

Spring 4-2007

# Effect of Standard Treatment Guidelines with or without Prescription Audit on Prescribing for Acute Respiratory Tract Infection (ARI) and Diarrhoea in some Thana Health Complexes (THCs) of Bangladesh

M. O. Faruk Khan

*Marshall University*, [khanmo@marshall.edu](mailto:khanmo@marshall.edu)


A.K. Azad Chowdhury

M. A. Matin

K. Begum

M. A. Galib

Follow this and additional works at: [http://mds.marshall.edu/sp\\_psr](http://mds.marshall.edu/sp_psr)

 Part of the [Medical Sciences Commons](#), and the [Pharmaceutics and Drug Design Commons](#)

## Recommended Citation

Chowdhury AK, Khan OF, Matin MA, Begum K, Galib MA. Effect of standard treatment guidelines with or without prescription audit on prescribing for acute respiratory tract infection (ARI) and diarrhoea in some thana health complexes (THCs) of Bangladesh. *Bangladesh Medical Research Council Bulletin*. 2007 Apr; 33(1): 21-30

This Article is brought to you for free and open access by the Faculty Research at Marshall Digital Scholar. It has been accepted for inclusion in Pharmaceutical Science and Research by an authorized administrator of Marshall Digital Scholar. For more information, please contact [zhangj@marshall.edu](mailto:zhangj@marshall.edu), [martj@marshall.edu](mailto:martj@marshall.edu).

# Effect of Standard Treatment Guidelines with or without Prescription Audit on Prescribing for Acute Respiratory Tract Infection (ARI) and Diarrhoea in some Thana Health Complexes (THCs) of Bangladesh

AK Azad Chowdhury<sup>1</sup>, OF Khan<sup>1</sup>, MA Matin<sup>1</sup>, K Begum<sup>\*2</sup>, MA Galib<sup>1</sup>

*Bangladesh Med. Res. Counc. Bull. 2007; 33(1): 21-30*

## Summary

Inappropriate prescribing for ARI and diarrhoea is a serious health problem in many developing countries including Bangladesh. A baseline retrospective prescribing survey for ARI and diarrhoea have been conducted in randomly selected 60 thana health complexes (THCs) of Dhaka division of Bangladesh. In the 38 of 60 THCs, the prescribers did not comply with the standard treatment guidelines (STG) for ARI. They are marked as 'unsatisfactory performers'. In these THCs unnecessary antibiotics were prescribed in more than 50% of the encounters. The study further revealed that in 26 THCs, comprising 41.6% of the 38 THCs, the situation was even worse regarding the indiscriminate use of antibiotics. In these THCs antibiotics were prescribed in  $\geq 72\%$  of the encounters. For diarrhoea, only in 8.3% of the THCs antibiotics were prescribed in  $\geq 50\%$  of the encounters. Encouragingly, most of the prescribers prescribed ORS. So the diarrhoea cases were dropped from the intervention. The 24 out of 26 worse performing THCs for ARI management, were grouped into three groups: Group-I (implementing STG+ Audit), Group-II (STG) and Group-III (no intervention, control). The prescribers of the THCs belonging to Group-I and Group-II received STG+Audit and STG only respectively as intervention(s). On the contrary, the prescribers of the THCs of Group-III (control) did not receive any intervention. It was observed that after the implementation of interventions the use of the unnecessary antibiotics to treat ARI was significantly reduced ( $p < 0.01$ ) compared to pre-intervention period in Group-I (STG+Audit). In this group highly significant ( $p < 0.000$ ) reduction in antibiotics use was achieved in 6 out of 8 THCs. The average reduction in antibiotic use in terms of encounters was 23.7 and 15.2% in the Group-I and Group-II respectively owing to the intervention(s). Significant reduction in antibiotic use in terms of THCs was 3 (out of 8 THCs) and 2 (out of 8 THCs) belonging to the Group-II and Group-III respectively. When compensated for the change in the control group, the reduction of antibiotic use in terms of encounters was 15.2 and 6.9% in the THCs of the Group-I and Group-II respectively due to introduction of the interventions. The study concludes that STG supported by prescription audit are highly effective interventions to change the prescribing behaviour of the prescribers for ARI in the THCs.

