

Acute Diarrhoea Management in Emergency; Influencing Antibiotic Prescribing Patterns

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ABSTRACT

Background: Medical students are taught the internationally accepted approach to acute diarrhoea, viz. adequate fluid and electrolyte replacement is the fundamental management of acute diarrhoea. Antibiotics should be restricted to specific indications, such as acute dysentery. Despite the well known rationale, there has been a high rate of prescription of antibiotics for acute diarrhoea presenting to Emergency.

Methods: The pre and post intervention data was collected in the following way. All Emergency case records were routinely scrutinized in the Dept of Family Medicine after discharge with the exception of cases that were admitted to the wards. All cases with a discharge diagnosis fitting the clinical criteria of acute diarrhoeal syndrome: diarrhoea, gastroenteritis, dysentery and cholera were separated, analysed and recorded sequentially.

Results: Initially doctors were prescribing antibiotics for 52.8% of case of non-bloody diarrhoea. In the 2nd intervention period there were few cases, but it is remarkable how few were prescribed antibiotic (20%) while the survey of prescribing habits was underway. In the 3rd intervention period when an education

event took place, it was the peak of the diarrhoea season. Prescribing increased somewhat to 29%. In the 4th intervention a letter was sent out to the doctors describing the results so far, and pointing out the lower prescribing by “senior doctors”. The overall changes in prescribing behaviour after the educational interventions were statistically significant. The reduction in prescribing noted when comparing intervention 1 and intervention 4, is highly significant (antibiotic $p < 0.0001$, anti-protozoal $p < 0.0001$). In the 5th intervention period when appropriate prescribing was no longer actively promoted, the rate of prescribing increased again to 41.4% of cases. A similar pattern is noted for antiprotozoal prescribing. The increase in prescribing noted in the 5th period was still less than in the 1st period (antibiotic $p = 0.041$, anti-protozoal $p = 0.055$). The increase in prescribing from periods 4 to 5 was significant. (Antibiotics $p < 0.0001$, anti-protozoal $p = 0.012$).

Keywords: Antibiotics, Diarrhoea, *Vibrio cholera*

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INTRODUCTION

Acute infective diarrhoea is a common cause of presentation in the hospital setting. Every medical student is taught that the majority of cases are self-limiting, requiring only fluid and electrolyte management.¹ Antibiotics are not necessary unless there are specific indications. It is also widely taught that overuse of antibiotics and inappropriate prescribing of them is contributing to the world wide problem of antibiotic resistance. However, it is observed that in the Emergency Department of BP Koirala Institute of Health Sciences, the majority of cases of acute diarrhoea are in fact prescribed one or more antibiotics. Why is this prescribing behaviour of recently graduated doctors at odds with their training? Is there evidence for or against the prescribing or non-prescribing of antibiotics in this situation? Can the prescribing behaviour of the doctors be modified by an educational intervention?

Adults vs. Children

The approach to acute diarrhoea management in adults and children is very similar, but with a more cautious approach to the management of children, especially very small infants where antibiotic therapy may be indicated earlier or where there are signs of systemic toxicity. Essential elements in the management of the child with acute diarrhoea are the provision of oral rehydration therapy and continued feeding to all and the use of antimicrobials only for those with bloody acute diarrhoea, suspected cholera, or serious non-intestinal infections. The caretakers of young children should also be taught about feeding and hygiene practices that reduce diarrhoea morbidity.² The use of zinc supplementation has recently been shown to be of benefit in cases of childhood diarrhoea.³

In the case of adults, Kumar and Clark provide a table concerning use of antibiotics in acute bacterial gastroenteritis. They recommend that antibiotics are indicated in most cases of dysentery, all cases of cholera, cases of watery diarrhoea with severe symptoms, prolonged illness, elderly and immuno-compromised patients. Treatment of confirmed Salmonella, Campylobacter and Shigella cases is rarely needed but may be given where symptoms are not improving. Antibiotic

treatment of Shigella cases decreases the severity and duration of diarrhoea and possibly reduces the risk of further transmission.

Most cases of *Clostridium difficile* required treatment unless symptoms have resolved.⁴ In addition; the use of antimicrobials adds to the cost of treatment, increase risks of the adverse reactions and enhances the development of resistant bacteria.²

The use of antibiotics really depends on the specific organism concerned and host resistance. In situations where it is not possible to identify the specific organism causing acute diarrhoea, treatment is a clinical decision based on history, type of diarrhoea and the condition of the patient.

