ISSN: 0976-3031

Available Online at http://www.recentscientific.com

CODEN: IJRSFP (USA)

International Journal of Recent Scientific Research
Vol. 9, Issue, 4(L), pp. 26348-26353, April, 2018

International Journal of Recent Scientific Research

DOI: 10.24327/IJRSR

Research Article

THE ROLE OF EDUCATION AND SEASONAL VARIATION IN THE RATIONAL USE OF DRUGS IN TREATMENT OF ACUTE DIARRHOEA IN THE EMERGENCY

Mansuri Mohammed Islam*[1] and Ahmad Md. Parwez[2]

[1]Department of General Practice and Emergency Medicine, National Medical College, Birgunj, Nepal
[2]Department of Pharmacology, National Medical College, Birgunj, Nepal

DOI: http://dx.doi.org/10.24327/ijrsr.2018.0904.2042

ARTICLE INFO

Article History:

Received 17th January, 2018
Received in revised form 21st February, 2018
Accepted 05th March, 2018
Published online 28th April, 2018

Key Words:

Antibiotics, Diarrhoea, Vibrio cholera

ABSTRACT

Background: Medical officers posted in emergency are taught the internationally accepted approach to management of acute diarrhoea, e.g 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. This study investigates the diarrhoea seasonality and potential opportunities for future diarrhoea control and prevention of patients with acute diarrhoea.

Methods: Data collection of pre and post intervention in the following way. All Emergency case records were routinely scrutinized in the Emergency 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: In initial period (no intervention) doctors were prescribing antibiotics for 51.4% of case of non-bloody diarrhoea. In the Second intervention period there were few cases, but it is remarkable how few were prescribed antibiotic (19%) while the survey of prescribing habits was underway. In the Third intervention period when an education event took place, it was the peak of the diarrhoea season. Prescribing increased somewhat to 28.2%. In the Forth 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 $p < 0.001$, anti-protozoal $p<0.001$). In the Fifth intervention period when appropriate prescribing was no longer actively promoted, the rate of prescribing increased again to 40.8% of cases. A similar pattern is noted for antiprotozoal prescribing. The increase in prescribing noted in the Fifth period was still less than in the First period (antibiotic $p=0.041$, anti-protozoal $p=0.055$). The increase in prescribing from periods Forth to Fifth was significant. (Antibiotics $p<0.001$, anti-protozoal $p = 0.012$).

INTRODUCTION

Acute diarrhoea is a common cause of presentation in the hospital setting. Every medical officer is taught that the majority of cases are self-limiting, requiring only fluid and electrolyte management. (De Vries *et al*., 1994). 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. It is also taught that which season is peak for the diarrhoea so that future prevention can be taken to control the diarrhoea. (Gani L *et al*., 2005) 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? Can the diarrhoea can be controlled and prevented during peak season? (Guerrant RL *et al*., 1990)

Diarrhoeal diseases are a leading cause of childhood morbidity and mortality in developing countries and an important cause

Corresponding author:* **Mansuri Mohammed Islam
Department of General Practice and Emergency Medicine, National Medical College, Birgunj, Nepal

of malnutrition. In 2001 an estimated 1.5 million children below 5 years old died from diarrhoea. (Gilbert D and Chetley, 1986) A Though the mortality rate of children under 5 suffering from acute diarrhoea has fallen from 4.5 million deaths annually in 1979 to 1.6 million deaths in 2002, Nizami SQ acute diarrhoea continues to exact a high toll on children in developing countries. On average, children below 3 years of age in developing countries experience three episodes of diarrhoea each year. Eight out of 10 of these deaths occur in the first two years of life. (Baltazar, J.C. *et al*., 2002). In many countries diarrhoea, including cholera, is also an important cause of morbidity among older children and adults[2]. Worldwide, more than 1 billion people suffer one or more episodes of acute diarrhoea each year. In the Philippines about 10% of all deaths of children are due to diarrhoea (Baltazar, JC *et al*., 2002). In Nepal, according to the Annual Report of 2001-2002, the incidence of diarrhoea per 1,000 under 5 children was 177, total diarrhoeal deaths was 136, and case fatality rate per 1,000 under 5 children was 0.2. In Sunsari District the annual incidence of diarrhoea per 1,000 under 5 children was 298**.** In other words, approximately 3 children in ten under the age of five years have an episode of diarrhoea recorded in the local government health services. Many of these may be getting inappropriate prescriptions for antibiotics. With each prescription there is a chance of a reaction. Each time antibiotics enter the human gut antibiotic resistance is promoted and the bacterial flora are excreted back into the environment. These unwanted effects are described in further detail below. (Nizami SQ *et al*., 1996).