---

1. Deptt. of Pharmacy, Dhaka University, Dhaka. 2. National Institute of Preventive and Social Medicine (NIPSOM), Dhaka. \* Present address: Director, Shaheed Shuhrowurdy Hospital, Sher-e-Banglanagar, Dhaka.

## Introduction

Inappropriate prescribing, especially for diarrhoea and acute respiratory infection (ARI), has always been a serious problem of the health care in the developing countries<sup>1-9</sup>. Antibiotics, anti-diarrhoeals & metronidazole are the randomly used drugs to treat acute diarrhoea. Antibiotics and anti-histaminics are excessively used for ARI. Similar situations are likely to be in Bangladesh. In the Thana Health Complexes (THCs) metronidazole is used in more than 70% of the encounters, whereas ORS was used in less than 50% of the encounters. In ARI antibiotic was used in 70% of the encounters, in contrast, paracetamol was in 50% of the encounters<sup>8,9</sup>.

Many intervention strategies have been tried to change the prescribing behaviour of the prescribers in the developed countries, with varying degree of success<sup>10-12</sup>. Recently, clinical guidelines as an intervention strategy have drawn wide spread attention in the west. This is because it is inexpensive, easy to administer, and has some effect in reducing inappropriate practices and improving efficiency<sup>13-16</sup>. But there is a concern that they may be insensitive to individual patient needs. The uncertainty whether they may be effective or not in changing the prescribing behaviour is also there. Review of current literature on clinical guidelines suggests that the explicit guidelines improve clinical practice in the context of rigorous evaluation<sup>13</sup>. A successful introduction of clinical guidelines is dependent on many factors such as method of development, dissemination and implementation of those guidelines. But other studies suggest that guidelines are unlikely to change behaviour of the physicians<sup>17</sup>.

Recently, a new intervention known as VCR (verbal case review) and INFECTOM (a package of intervention for improving providers' quality of care) improved the quality of private practitioners care of sick children<sup>6</sup>. Training of medical staff with the WHO-ARI management guidelines reduced the antibiotics use, improved the quality of care and reduced the fatality rate<sup>18</sup>. Studies showed that there is difference in the outcome of the treatment by standard case management Vs conventional treatment<sup>18,19</sup>.

It is interesting to test the effectiveness of clinical guidelines with or without prescription audit in changing the prescribing behaviour of the physicians in a developing country like Bangladesh, because the interventions are cheap and easy to administer. It is also important in the context of improving the quality of care through rational use of drugs in common diseases such as diarrhoea and ARI. Clinical guidelines, an intervention claimed to be effective in other countries<sup>17-18</sup>, may be tested in the government Thana health complexes (THCs), the primary health care centres of Bangladesh. In the paper, effects of the interventions on the prescribing behaviour of physicians for ARI and diarrhoea in some selected THCs in under five children are reported.

## Materials and Methods

This was a retrospective study followed by intervention study to test the effectiveness of standard treatment guidelines (STG) supported by prescription audit/or without it in influencing the prescribing behaviour of the THCs' doctors for ARI and diarrhoea. Three equal groups of THCs having similar

performance records, determined by the prescribing survey, were randomly selected for the study. The doctors of the THCs of Groups I and II received STG+Audit and STG only respectively as interventions. The doctors of THCs of Group III (control) received no intervention. The outcome of the intervention was measured by scoring the prescriptions against the STG and WHO Drug Use Indicators; three months after the interventions had been implemented. The target group was the THCs doctors who were involved in prescribing at the out patient departments and the interventions were aimed at the ARI management with standard treatment guidelines (STG) and STG +Audit. The retrospective prescribing data was collected from THCs records three to four months succeeding the introduction of interventions.

