SIMPLE APPROACH TO ACUTE RESPIRATORY INFECTION IN RURAL UNDERFIVE CHILDREN

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ABSTRACT

The feasibility of acute respiratory infection (ARI) control in 5,535 rural preschool children was studied. The Primary Health Centre (PHC) staff and local practitioners (drug distribution centres) were identified and trained in recognition of moderate/severe ARI, referral, drug administration and in the education of the community. Functional ARI classification as envisaged in ARI control programme was followed. There was significant reduction in moderate (42% reduction) and severe (89% reduction) ARI episodes from year 1985 to 1987. Both ARI (27.8 %) and non-ARI (18.3%) deaths showed reduction. Majority of children who died due to ARI were also unimmunized. The moderate and severe ARI related morbidity and mortality was significantly reduced in immunized children compared to unimmunized children. Although, strategies of National ARI control programme by health education, standard case management and strengthening of immunization is a good thought but it is clear that proper implementation of immunizations is going to pay more dividends. It is also evident that the local medical practitioners should be trained and involved in this control programme to have community faith as well as to avoid opposition.

Key words: *Acute respiratory infection, Morbidity, Mortality, Child Tetanus, Pneumonia.*

The incidence of acute respiratory infection (ARI) is about 50 times more in developing as compared to developed countries(1.2). One third(4 out of 15 million) of all deaths in children below 5 years are contributed by ARI and of these 2/3rd die in first year of life(3). According to the data available from the Registrar General of India(4,5) 14.3% of deaths in infancy and 15.9% in 1-5 years are due to ARI. In Tanzania(6) out of 1198 child deaths, 421 (35%) were due to pneumonia and of these 148 had measles as an associated cause. The etiology of acute lower respiratory tract infection in developing countries is predominantly bacterial compared to non-bacterial in developed countries(7-9). These facts suggest that ARI related morbidity and mortality can be controlled by (*a*) immunization, (*b*) timely use of antibiotics, and (*c*) referral for proper case management(10). In a country like our's where 80.0% population lives in rural areas, a feasible practical strategy is needed to reduce the underfive mortality and morbidity. The present study is an endeavour at the field level in the same direction.

Material and Methods

The present study was conducted in 24 villages of KV Block of Varanasi covering a population of 33,441. A total of 5,535 underfive children were identified for the

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present study. These villages were catered for health by female and male health workers. The Medical Officer of PHC and male and female health workers of the study village were contacted and objectives as well as strategies of the present feasibility study (as given below) were explained to them.

(*a*) Recognition of ARI cases and the use of functional ARI classification as envisaged in ARI control programme.

(*b*) Recognition of cases for referral and linkage with PHC/District/Medical College Hospitals.

(*c*) Strengthening of immunization.

(*d*) Use of suitable antibiotics, *i.e.*, ampicillin for 0-6 months group age and trimethoprim (20 mg for 6 months to one year and 40 mg for 1-5 year age group, twice daily) and sulfamethaxozole combination twice daily through peripheral worker.

(*e*) The cleaning of airways, continued feeding and as well as extra intake of fluids.

Although, functionally these workers were responsible for providing the health care to the children of the area but their availability was not regular. Initially these health workers were contacted each month for training during first six months. However, it was realized that the moderate and severe cases of ARI required immediate management at home and, therefore, an alternative person in the area has had to be identified and trained for management of these cases. Our earlier study(11) has shown that almost each village has 1-2 practitioners who are providing first line health care to the population. Such practitioners were identified by interviewing the villagers and they were then also trained to (*a*) identify the mild, moderate and severe cases of ARI; (*b*) give antibiotics to moderate and severe ARI cases (as given above); and (*c*) to refer severe cases of ARI immediately to the primary health centre/other recognized referral centres.

In addition to the initial one week training these practitioners were provided referral support and involved in providing immunizations. During the immunization sessions, the pregnant and other women were given health education and told about seriousness of ARI diseases. The immunization was mainly strengthened in later half of 1986 and early 1987. The children were visited each month by field supervisors for carrying out the morbidity and mortality survey besides providing treatment support to the village practitioners labelled as drug distribution centres (DDC). The villagers were educated in each visit by the field supervisors for the facility available. The cause of death was ascertained by field supervisor by verbal autopsy and was also subsequently confirmed by one of the authors.

Results

Table I presents episodes of acute respiratory infections per child per year for 1985, 1986 and 1987. The ARI episodes per child per year were 2.73 in 1985, 2.64 in 1986 and 2.54 in 1987. This reduction was mainly due to significant fall in moderate and severe type of ARI episodes moderate 0.24 to 0.14 (*i.e.*, 42.0% reduction) and severe 0.09 to 0.01 (*i.e.*, 89.0% reduction) per child per year from 1985 to 1987 ($p<0.001$). The mild ARI episodes (90% of the total) did not show any steep change during the study period and thus resulting in only 7% reduction in the total ARI episodes per child per year ($p<0.01$).

