary lactose intolerance

Diagnosis	No .of patients (out of 210)	Management
Secondary lactose intolerance	9 = 4.28% of 210 cases	A Lactose free milk formula (ZEROLAC®) containing soy protein isolate and maltodextrin, to be taken for some days, was prescribed as substitute dairy milk.

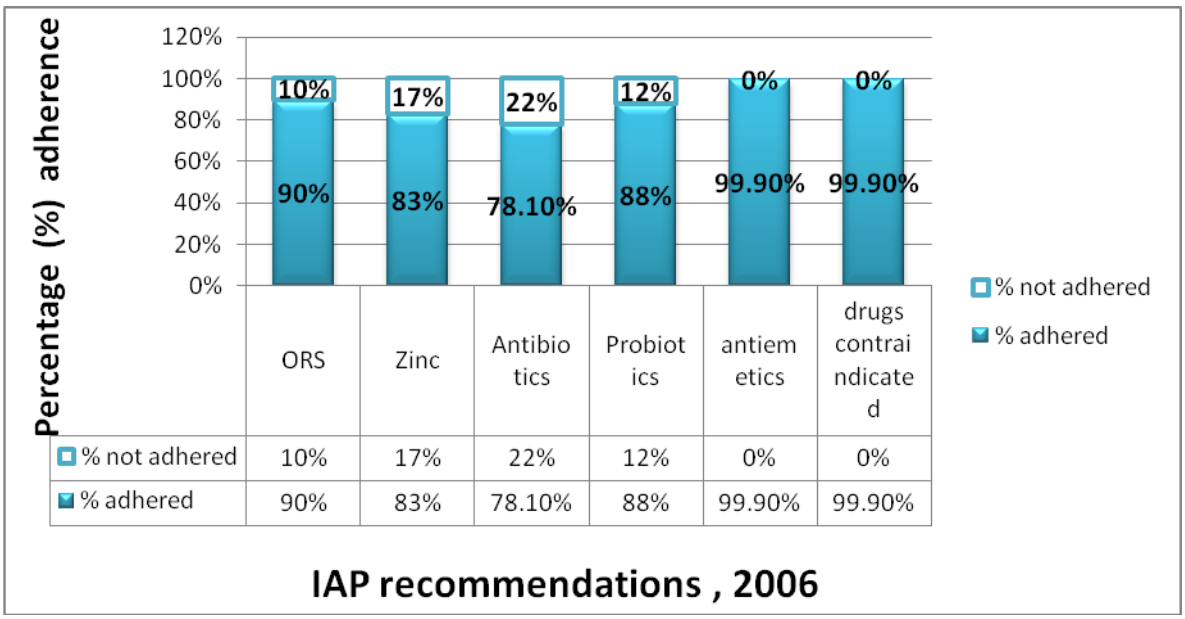
Management of dysentery bloody diarrhoea and amoebic dysentery

Diagnosis	No.of patients (out of 210)	Management
Bloody diarrhoea	4	Amicrobials prescribed were antibiotics. out of 6 prescriptions: • Cefotaxime +amikacin + metronidazole combination was prescribed in 3 • Cefotaxime +amikacin + metronidazole+ piperacillin+ tazobactum in 1 • cefotaxime+ metronidazole in 1 • Ceftriaxone + amikacin in 1 Duration of administration was for average of 6 days,
Amoebic dysentery	2	
	Total = 6 = 2.8%	

Adherence to IAP, 2006

S.no	Management	Observed frequency (O_f)	Expected frequency (E_f)	$\chi^2 = \Sigma \frac{(Of - Ef)^2}{Ef}$	*P* values	% adherence
1	WHO recommended low osmolarity ORS for all ages in all types of diarrhea.	189	210	2.1	=0.147 df = 1	90
2	Zinc supplement to be prescribed to children < 5 yrs along with ORS.	142	171	4.9	<0.0167 df = 1	83
3	Antibiotics to be prescribed only in presence of bloody diarrhea systemic infection, severely malnourished and in culture proven etiology.	164	210	10.07	<0.001 at df = 1	78.1
4	Probiotics to be strains of Lactobacillus	165	187	2.58	=0.1082 df = 1	88
5	Antiemetics to be given only in presence of severe vomitings.	136	136	0	=1.000 df = 1	99.9
6	Drugs contraindicated or not to prescribed i.e. antisecretory, Racedotril and anti motility drugs like metoclopramide	210	210	0	=1.000 at df = 1	99.9