#### *Study site, data collection, data analysis and selection THCs*

The reference population is the doctors of THCs of Dhaka division, Bangladesh. Sixty THCs (Table I) were randomly selected from the 120 THCs of Dhaka division. They were included in the baseline prescribing survey for diarrhoea and ARI. The division was chosen because it is centrally located and because the prevalence and management of diarrhoea and ARI is typical of the country<sup>6,7</sup>. In each THC there are 8 doctors of which 3 to 4 are involved in prescribing in an outpatient department. The other doctors are engaged in administration, in-patient duties, surgery, gynaecology and obstetrics. A baseline prescribing survey for diarrhoea and ARI was conducted retrospectively from the treatment records of outpatients of the THCs using prescribing indicator form (WHO/

DAP) and literature methods<sup>6,7,14,15</sup>. The number of prescriptions per indication per health complex was 50. The total number of prescription collected in the baseline survey were  $(50 \times 2 \times 60) = 6000$  (six thousands).

The prescribing data were analysed using literature method<sup>7,14,15</sup> to give the following information: (i) number of drugs prescribed per encounter, (ii) % of encounters antibiotics prescribed, (iii) % of encounters ORS prescribed, (iv) % of encounters metronidazole prescribed and (v) % of encounters complying with STG for diarrhoea management. Similar prescribing information from ARI encounters such as (i) No of drugs per encounter, (ii) % of encounters paracetamol prescribed, (iii) % of encounters antibiotic prescribed, (iv) % of encounters antihistaminic prescribed and (v) % of encounters STG complied were collected.

#### *Intervention Introduction*

The management guidelines (WHO/ARI/94, 31 January) were used as the standard treatment guidelines. The STG were explained to the doctors in THCs once by a pediatrician/clinician who visited the THCs from Dhaka. The WHO guidelines for ARI management are essentially a brief description of signs and symptoms of pneumonia and ways and means of differentiating pneumonia from cough and cold and malaria. The doctors of STG+Audit group received briefing on STG and also on prescription audit (auditing was done by using the WHO drug use indicators' form and scoring of the prescriptions against STG by the THCs doctors among themselves and by their colleagues. The interventions were implemented in the THCs where antibiotic

use in ARI is high. The scoring of the prescriptions was done on the basis of the diagnosis and medication given i.e. whether antibiotic prescribed in non pneumonia patient; whether paracetamol is prescribed in high fever, number of drugs prescribed per encounter. The doctors had discussion among themselves about prescribing during tea time. Retrospective prescribing data was collected from THC records three to four months succeeding the introduction of interventions and the data were analyzed.

### Results

From the baseline survey it was observed that 38 out of 60 THCs (consisting of 62% of THCs of the study area) antibiotics were prescribed in more than 50% of the encounters (Table-II). Since there was widespread inappropriate use of antibiotics in ARI, intervention was targeted to ARI management only. Diarrhoea was kept out of intervention as antimicrobial use in non specific diarrhoea was not high. Twenty six of the 38 health facilities performed even worse where antibiotics were prescribed in  $\geq 72\%$  of the encounters for ARI (Table-II). Twenty four of the 26 THCs were grouped into three equal groups as matched triplets (Table-III). The doctors of the THCs of Group-I received intervention such as STG + prescription audit that of the Group-II received STG only while the doctors of THCs belonging to Group-III received no intervention at all i.e. control.

On the contrary, only in 8.3% of the THCs antibiotics, including metronidazole, were prescribed for diarrhoea in more than 50% of the encounters. The STG was complied with in more than 80% of the health facilities as manifested in high ORS and low antibiotic prescribing. The prescribing for diarrhoeal

diseases improved tremendously during the last two years, from the time of designing of protocol to its implementation, owing to several interventions introduced by INRUD Bangladesh Core Group, opening of ORT corners in most THCs by the Primary Health Care Directorate, International Centre for Diarrhoeal Diseases Research, Bangladesh (ICDDR,B), National Institute of Preventive and Social Medicine (NIPSOM). So the diarrhoea management was excluded from the intervention study.