Table II presents the morality for the same period. The data for the year 1985 for first 6 months was collected retrospectively

TABLE I—*Prevalence of ARI episodes in Rural Areas of Varanasi*

Year	Number of children	Period of study	Number of ARI episodes			
			Mild	Moderate	Severe	Total
1985	5525	June - December	6642	659	247	7548
			(2.40)	(0.24)	(0.09)	(2.73)
1986	5312	January-December	13076	815	127	14018
			(2.46)	(0.15)	(0.02)	(2.64)
1987	5132	January - December	12275	721	55	13051
			(2.39)	(0.14)	(0.01)	(2.54)
			NS	18.19***	30.74***	12.35**

** <0.01, *** <0.001.

TABLE II—*Proportionate Percentage Distribution of ARI and Non-ARI Mortality and Percentage Change During the Study Period*

Year	Age in yrs / Type of mortality	(0-5)			(0-1)			(1-5)		
		ARI	Non-ARI	Total	ARI	Non-ARI	Total	ARI	Non-ARI	Total
1985	No.	18	115	133	7	82	89	11	33	44
	%	13.5	86.5	-	7.9	92.1	-	25.0	75.0	-
1986	No.	19	112	131	8	82	90	11	30	41
	%	14.5	85.5	-	8.9	91.1	-	26.8	73.2	-
1987	No.	13	94	107	9	77	86	4	17	21
	%	12.1	87.9	-	10.5	89.5	-	19.1	80.9	-
Percentage Change		27.8	18.3	19.5	28.6	6.1	3.4	63.6	48.5	52.3

No. = Number of children.

while for the study period July 1985 to December 1987 it was prospective. There were in all 133, 131 and 107 deaths in 1985, 1986 and 1987, respectively. The ARI deaths were 18 and 19 in years 1985 and 1986 but reduced to 13 in year 1987. There was also reduction of non-ARI deaths from 115 in 1985 and 112 in 1986 to 94 in 1987. The distribution of ARI deaths in age groups 0-1 and 1-5 years showed a change from 7 to 9 and 11 to 4, deaths respectively. The percentage change of ARI mortality is also given in *Table II*. An overall reduction of both ARI and non-ARI mortality was observed (52.3% in 1-5 years age group as compared to 3.4% in the age group of 0-1 year). The mortality reduction was 63.6% for ARI and 48.5% for non-ARI deaths in 1-5 years age group compared to corresponding figures of 28.6 (ARI) and 6.1% (non-ARI) in age 0-1 year.

A detailed analysis to identify the diseases resulting in mortality is presented in *Table III*. In non-ARI groups, the

TABLE III —*Agewise Proportionate Percentage of Cause of Death-Study Period*

Year	1985						1986						1987					
Age (years)	0 - 5		0 - 1		1 - 5		0 - 5		0 - 1		1 - 5		0 - 5		0 - 1		1 - 5	
Cause of deaths	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
A. NON-ARI Group																		
1. Infection & parasitic diseases	46	34.6	22	24.7	24	54.5	35	26.7	18	20.0	17	41.4	36	33.6	24	28.0	12	57.1
(*a*) Septicemia	8	6.0	7	7.9	1	2.3	12	9.2	10	11.1	2	4.9	12	11.2	12	14.0	-	-
(*b*) Gestroenteritis	38	28.6	15	16.8	23	52.2	23	17.5	8	8.9	15	36.5	24	22.4	12	14.0	12	57.1
2. Hyperpyrexia	4	3.0	1	1.1	3	6.8	-	-	-	-	-	-	1	0.9	-	-	1	4.8
3. Diseases of CNS	4	3.0	-	-	4	9.1	9	6.9	2	2.2	7	17.1	1	0.9	1	1.1	-	-
(*a*) Encephalitis	-	-	-	-	-	-	3	2.3	-	-	3	7.3	1	0.9	1	1.1	-	-
(*b*) Meningitis	-	-	-	-	-	-	6	4.6	2	2.2	4	9.8	-	-	-	-	-	-
4. Certain perinatal conditions	55	41.3	55	61.8	-	-	59	45.0	59	65.5	-	-	48	44.9	48	55.8	-	-
(*a*) Low birth weight	23	17.3	23	25.8	-	-	22	16.8	22	24.4	-	-	27	25.2	27	31.4	-	-
(*b*) Severe birth anoxia	10	7.5	10	11.3	-	-	16	12.2	16	17.8	-	-	8	7.5	8	9.3	-	-
(*c*) Tetanus neonatorum	22	16.5	22	24.7	-	-	21	16.0	21	23.3	-	-	13	12.2	13	15.1	-	-
5. Congenital anomaly	2	1.5	2	2.2	-	-	3	2.3	2	2.2	1	2.4	1	0.9	-	-	1	4.8
6. Others	4	3.0	2	2.2	2	4.5	5	3.8	1	1.1	4	9.7	7	6.5	4	4.6	3	14.3
7. Nutritional deficiency	-	-	-	-	-	-	1	0.8	-	-	1	2.4	-	-	-	-	-	-
B. ARI GROUP	18	13.5	7	7.9	11	25.0	19	14.5	8	8.9	11	26.9	13	12.2	9	10.4	4	19.0
(*a*) Pneumonia (post measles & others)	16	12.0	7	7.9	9	20.5	17	13.0	8	8.9	9	22.0	13	4.2	9	10.4	4	19.0
(*b*) Diphtheria	2	1.5	-	-	2	4.5	2	1.5	-	-	2	4.9	-	-	-	-	-	-
Total deaths	133		89		44		131		90		41		107		86		21	