MATERIALS AND METHODS

The methodology chosen reflects that recommended by INRUD which suggests the following general objectives of a hospital antimicrobial use study.⁵

- Describe antimicrobial drug prescribing practices
- Compare performance among hospitals or prescribers
- Monitor performance and orient supervision
- Assess changes resulting from interventions

The document also contains a table of recommendations about data collection, duration of study etc. which has been followed in this study.

Data Collection

The pre and post intervention data was collected in the following way. All Emergency case records were routinely scrutinized in the Dept of Family Medicine, BP Koirala Institute of Health Sciences, after discharge with the exception of cases that were admitted to the wards. All cases with a discharge diagnosis fitting the clinical criteria of acute diarrhoeal syndrome: “diarrhoea”, “gastroenteritis”, “AGE”, “dysentery” “cholera” “were separated, analysed and recorded sequentially.

The Interventions

- A baseline analysis of gastroenteritis case records was performed without telling the doctors.

- A survey and interviews were conducted with a small number of doctors in Emergency to raise their awareness and discover their attitudes and practice in management of gastroenteritis.
- An education session using PowerPoint introduced a Standard Treatment Guideline (STG)5 for Management of Acute Diarrhoea that was prepared with reference to international literature. In the education session, data of prescribing patterns for acute diarrhoea was shown to the prescribers in order to raise awareness about the issue. After the first education session the researcher personally encouraged doctors by repeated visits to the Emergency department.
- After the education session a change in prescribing was noted, so the data was presented to the doctors in the form of an “encouragement letter” that was posted on the Emergency Dept. notice board and other locations two months after the CME event.
- All intervention and mention about appropriate prescribing for diarrhoea ceased but case records continued to be analysed. Notices and the encouragement letter were removed.

Steps in Research Method

- An initial survey of Emergency Registers was done to assess seasonal load of acute diarrhoea cases.
- An initial analysis was done of acute diarrhoea case records of Emergency patients who have been discharged directly home from Emergency (i.e. excluding inpatient admissions)
- A decision was taken as to which details found in the case record would be recorded.
- The names of the main group of doctors managing the cases before and after the intervention were recorded
- Data was recorded from 106 cases in the pre-intervention period.
- Time periods in the study were recorded in line with the interventions described above:
 - Intervention Period 1 = no intervention
 - Intervention Period 2 = after preliminary survey
 - Intervention Period 3 = after the education session

- Intervention Period 4 = after the encouragement letter
- Intervention Period 5 = follow up period
- Data was recorded from all case records of diarrhoea sequentially throughout the study.

DETAILS

Human Study

Type of study – clinical audit with a pre-intervention and post-intervention design

Inclusion Criteria : all cases of acute watery diarrhoea managed in Emergency between 21/9/2002 and 27/6/2004.

Exclusion Criteria

- Bloody diarrhoea (dysentery)
- Cases that were admitted to the wards because
 - Access to records was difficult
 - Cases that were admitted to the wards tend to be the more complicated ones
- Infants under 6 weeks.

Sample Size: total 551 cases

- Period 1: 106 cases (pre-intervention):
- Period 2: 45 cases (post-intervention)
- Period 3: 129 cases (post-intervention)
- Period 4: 97 cases (post-intervention)
- Period 5: 174 cases (post-intervention)
- Data stratified by doctor’s name.

Duration of study – 22 months

Parameters/Variables Studied

In period 1, a variety of data was collected. However, as the main aim of this study was to measure the effect of the intervention, these were the parameters.

Patient initials, Date, Name of doctor, Antibiotic prescription, Antiprotozoal prescription

Statistical Methods Employed

Significance testing of the changes in prescribing between different intervention periods.
Time series analysis

RESULTS:

A total of 551 non-bloody diarrhoea cases were seen in the Emergency over the period of 646 days.

The time was divided into five intervention periods:

- Initial period without any intervention
- A period in which the Emergency doctors were interviewed by the investigator about their prescribing preferences in acute diarrhoea.
- A third period that followed a Continuing Medical Education classroom event.
- A fourth period following the publishing of an “encouragement letter” in the department.
- A fifth period in which there was no mention of the suggestion to reduce antibiotic/ anti-protozoal prescribing.

The case rate varied across these intervention periods reflecting normal changes in seasonal incidence.