In the THCs of Group I, receiving standard treatment guidelines supported by prescription audit, there was a highly significant reduction in antibiotic prescribing for ARI during the post intervention period compared to that of pre intervention. In 6 out of 8 THCs of the group the reduction in antibiotic use of highly significant ( $p < 0.01$ ) (Table-IV). The average reduction in antibiotic prescribing between the pre and post periods was 23.7% of the encounters i.e. from 90.3% of the encounters in pre to 66.6% of the encounters in post intervention period (Table-IV). In the Group II (STG), highly significant reduction in antibiotic prescribing after intervention was observed only in three THCs ( $p < 0.01$ ) (Table-IV). Significant reduction in antibiotic prescribing was observed in 2 of 8 THCs in the control group. The average reduction in antibiotic prescribing between pre and post in the Group II was by 15.2% of the encounters i.e. from 85.9% to 70.7% encounters after intervention. During the same time frame the reduction of antibiotic prescribing in control group, where no intervention introduced, was 8.2% of the encounters owing to unforeseen factors. If the correction is made for the

reduction of antibiotic prescribing in control group over the period, then the THCs of Group I have witnessed a highly significant reduction in antibiotic use in four THCs and those of Group II have experienced highly

significant reduction in one health complex. This observation suggests that STG + Audit worked better than the STG only as intervention at least in term of reduction in antibiotic prescribing for ARI.

**Table-I:** List of 60 Thana Health Complexes, Randomly Selected from 120 THCs of Dhaka Division, Bangladesh. For inclusion in the Study

No. of THCs Assigned by MOH	Name of THCs	No given to THCs in study	No. of Assigned by MOH	Name of THCs	No. given to THCs in study
221	Damuddya	1	287	Kalihati	33
223	Bhedergonj	2	289	Ghatail	34
225	Zangira	3	283	Delduar	31
227	Rajoir	4	285	Basail	32
229	Kalkini	5	287	Kalihati	33
231	Tungipara	6	289	Ghatail	34
233	Kassiani	7	292	Sarisabari	35
235	Bhanga	8	294	Madargonj	36
237	Charthadrason	9	295	Islampur	37
239	Nagarkanda	10	298	Bakshigonj	38
241	Boalmari	11	300	Jhenaigati	39
243	Baliakandi	12	302	Makhla	40
246	Goalandaghat	13	304	Haluaghat	41
248	Shibalya	14	307	Gouripur	42
250	Ghior	15	309	Mymensingh(s)	43
252	Singair	16	311	Fulbaria	44
254	Dhamrai	17	313	Gaffargaon	45
257	Nawabgonj	18	315	Nandail	46
259	Sreenagar	19	318	Pakundia	47
261	Serajdikha	20	321	Bhairab	48
263	Munshigonj(s)	21	323	Astagram	49
265	Narayangong(s)	22	325	Mitamaia	50
267	Sonargaon	23	327	Tarail	51
269	Rupgonj	24	329	Khaliajhnir	52
271	Narsingdi(s)	25	331	Kendua	53
273	Balaboo	26	333	Mohangonj	54
275	Monohardi	27	335	Netrkona	55
277	Kaligonj	28	337	Durgapur	56
279	Sreepur	29	220	Goshairhat	57
281	Mirzapur	30	222	Palong(s)	58
283	Delduar	31	224	Naria	59
285	Basail	32	226	Shibchar	60

MOH=Ministry of Health and Family Welfare; Government of Bangladesh, THCs= Thana Health Complexes

**Table-II:** List of 60 Thana Health Complexes where Antibiotics are Prescribed in more than 50% of the Encounter for ARI in under five Children