TABLE IV—*ARI Morbidity (Moderate and Severe) and Mortality in Relation to Immunization Status*

Immunization status	Number of children	ARI morbidity			ARI mortality
		Moderate	Severe	Total	
Immunized children (DPT, Polio 3 doses, Measles)	1687	125 (0.074)	7 (0.004)	132 (0.078)	2
Unimmunized children	1510	325 (0.215)	44 (0.029)	369 (0.244)	11

Figures in parentheses are number of ARI episodes per child per year.

reduction in number of deaths was mainly due to control of tetanus neonatorum from 22 (year 1985) and 21 (year 1986) to 13 (year 1987) followed by fall in mortality due to diarrhea (from 38 in 1985 to 23 in 1987). The ARI mortality for the same period due to measles bronchopneumonia was 6, 7 and 4 deaths in 1985, 1986 and 1987, respectively. There were 2 deaths each in year 1985, 1986 due to diphtheria.

The ARI morbidity and mortality in relation to immunization status has been presented in *Table IV*. The moderate and severe episodes were comparatively less in immunized as compared to unimmunized children. The number of deaths were also only 2 in the immunized groups as compared to 11 in the unimmunized children.

Discussion

To meet the challenge of health for all (Alma Ata declaration) by 2000 AD, our Government has set targets of reducing IMR from 95 to 60 and childhood mortality from 30 to 10(12). There have been efforts to meet these targets by providing safe drinking water, promotion of oral rehydration therapy and initiative towards universal immunization. Recently the Government has planned to launch 'Acute Respiratory Infection (ARI) control programme' in the country so as to reduce ARI related mortality and morbidity(13).

The ARI control programme is proposed to be the responsibility of the maternal and child health (MCH) division of the family welfare. As such the most peripheral workers proposed to be the supervisors of ARI control programme are female and male health workers who are responsible for a population of 3000-5000 in rural area. The control strategies envisage to provide training to these workers for case management and timely referral besides strengthening the immunization(13) In addition diarrheal diseases control and provision of safe drinking water is also to be implemented on priority. Timely case management of moderate and severe ARI cases has many problems as it needs immediate care while the health workers responsible may not be available within reasonable distance for management and timely referral. Hence, alternate strategies for management of ARI cases have to be kept in mind. In view of such difficulties under the pres-

ent programme, besides training MCH staff of the area, the village practitioners were also trained for treating ARI cases and to act as drug distribution centres (DDCs). The results of the present study are based on involvement of local village level practitioners who are trained to give first line management and refer patients when necessary. The overall episodes of ARI/child/year in the year 1985 were 2.73 which are lower than the incidence reported in earlier urban community based studies (14-17) but were similar to 1-3 AR episodes/child/year in rural studies(18,19). The severe ARI episodes in the present study were 0.09/child/year (*i.e.,* 90/1000 children) accounting for most of the children suffering from pneumonia. The incidence of pneumonia reported from some of the studies have varied from 70 to 90 per 1000 children(19). However, if moderate ARI cases are also taken into consideration, the incidence was much higher in the present study (328 per 1000 children in age group of 0-5 years). In a study from Papua New Guinea(20) an incidence of 256/1000 for infants and 62/1000 for preschoolers has been reported.

The results of present study suggest that such strategies could bring down moderate and severe ARI episodes as well as ARI-related mortality. It is important to note that the reduction was mainly due to prevention of deaths related to post-measles bronchopneumonia and diphtheria because of strengthening of immunization services. There were 2 ARI deaths in immunized children compared to 11 deaths in unimmunized matched number of children. The reduction in non-ARI related mortality was mainly due to decrease in deaths due to tetanus neonatorum and diarrhea. Every study subject was contacted once a month thus the influence of education and other inputs during visits is likely to be similar (Hawthorn effect). In the present study deaths were in unimmunized groups of children who also had regular contacts. Perhaps they could not be motivated in.

Although the strategies of National ARI control by using health education, standard case management and strengthening of immunization is a good thought but it is clear that proper implementation of UIP and EPI is going to pay more dividends. Further, even health education and standard case management has to be implemented through personnel who are available at the time of need and enjoy community confidence rather than at subcentre level by multipurpose health workers. They can act as linkage for providing drugs and vaccine and conducting vaccine sessions for the village practitioners and also can help in conducting mortality and morbidity surveys for evaluating the impact of the programme.

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