Figure, Adherence to IAP 2006



IX. DISCUSSION

Prevalence: In the present retrospective cross sectional study, the prevalence and management of acute gastroenteritis in the pediatric inpatients was evaluated in a total of 210 patients. During the study it was found that prevalence of AGE was common in males (53.6%) than compared to female (46.6%) patients. AGE was most prevalent in children of age less than 2 years i.e. out of 210 patients, 171 (81.4%) patients were under 2 years of age. Among the children under 2 years, AGE was more prevalent i.e. 50.9% in children of age 6 months to 12 months. The frequency of AGE in children was more in the month of December (76 out of 210) i.e. during initial winter season which probably indicates viral etiology i.e. rotavirus is suspected. The etiology of infectious AGE cannot be known due to lack of stool culture reports as stool culture is not routinely recommended (since AGE is considered to be viral in 70% of the cases) and moreover patient's inaffordibility for the cost of stool culture. Out of 210 patients 2.8% were diagnosed to be suffering from dysentery 3.8% had their stool culture proven to be protozoal and in 93.3% did not go for stool analysis , the reason behind this was patient's inability to afford for the stool analysis . It was found that 69% of the patients suffered from some dehydration, 19% suffered from severe dehydration and only 12% were with no dehydration, but still hospitalized due to inadequate oral rehydration so as to avoid severe dehydration.

Management i.e. Adherence to IAP, 2006: The treatment given to the pediatric inpatients suffering from AGE involved a large number of drugs like drugs recommended in the management of AGE in children and other adjuvant therapies given to manage the patients according to their symptoms.The drugs given to manage AGE in pediatrics inpatients include IV fluids, ORT, zinc supplements, antiemetics, probiotics, antimicrobials and other adjuvant therapies. The IV fluids were prescribed to all the hospitalized children; most commonly prescribed was Ringer's Lactate (33.3%).The ORT prescribed was low osmolarity WHO recommended ORS i.e. 245 mosmol/L along with IV fluids to all the pediatric inpatients of different age groups.Zinc supplements (zinc

sulphate=91.54%) were prescribed to all the children less than 5 years of age along with ORS which shows full compliance (99.9%) with IAP guidelines, 2006, that ORT with zinc is superior to ORT alone. Antiemetic most commonly prescribed was ondansetron (94%) in patients suffering from severe vomitings. Other antiemetic prescribed was domperidone (6%). IAP recommends domperidone is the safest antiemetic with no central nervous system side effects, a single dose of domperidone at a dose of 0.1-0.3 mg/kg in children with severe vomiting is recommended. Probiotic most commonly prescribed starting from the day of admission, was a multistrain product. IAP considers strains of Lactobacillus species with stronger evidence of effectiveness compared to other strains. It was found that out of 89 % prescriptions containing probiotics 88.23% comply with the guidelines. Patients suffering from fever due to AGE were managed through NSAIDS like acetaminophen (66.19%), was most commonly prescribed, sometimes in combination with Ibuprofen (5.02%).

Antimicrobials administered mainly included antibiotics. Third generation Cephalosporins (45%) (Cefotaxime and ceftriaxone), aminoglycoside like amikacin (37%) and antiprotozoal like metronidazole (10%) (Sometimes in combination with furazolidone, 4%) were commonly prescribed.

Treatment with two antibiotics was 65.23%; Cefotaxime in combination with amikacin was most commonly prescribed to treat all types of acute diarrhea. Antibiotics were prescribed for usually 5 to 7 days i.e. on average for 6 days. Adjuvant therapies like drugs to treat diaper rash (18.1%), antispasmodics (4.7%) i.e. colic aids to relief abdominal pain were prescribed. Prescribing multivitamin and multiminerals (20%) was found to be irrational; and formulations with iron supplements will impair absorption of zinc, however this was justified, to be prescribed in underweight/malnourished children at the time of discharge. Diuretic like furosemide was prescribed in 4 cases to treat peripheral and facial edema due to IV fluid overload. Antireflux drugs (5.23%) like pantoprazole and ranitidine were prescribed irrationally in children >5 years. Lactose free formula was prescribed in children with secondary lactose intolerance (7.14%) during diarrhea.

X. CONCLUSION

It was found that the hospital shows adherence to almost all treatment guidelines given by IAP, 2006 at a non significant P value i.e. > 0.005 except antimicrobials which shows significant non adherence i.e. P value was found to be < 0.001.However persistent diarrhoea and fever i.e. > 38 C for more than three days and patient inability to afford for stool culture were the reasons for prescribing antibiotics empherically and prophylactically. According to IAP, to control the diarrheal diseases; the main strategy should be awareness generation of treatment guidelines among practioners and about the importance of early initiation of management among care givers, mothers, particularly those with low literacy levels. During the study it was found that parents of the care givers had a poor knowledge about the disease, hence information leaflets were prepared under guidance of the head of the department, pediatrics and distributed to the patients at the time of discharge so as to create awareness about the disease like diet to be given during diarrhea, importance of ORS, zinc supplements to be continued upto 14 days and precautions to be taken like benefits of breast feeding to infants up to age of 6 months, ill effects of bottle feeding, importance of hand hygiene and rotavirus vaccination at 6, 10 and 14 weeks to prevent AGE in future , as recurrent AGE makes children malnourished.

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Conflict of interest: The authors declares that they don't have any conflict of interest

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