No. of THCs	Name of THCs	No .of Generics/50 Encs	No. of ED/50 Encs	No. of Drug/Encs	% of Encs. Antibiotic pres.
1.	Delduar	50	50	1.00	58
2.	Kalihati	50	50	1.00	100*
3.	Belabo	23	91	1.82	72*
4.	Baliakandi	65	109	2.18	86*
5.	Rajoyt	25	54	1.08	56
6.	Goalando	19	95	1.90	88*
7.	Kalkini	47	96	1.92	82*
8.	Narsingdi	43	70	1.40	68
9.	Alfadamga	49	102	2.04	96*
10.	Zazira	42	58	1.16	56
11.	Damudia	40	82	1.64	60
12.	Shibchar	71	81	1.62	72*
13.	Islampur	50	50	1.00	76*
14.	Sarisabari	50	50	1.00	100*
15.	Nakla	48	57	1.19	58
16.	Palong	61	100	2.08	84*
17.	Rupgonj	43	64	1.28	72*
18.	Naria	58	100	2.00	86*
19.	Ghoshair Hat	62	92	1.84	70
20.	Bhedargonj	50	50	1.00	100*
21.	Nawabgonj	78	106	2.21	76*
22.	Narayangonj	42	55	1.17	64
23.	Shibalya	68	68	1.36	96*
24.	Dhamrai	60	65	1.30	68
25.	Ghior	51	82	1.64	76*
26.	Sreepur	60	96	1.92	96*
27.	Munshigonj	50	50	1.16	84*
28.	Pakundia	48	46	1.00	76*
29.	Merzapur	55	50	1.10	70
30.	Sreenagar	95	95	1.90	92*
31.	Sonagaon	75	75	1.50	94*
32.	Durgapur	74	74	1.54	75*
33.	Gouripur	88	112	2.55	88*
34.	Jhenaigati	50	50	1.00	98*
35.	Nandair	32	57	1.14	54
36.	Ghatail	52	52	1.04	66
37.	Baksigonj	50	50	1.00	78*
38.	Mymensingh	50	50	1.00	100*

THCs= Thana Health Complexes, Encs = Encounters, ED= Essential Drugs, Pres. = Prescribed , \* 24 out of 26 THCs each having  $\geq 72\%$  Encs using antibiotics grouped into Control, STG (Standard Treatment Guidelines), STG +Audit for intervention study.

**Table-III:** List of Thana Health Complexes of Dhaka Division, Bangladesh in Matched Triplicates (where Antibiotics are Prescribed in  $\geq 72\%$  of the Encounters) Grouped in three Groups; Group I (STG+Audit), II (STG) and III (No Intervention) for Intervention Study

Group I (STG+Audit)		Group II (STG)		Group III (Control)	
Name of THC's	% of Encs antibiotic prescribed	Name of THC's	% Encs antibiotic prescribed	Name of THC's	% Encs antibiotic prescribed
1. Gouripur	100	1. Kalihati	100	1. Bhedeggonj	100
2. Ghior	100	2. Sreepur	96	2. Mymensingh	100
3. Sorisabari	100	3. Srenagar	92	3. Jenaighati	98
4. Alphasdanga	96	4. Naria	86	4. Sonargaon	94
5. Shinalya	96	5. Munshiganj	84	5. Goalando	88
6. Palong	84	6. Bukshigonj	78	6. Baliakandi	86
7. Kalkini	82	7. Pakundia	76	7. Islampur	76
8. Nawabgonj	76	8. Durgapur	75	8. Rupgonj	72

STG= Standard treatment guidelines; Audit= prescription audit; Encs= Encounters.

**Table-IV:** Effect of Standard Treatment Guidelines with or without Prescription Audit on Antibiotic Prescribing for Ari in under five Children in Thana Health Complexes of Dhaka Division, Bangladesh.

No. of THC's	Name of THC's	Control		P-value	Name of THC's	STG		P-value	Name of THC's	STG+AUDIT		P-value
		% Encounters antibiotic prescribed	P-value			% Encounters antibiotic prescribed	P-value			% Encounters antibiotic prescribed	P-value	
P-value		Pre	Post		Pre	Post			Pre	Post		
1.	Bhedergonj	100	94.7	0.043	Kalihati	100	73.3	0.000*	Ghior	100	60	0.000*
2.	Mymensingh	100	100	0.500	Sreepur	96	69.3	0.000*	Sarisaban	100	88.3	0.005*
3.	Jhenaighati	98	50	0.000*	Sreenagar	92	41.8	0.000*	Alfadanga	96	66.6	0.000*
4.	Sonargaon	94	95	0.413	Naria	86	74.9	0.079	S <sup>c</sup> 'balaya	96	69.9	0.000*
5.	Goalando	88	67.4	0.005*	Munshigonj	84	78.3	0.233	Gouripur	88	64.7	0.002*
6.	Baliakandi	86	76.9	0.120	Bukshigonj	78	79.5	0.428	Palong	84	75.0	0.120
7.	Islampur	76	90.5	0.024	Pakundia	76	78.3	0.394	Kalkini	82	26.6	0.000*
8.	Rupganj	72	74.4	0.394	Durgapur	75	70.0	0.287	Nawabgonj	76	81.3	0.257
Average value		89.3	81.1			85.9	70.7			90.3	66.6	