MATERIALS AND METHODS

The methodology chosen reflects that recommended by the International Network for Rational Use of Drug which suggests the following general objectives of a hospital antimicrobial use study. (Kirschner BS and Black D.D., 2002)

1. Describe antimicrobial drug prescribing practices
2. Compare performance among hospitals or prescribers
3. Monitor performance and orient supervision
4. 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

Data collection of pre and post intervention 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. (Camilleri M *et al*., 2001)

The Interventions

1. The analysis of gastroenteritis case records was performed without telling the doctors.
2. 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.
3. CME (an education session) using Power Point introduced a Standard Treatment Guideline 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.
4. A change in prescribing was noted after the education session, 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.
5. 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 101 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 12 weeks.

Sample size: total 526 cases

- Period 1: 101 cases (pre-intervention):
- Period 2: 42 cases (post-intervention)
- Period 3: 124 cases (post-intervention)
- Period 4: 92 cases (post-intervention)
- Period 5: 169 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 (Alam MB *et al*., 1998)

RESULTS

A total of 526 non-bloody diarrhoea cases were seen in the Emergency over the period of 639 days.

The time was divided into five intervention periods

1. Initial period without any intervention
2. A period in which the Emergency doctors were interviewed by the investigator about their prescribing preferences in acute diarrhoea.
3. A third period that followed a Continuing Medical Education classroom event.
4. A fourth period following the publishing of an "encouragement letter" in the department.
5. 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

Inter-vention period	Dates	Intervention	No. of days	No. of cases	Case rate per day
1	21/O9/2002 - 14/01/ 2003	none	116	101	0.87
2	15/01/2003 - 14/04/2003	survey	82	42	0.51
3	15/04/2003 – 14/06/2003	CME	54	124	2.11
4	15/06/2003 – 24/11/2003	letter	154	92	0.60
5	25/11/ 2003 – 27/06/2004	none	205	169	0.82
Totals			639	526	

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

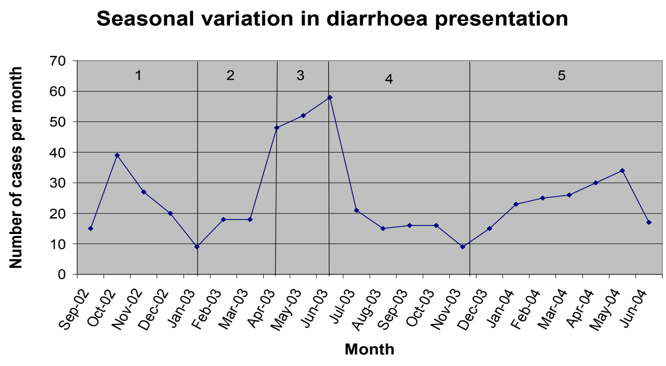


Figure 1

Change in prescribing pattern following the interventions

Initially doctors were prescribing antibiotics for 51.4% of case of non-bloody diarrhoea. (illustrated in Table 2).

In the 2nd intervention period there were few cases, but it is remarkable how few were prescribed antibiotic (19%) 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 28.2%, 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 15.2% - 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 40.8% 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 $p = 0.012$).

Table 2 Interventions, antibiotic and antiprotozoal prescribing

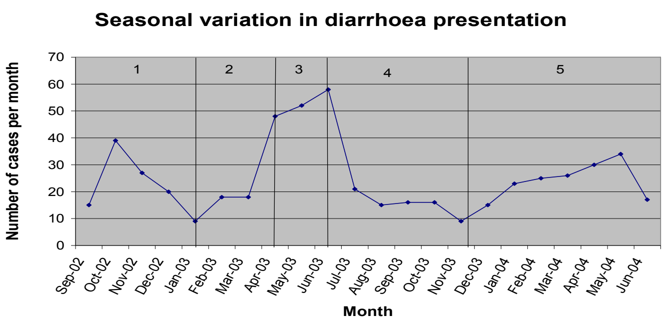
Intervention period	Intervention	Number of cases	Antibiotic prescribed	Antibiotics prescribed %	Antiprotozoal prescribed	Antiprotozoal prescribed %
1	none	101	52	51.4%	61	60.4%
2	survey	42	8	19.0%	3	7.1%
3	CME	124	35	28.2%	57	45.9%
4	letter	92	14	15.2%	31	33.7%
5	none	169	69	40.8%	80	47.3%
Total		526				