Table 1: Intervention dates and case rates

Intervention period	Dates	Intervention	No. of days	No. of cases	Case rate per day	Range per day
1 st	21 Sep 2002 - 14 Jan 2003	none	123	106	0.86	0 - 3
2 nd	15 Jan 2003 - 14 April 2003	survey	89	45	0.51	0 - 3
3 rd	15 Apr 2003 - 14 June 2003	CME	61	129	2.11	0 - 7
4 th	15 June 2003 - 24 Nov 2003	letter	161	97	0.60	0 - 6
5 th	25 Nov 2003 - 27 June 2004	none	212	174	0.82	0 - 4
Totals			646	551		

The following graph illustrates the seasonal changes on a monthly basis. Note the vertical lines divide the intervention periods 1-5.

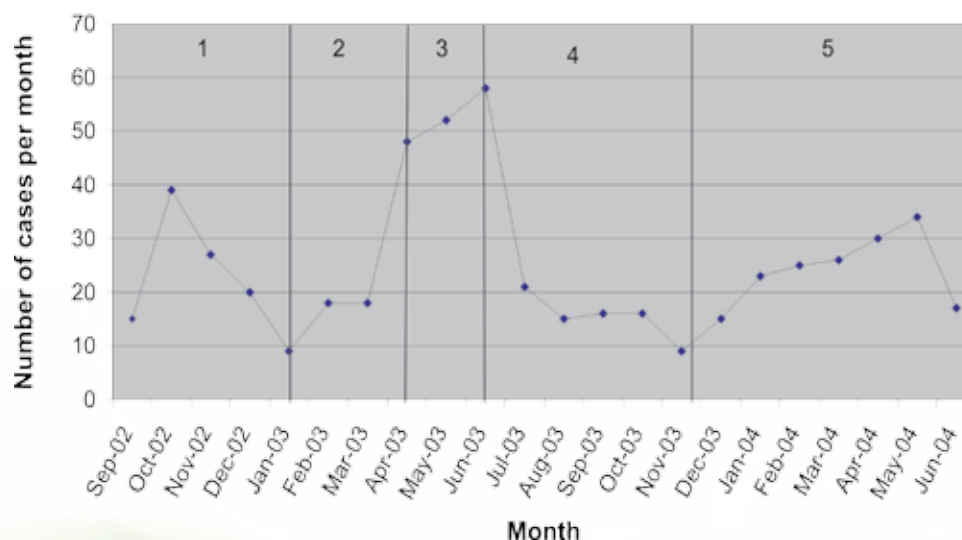


Figure 1 : Seasonal variation in diarrhoea presentation

Table 2: Interventions, antibiotic and antiprotozoal prescribing

Intervention period	Intervention	Number of cases	Antibiotic prescribed	Antibiotics prescribed %	Antiprotozoal prescribed	Antiprotozoal prescribed %
1 st period	none	106	56	52.8%	63	59.4%
2 nd period	survey	45	9	20.0%	3	6.7%
3 rd period	CME	129	38	29.5%	60	46.5%
4 th period	letter	97	16	16.5%	33	34.0%
5 th period	none	174	72	41.4%	85	48.9%
Total		551				

Time Series Analysis

Some techniques were applied to the data to evaluate seasonality and trend. To demonstrate these phenomena in relation to prescribing, the moving average technique was used to prepare data for graphic display. The method used in this analysis was to create a moving average of prescriptions for the previous 40 cases on each day that a case or cases were recorded. Only previous prescribing was included in the moving average so as not to anticipate change that may have occurred as a result of the interventions. The seasonality of diarrhoea as illustrated below in Figure 1 shows increased diarrhoea rates in the hot season each year. The resulting graphs show a changing trend in prescribing over the study period that is broken up in the graphs by the intervention periods marked by vertical lines.

Change in prescribing pattern following the interventions

Initially doctors were prescribing antibiotics for 52.8% of case of non-bloody diarrhoea. (Refer to Table 2)

In the 2nd intervention period there were few cases, but it is remarkable how few were prescribed antibiotic (20%) while the survey of prescribing habits was underway.

In the 3rd intervention period when an education event took place, it was the peak of the diarrhoea season. Prescribing increased somewhat to 29%, but it was still much less than the initial rate of antibiotic prescribing.

In the 4th intervention a letter was sent out to the doctors describing the results so far, and pointing out the lower prescribing by “senior doctors”. During this period prescribing fell to 16.5% - a highly significant difference between 1st and 4th intervention periods ($p < 0.0001$).