Pre = Pre intervention, Post = Post intervention, STG = Standard treatment guidelines, Audit = Prescription audit, % Encounters antibiotics prescribed \* $p < 0.01$  (significant).

**Table-V:** The incidences of ARI and Pneumonia in a typical district (Narsingdi) of Bangladesh, compiled from Bangladesh Health Bulletin 1998-99<sup>21</sup>

Disease	Patient (<1yr)		Patient (1- 4 yr)		Total No. of Patient (under five yrs)	% patients morbidity
	M	F	M	F		
ARI	1,520	1,515	2,696	2,914	8,245	12.13% of total patients
Pneumonia	445	257	366	373	1,441	17.48 % of ARI patients
All diseases	8,966	9,867	22,245	26,911	67,987	



Paracetamol prescribing during the post intervention period in different groups was different. Paracetamol use was reduced by 16.82% of the encounters through the introduction of STG when compared to that of the control group. But in the STG+Audit group paracetamol prescribing was reduced only by 3.76% of the encounters as it was advised to use paracetamol only in uncomplicated ARI. The average number of drugs per encounter did not change much. The values were 1.43, 1.20 and 1.24 in the control, STG and STG + Audit groups respectively. Introduction of interventions, STG +prescribing Audit significantly reduced the antibiotic use and these interventions are easy to be introduced and do not cost extra financial involvement. The senior doctors from civil surgeons' office can easily administer the intervention in the THCs under its jurisdiction and the THCs doctors can do the prescribing audit among themselves during tea time. The reduction in antibiotic use will help inappropriate antibiotic use and improve the adherence to STG and thereby improve the quality of care.

### Discussion

Pneumonia has been the number one cause of mortality of the country in all the years between 1993-97<sup>21</sup>. The deaths due to pneumonia in the districts and lower level hospitals range from 13.5% in 1993 to 18.0% in 1999<sup>21</sup>. The other pulmonary diseases including respiratory failure, asthma and the other diseases of acute upper respiratory tract have also been the most common causes of death. The morbidity owing to ARI is also high. It comprises 12.13% of all the under 5 patients suffering from all other diseases and

health conditions and indication (Table V). This suggests that intervention in the management of ARI is very important in Bangladesh like many other developing countries. Unfortunately the prescribing in ARI in the health facilities is far from rational as is evident from the wide spread antibiotic use (antibiotics are prescribed in more than 70% of the encounters in the study area). It appears from the disease profile of a typical district of Bangladesh (Table V) the incidence of pneumonia in under five children is 17.48% of the total ARI patients of that age group<sup>21</sup>. So as a general rule, according to the WHO Guidelines for ARI management the antibiotic use may be justified in 20% of the encounters approximately of ARI patients.

The excessive use of antibiotics puts a tremendous financial pressure on the poor household and the children also suffer from inappropriate prescribing. Wide spread antibiotic use also causes emergence of antibiotic resistant microbes making treatment of infectious diseases difficult in the developing world.

Introduction of standard treatment guidelines (STG) for management of ARI when supported by prescription audit can significantly reduced the prescribing of unnecessary antibiotics. But mere introduction of the standard treatment guidelines did not reduce the antibiotic prescribing significantly in the thana health complexes. These interventions easily affordable with present structure of health care delivery system, what is needed is the initial cost of introduction of the interventions

and orientation of the doctors of THCs. A little vigilance and monitoring on the part of the senior doctors of the district health administration would be sufficient to implement the interventions.