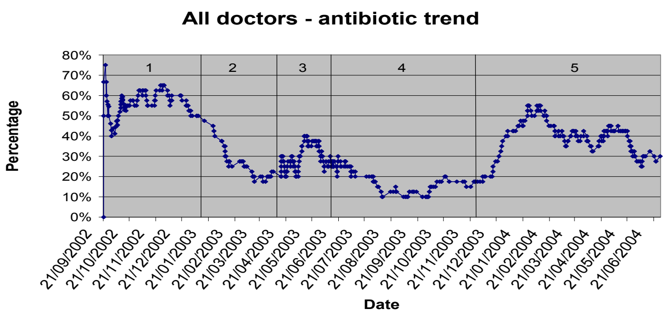
Time Series Analysis

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 above 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.

Seasonality

Allowing for seasonal effects is one of the important tasks of time series analysis. Could change in seasonal incidence of diarrhoea affect prescribing behaviour? Apparently not, as prescribing of antibiotic actually decreased during the time of rapid increase in cases in intervention period 2 (illustrated in Figure 2). There was a small increase in prescribing of antibiotic at the peak of the diarrhoea season in the third intervention period as illustrated when graphs of monthly case rate and antibiotic prescription trend are seen side by side as in Figures 1 & 2.





Turnover of doctors

There was a high turn over of doctors coming and leaving the department. How can it be claimed that the educational efforts brought about the improvements in prescribing? When the active interventions had finished very soon there were new doctors who had not been exposed to the promotion of appropriate prescribing. This is illustrated in the following graph (figure 3). The turnover may explain the deterioration in prescribing behaviour once the active promotion finished. Doctors No. 9-14 (white filled bars) are those who were deemed "Senior" and were individually tracked as will be explained.

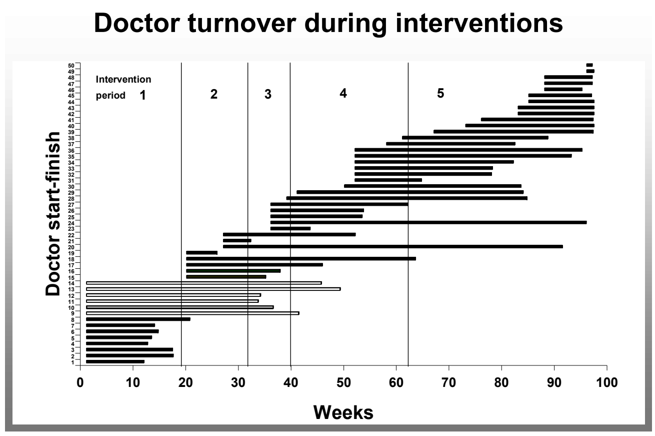


Figure 3 Senior doctors- white bars. Other doctors - black bars

Prescribing and Seniority

In an attempt to remove bias from the results due to high turnover, a subgroup of doctors was tracked. Six doctors who had already worked in Emergency for six months before the beginning of the study were deemed to be "senior" doctors. They are shown in the figure as white filled bars.

Overall senior doctors prescribed less. Senior doctors saw 140 cases and prescribed antibiotics for 25.7% and antiprotozoals for 31.4% of the cases seen in the first four intervention periods. In contrast other doctors who joined the department later saw 219 cases in the first four intervention periods, prescribing antibiotics for 33.3% and antiprotozoals for 49.3% of the cases. As time went on, these senior doctors gradually left the department. None of them remained in the department in the fifth intervention period.

The difference in prescribing rates is shown in each of the intervention periods. Senior doctors continued to decrease their rate of prescribing into the fourth intervention period as can be seen in table 3.

Senior doctors

Table 3 Interventions and prescribing – senior doctors

Intervention period	Intervention	No. cases seen by senior doctor	Antibiotic prescribed	Antibiotics prescribed %	Antiprotozoal prescribed	Antiprotozoal prescribed %
1st period	none	43	20	46.5%	24	55.8%
2nd period	survey	41	7	17%	3	6.8%
3rd period	CME	51	9	17.6%	17	33.3%
4th period	letter	5	0	0.0%	0	0.0%
5th period	none					
Total		140	36	25.7%	44	31.4%

Other doctors

Table 4 Interventions and prescribing – other doctors

Intervention period	Intervention	No. cases seen by other doctors	Antibiotic prescribed	Antibiotics prescribed %	Antiprotozoal prescribed	Antiprotozoal prescribed %
1st period	none	58	32	55.1%	37	63.7%
2nd period	survey	1	1	100.0%	0/0	0.0%
3rd period	CME	73	26	35.6%	40	55.3%
4th period	letter	87	14	16.0%	31	35.6%
5th period	none	169	72	42.6%	80	47.3%
		388	145	37.3%	188	48.4%

Are the differences statistically significant?