The overall changes in prescribing behaviour after the educational interventions were statistically significant. The reduction in prescribing noted when comparing intervention 1 and intervention 4, is highly significant (antibiotic $p < 0.0001$, anti-protozoal $p < 0.0001$).

In the 5th intervention period when appropriate prescribing was no longer actively promoted, the rate of prescribing increased again to 41.4% of cases. A similar pattern is noted for antiprotozoal prescribing as shown in Table 2.

The increase in prescribing noted in the 5th period was still less than in the 1st period (antibiotic $p=0.041$, anti-protozoal $p=0.055$). The increase in prescribing from periods 4 to 5 was significant. (antibiotics $p < 0.0001$, anti-protozoal $p = 0.012$).

DISCUSSION

This study was done to measure the effectiveness of educational strategies to reduce the use of antibiotic in acute diarrhoea in the Emergency of a tertiary hospital in eastern Nepal.

In the initial audit the prescribing rates in acute watery diarrhoea were 52.8% for antibiotics and 59.4% for protozoals. This compares with the study from Bangladesh 5 where initial prescribing rate was 86% for metronidazole, and Pakistan.⁶ where GP's prescribed antibiotics to 41 % of children with diarrhoea and metronidazole to 26%.

It is interesting to contrast this to a community based study in Bangladesh where antibiotic prescribing rates were much lower (17.3% for antibiotics and 38.6% for antiprotozoals). In that study most patients were seen by other care-providers and it was those who saw a doctor who were at highest risk of receiving drugs.⁷

The interventions used in this study were spread over a period of time and consisted of individual interviews, classes, and an encouragement letter with the results of the preliminary audit. It was hoped that the series of actions would reinforce the reduction in the rate of prescribing and that this would persist after the end of the active intervention. Unfortunately this did not prove to be the case. Although there was significant overlap in successive groups of doctors coming to the department, peer example apparently did not prevent inappropriate prescribing by new doctors beyond the time active promotion of better prescribing as shall be discussed. Other researchers may have had better results. In Jakarta a successful intervention was a one day workshop followed by distribution of leaflets and literature.⁸ In an Australian hospital distribution of standard antibiotic guidelines for 20 common conditions resulted in a significant improvement over a 12 month period.⁹

In this study comparison of senior and other doctors is instructive. Even in the initial audit, senior doctors were prescribing fewer drugs for acute diarrhoea though this was not significantly different. It must be remembered that “seniority” here refers only a few months to a year of seniority over the other doctors who followed. As time went on senior doctors led the way in reducing prescriptions after the educational interventions. Significant differences were found between the prescribing of senior and other doctors groups in intervention period 3. It is postulated from this result that junior doctors are strongly influenced by the practices of doctors just senior to them. No other studies comparing senior versus junior doctor prescribing for diarrhoea could be found, but further research on this topic may show a way forward in bringing about changes in doctor's prescribing behaviour.

By the fourth period most of the senior doctors had left the department. In this period, there was

no prescribing of antibiotics or antiprotozoals by senior doctors but they only had 5 cases. Despite this the other doctors prescribed significantly less than the doctors at the beginning of the study ($p < 0.0001$) suggesting significant peer influence along with the effect of the encouragement letter that was still prominently displayed in the Emergency Department.

In the fifth period, no education took place, the letter was taken down and all of the senior doctors had left the department. Prescribing of antibiotic and antiprotozoal drugs increased again by 24.9% and 14.9% respectively, in comparison to the fourth intervention. ($p < 0.0001$). However, the prescribing rate was still less than that in the initial audit (antibiotic $p = 0.041$, antiprotozoal $p = 0.055$).

There was another similar study done in Bangladesh to improve the prescribing pattern of health providers of 3 clinics of an NGO and three government dispensaries. There were marked improvements in the prescription patterns, with a reduced misuse of antibiotics for management of diarrhoea. Inappropriate use of metronidazole was reduced from 86% to 31% in diarrhoea⁵ where as in our study the use of antiprotozoal was reduced from 59.4% to 34% from first to fourth intervention period, but increased in fifth intervention period to 48.9%.

Educationally, the strategy of performing an audit, conducting an educational intervention and auditing again to see the change in behaviour, is called "closing the audit loop"¹⁰. It is a recognised way of seeing whether the intervention has been successful.¹¹ In our study we saw that even this is not enough and that in the hospital setting with rapid staff changeover, education needs to be ongoing and repeated. Further audit cycles will be needed.

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