### Acknowledgment

The authors gratefully acknowledge the financial and the technical support rendered by the WHO Drug Action Programme on Essential Drugs, Geneva, the International Network for Rational Use of Drugs (INRUD), Arlington, VA, respectively. The authors acknowledge Sheikh Zahir Raihan, Dept. of Clinical Pharmacy & Pharmacology, University of Dhaka for the editing and computing work of the paper.

### References

1. Elliot K, Cutting W and Attawel K. Drugs and childhood. *Dialogue on Diarrhoea* 1990; 42: 1-8.
2. Cutting WAM. Self prescribing promotion of anti-diarrhoeal drugs, *Lancet*, 1989; 8646: 1080.
3. Tomson G, Sterky G. Self prescribing by way of pharmacies in three Asian developing countries, *Lancet* 1986; ii: 165-9.
4. Ronsmans C, Bennish ML, Wierzba T. Diagnosis and management of dysentery by community health workers, *Lancet* 1988; ii: 552-5.
5. Monio SA. Acute respiratory infection in childhood of developing countries: challenge for 1990s, *Rev Infect Dis*. 1989; 11: 498-505.
6. Chakroborti S, D'Souza A, and Northrop R S. Improving private practitioners' care of sick children: testing new approaches in rural Bihar, *Health Policy Planning* 2000; 5: 400-7.
7. Bojalil R, Guiscafre H, Espinosa P, Martinez H, Palafox M, Romero G, Gutierrez G. The quality of private and public primary health care management of children with diarrhoea and acute respiratory infections in Tlaxcala, Mexico, *Health Policy Plan* 1998; 13: 323-31.
8. Azad Chowdhury AK. Prescribing pattern acute diarrhoea in three districts in Bangladesh, *Tropical Doctors*, 1993; 23: 165-66.
9. Azad Chowdhury AK et al. Impact of the availability of essential drugs and focused training on prescribing pattern of doctors in diarrhoea and ARI in the government health facilities in Bangladesh, *Health Policy and Planning*, presented at the ICIUM, April 1-4, 1997, Chiang Mai, Thailand.
10. Soumerai SB. Improving drugs prescribing in primary health care: a critical analysis of the experimental literature, *Milbank Quarterly*, 1989; 67: 268-317.
11. Raisch DW. A model of methods for influencing prescribing: Part I: a review of prescribing model, persuasions theories, administrative and education methods, *DICP Ann Pharmacother* 1990; 24: 417.
12. Raisch DW. A model of methods for influencing prescribing: Part II: a review of education methods, theories of human inference and delineation of the model, *DICP Ann Pharmacother* 1990; 24: 537-41.
13. Grimshaw JM and Russel IT. Effect of clinical guidelines on medical practice: a systematic review of rigorous evaluations, *Lancet* 1993; 342: 1317-22.

14. James, J. Anderson GM, Pierre KD. Do practice guidelines guide practice? *N Eng J Med* 1989; 321: 1306-11.
15. Fowkes FGR, Robert CJ. Introducing guidelines into clinical practice, *Eff Health Care* 1984; 1: 313-23.
16. Vang J. The consensus development conference and the European experience *Int J Tech Assess Health Care* 1986; 2: 65-7.
17. Block N and Thompson E. Obstacles to medical audit: British doctor speak, *Soc Sci Med.* 1993; 36: 849-56.
18. Qazi SA, Rahman GN, Khan MA. Standard management of acute respiratory infections in a children's hospital in Pakistan; impact on antibiotic use and case fatality, *Bull World Health Org*, 1996; 74: 501-7.
19. Eisenberg JM, Doctors decisions and the cost of medical care, *Health Administration Press* 1986, Ann Arbor.
20. Hogerzeil HV, Bimo. Ross-Degnan D. Laing R O, Ofori-Adjei D. Santaso B. Azad Chowdhury AK, Das AM. Kafe K. Mafadeje AFB., Masee AY. Field tests for rational drug use in twelve developing countries, *Lancet* 1993; 342: 1408-10.
21. Bangladesh Health Bulletin. 1998-99. Unified Management Information System (UMIS); Directorate General of Health Services (DGHS), Government of Bangladesh. Oct. 2001. pp. 80-84.