The difference in prescribing behaviour according to seniority was not significant in first intervention period (antibiotic p = 0 0.370, antiprotozoal p = 0.490) even though senior doctors prescribed less antibiotics and anti-protozoals than the other doctors who had more recently joined the department.

However, by the third intervention period, senior doctors prescribed significantly less antibiotics and antiprotozoals than other doctors who had more recently joined the department (antibiotic p = 0.04, antiprotozoals p = 0.027). Numbers seen by senior doctors are too small to comment on in the fourth intervention.

Moving Average Daily Trend

The following graphs (Figures 2, 4, 5) illustrate the changes using the moving average method as described above. Each point represents the average of the previous forty cases seen (or total seen to that date if less than 40). By this method the fluctuations are smoothed to be more visually pleasing.

Figure 2

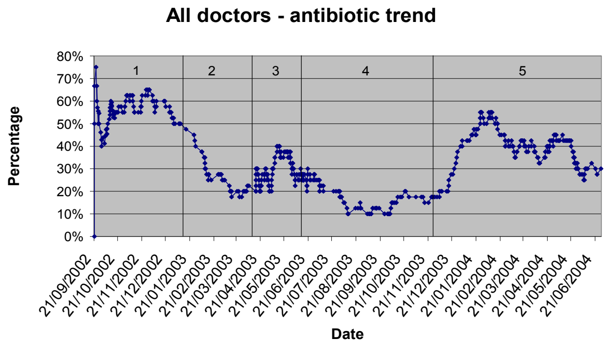


Figure 4

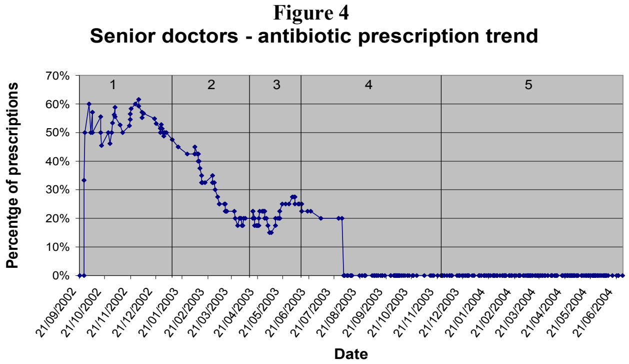
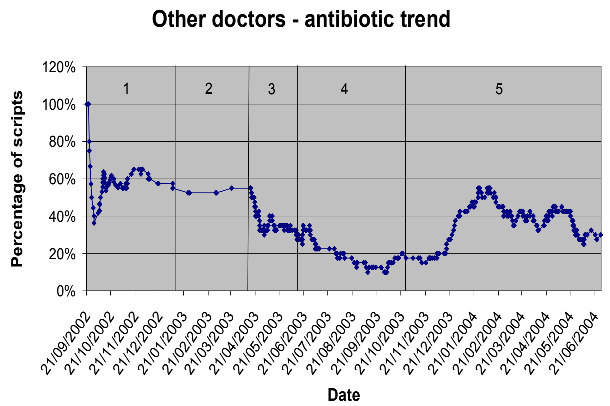


Figure 5



DISCUSSION

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. Antibiotics are not necessary unless there are specific indications. According to the WHO, 'Antimicrobial drugs are not indicated for the routine treatment of acute diarrhoea **(**South M *et al*., 2003).

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 51.4% for antibiotics and 60.4%% for protozoals. This compares with the study from Bangladesh where initial prescribing rate was 86% for metronidazole, and Pakistan 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. (Rourke SFO *et al*., 2003).

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. (World Health Organization,1990) In an Australian hospital distribution of standard antibiotic guidelines for 20 common conditions resulted in a significant improvement over a 12 month period.

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. (Amin S *et al*.,2001) 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 diarrhoea where as in our study the use of antiprotozoal was reduced from 60.4% to 33.7% from first to fourth intervention period, but increased in fifth intervention period to 47.3%.

More research is needed to test the possibility that doctors may prescribe less antibiotic if the laboratory testing service is better. The World Health Organization says that antiprotozoals for amoebiasis or giardiasis should only be used for laboratory proven infections, so this is one reason to do a stool test. Laboratory services are also helpful for knowing local sensitivity patterns of shigella and cholera. The literature does not recommend antibiotics for most other pathogens. (Guerrant RL *et al*., 1990)

Changing the behaviour of others is a daunting task, requiring communication strategies specific to the particular regions' culture, habit and socioeconomic situations. An example from Pakistan shows that even GPs and paediatricians were overusing antibiotics and other drugs. Against that background it is difficult to change the behaviour of house officers. Our study shows that an educational intervention can make a difference but that it is not sustained. Similar interventions in government health centres in Bangladesh and Jakarta also demonstrated the effectiveness of such an education program. 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". It is a recognised way of seeing whether the intervention has been successful. 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 (Kogan M and Redfern S, 1995).

The cholera outbreak in the 5th period makes it difficult to interpret the rise in antibiotic prescribing. If it was to cholera cases only this could have been appropriate. However anti-protozoal prescribing increased at the same time by a similar amount and this cannot have been related to cholera. (Gani L *et al*., 1997)

In this study it was planned to analyse the data using time series analysis. The graphic display of results after using the moving average smoothing procedure was successful, but due to lack of powerful enough computing facilities and expertise segmented regression analysis was not possible.

There is a marked seasonal variation in the incidence of diarrhoea with more cases in the summer months. As the study continued over 22 months this would have been unlikely to bias findings

References

Alam MB, Ahmed FU, Rahman ME, (1998), Misuse of drugs in acute diarrhoea in under-five children, *Bangladesh Med Res Counc Bull.* 24(2):27-31.

Amin S, Tunong C, Arifeeng SE, Baquig AH, Khanum R, and Manafg S. (2001), Implementation of the essential services package through standardized service delivery protocols. International Centre for Diarrhoeal Disease Research, Bangladesh (ICDDR, B), GOP Box 128 Dhaka 1000, Bangladesh.

Baltazar, J.C. *et al*. (2002), Evaluation of the National Control of Diarrhoeal Disease Programme in the Philippines, 1980-1993, *The International Journal of Public Health*, Nov 8, 180: 611-688.

Camilleri M., Ahlquist D. (2001), Diarrhoea and Constipation, Harrison's Principles of Internal Medicine, pp. 242-44. Ed. Braunwald E., 15th Ed, McGraw-Hill, (vol 1).

De Vries TPGM, Henning RH, Hogerzeil HV, Fresle DA. (1994), Guide to Good Prescribing; a practical manual. WHO Action Programme on Essential Drugs, Geneva,

Gani L, Tangkilisan A, Pujilestari L. (2001), Improving rational prescribing of physicians: an educational approach for acute diarrhoea in children. Atma Jaya University, Jakarta Indonesia, cited in International conferences on improving use of medicines (ICIUM)

Gilbert D, Chetley A. (1986), Problem Drugs: Antibiotics are perhaps the most reckless example of misuse of modern medicine to make a fast buck: Health Action International, The Hague: New Internationalist: issue 165-November

Guerrant RL, Hughes JM, Lima NL, Crane J.(1990), Diarrhoea in developed and developing countries: magnitude, special settings, and aetiologies. *Rev Infect Dis.*12 (Suppl 1) pp.41-50.

Kirschner BS, Black D.D., (2002), The Gastrointestinal Tract, Nelsons Essentials of Pediatrics. Ed Behrman R.E., Kliegman R.M. 4th edition, W.B. Saunders Company. pp.469-513,

Kogan M., Redfern S. (1995), What is audit? In: *Making use of clinical audit.* A guide to practice in the health professions. Open University Press;1-16

Nizami SQ, Khan IA, Bhutta ZA. (1996),Drug prescribing practices of general practitioners and paediatricians for childhood diarrhoea, Soc Sci Med. 42(8):1133-9.

Rourke SFO, Sauvage A, Evans PA. Paroxysmal supraventricular tachycardia: improving diagnosis and management within the accident and emergency department. *Emerg Med*. 21:495-97.

South M, Royle J, Starr M.(2003), A simple intervention to improve hospital antibiotic prescribing. *Med J Aus*. 178 (5): 207-9.

World Health Organization, A Manual For Treatment Of Diarrhoea: Programme For The Control Of Diarrhoea Diseases. WHO/CDD/SER/80.2 Rev.2 1990.