IMPACT OF NATIONAL IMMUNIZATION SCHEDULE ON VACCINE PREVENTABLE DISEASES: A HOSPITAL BASED STUDY

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ABSTRACT

An analysis of vaccine preventable diseases (VPD) in two block years, i.e., 1972-1975 and 1986-1989 showed an overall decline in morbidity and mortality. Improvement in morbidity was most noticeable in typhoid fever followed by polio and tetanus. However, in tuberculosis and measles with compilations, there was a significant increase in admission rates 3.8 vs 4.4% and 1.8 vs 2.2%, respectively. Mortality in vaccine preventable diseases except polio has declined significantly.

Key words: *Immunization, Vaccine preventable disease.*

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The World Health Organization, through its expanded programme on immunization (EPI), hoped to ensure that by 1990 every child in the world will be immunized against six diseases of childhood which are vaccine preventable and form the main causes of morbidity and mortality(1). In India, EPI was launched with all sincerity in January, 1978 and National Immunization Schedule was framed covering all children below five years and pregnant women. Subsequently, the immunization schedule and target population have been changed from time to time. In 1985, Universal Immunization Programme (UIP) was launched, where the emphasis for vaccination have been changed from under five to all infants below one year of age(2).

Immunization being a top priority area, it is of interest to know the impact of immunization programmes on the morbidity and mortality pattern, especially of vaccine preventable diseases (VPD). The present study carried out in a large hospital compares the available data on VPD during early seventies with that during recent years.

Material and Methods

Children below 12 years admitted to the Lok Nayak Jai Prakash Narain Hospital, New Delhi comprised the study population. Four block year periods of last two decades *viz.*, 1972-1975 and 1986-1989 were chosen for analysis of the data as data of seventies were available for four years only. The Pediatric bed strength during these periods was 75 and 150, respectively. Morbidity and mortality statistics were analyzed in relation to total pediatric admissions and in relation to vaccine preventable diseases.

Typhoid cases though not included

under Universal Immunization Programme have been analyzed in this study as they could also be considered as vaccine preventable to a considerable extent.

Results

VPD accounted for 18.3 and 12.8% of total pediatric admissions and 41.7 and 22.2% of total pediatric deaths, in the block years 1972-1975 and 1986-1989, respectively (*Table I*). Improvement in morbidity and mortality rates were mainly noticeable in typhoid fever (4.8 *vs* 1.3% of admissions and 4.3 *vs* 0.4% of deaths) followed by tetanus (5.2 *vs* 3.4% of admissions and 24.1 *vs* 12.1% of deaths) and poliomyelitis cases (2.3 *vs* 1.3% of admissions and 1.7 *vs* 1.4% of deaths). However admissions related to tuberculosis (3.8 *vs* 4.4%) and measles with complications (1.8 *vs* 2.2%) have actually increased during this period. Pertussis and diphtheria related admissions were low in both the periods, as these are usually admitted in a separate hospital for infectious disease cases (*Tables II & III*). Mortality in each of the vaccine preventable disease except polio has shown a declining trend (*Table IV*).

TABLE I—*Morbidity and Mortality Among Pediatric Inpatients*

Admission and deaths	1972-1975	1986-1989
Total pediatric admissions	25016	34106
Vaccine preventable diseases	4572 (18.3%)	4318 (12.7%)
Total pediatric deaths	2807	3965
Vaccine preventable deaths	1172 (41.8%)	881 (22.2%)

Discussion

Vaccine preventable diseases account for high morbidity and mortality in infants in developing countries. Under EPI in India, DPT, DT, TT and BCG were introduced in 1978. Polio and typhoid vaccines were introduced a year later. Measles vaccine had been included in the Immunization Schedule under UIP in 1985(2,3).

With 22 million annual newborns, the task of providing immunization services to all children is a formidable one. For vaccination coverage the Government of India has set up targets for every year till 1990 and per cent target achievement is reported to be about 60% for typhoid and 90% for other vaccine preventable diseases. According to report of State Health Authorities, published every year, there is a significant decline in number of vaccine preventable diseases(4). However, according to UNICEF, the morbidity rate is still high and even in late eighties every day in India, more than 3000 children die of VPDs and about 250 more are paralyzed for life by poliomyelitis alone(5).

The impact of immunization programme on morbidity is still not clear due to paucity of data. There is evidence to suggest that incidence of polio is actually increasing or has remained stationary(6,7). Even in vaccinated children there are increasing number of poliomyelitis cases(8,9). Despite adequate coverage, vaccination failure may occur as cold chain often is not maintained adequately(10).

Success of immunization programme should reflect on hospital admission of VPDs. The present study shows that there is an increase in number of tuberculosis and measles cases requiring hospitalization in current years. Of particular concern is increase in CNS tuberculosis cases, which

TABLE II—*Morbidity Rates in Relation to Total Vaccine Preventable Diseases and Total Pediatric Admissions*

Diseases	1972-1975			1986-1989			p value	
	Total	% VPD	% TPA	Total	% VPD	%TPA	% VPD	% TPA
Tuberculosis								
Total	949	20.8	3.8	1487	34.5	4.4	<0.001 (+)	<0.05 (+)
CNS	428	9.4	1.7	647	15.0	1.9	<0.001 (+)	>0.05 (+)
Non-CNS	521	11.4	2.1	840	19.5	2.5	<0.001 (+)	<0.01 (+)
Poliomyelitis	584	12.8	2.3	440	10.2	1.3	<0.001 (–)	<0.001 (–)
Measles with complications	454	9.9	1.8	757	17.5	2.2	<0.001 (+)	<0.001 (+)
Tetanus								
Total	1308	28.6	5.2	1143	26.4	3.4	<0.05 (–)	<0.001 (–)
Neonatal	–	–	–	704	16.3	2.1	–	–
Post-neonatal	–	–	–	439	10.2	1.3	–	–
Typhoid	1191	26.1	4.8	427	9.9	1.3	<0.001 (–)	<0.001 (–)
Pertussis	66	1.4	0.3	23	0.5	0.1	–	–
Diphtheria	20	0.4	0.1	41	1.0	0.1	–	–
Total	4572		18.3	4318		12.8		

+ = Increase; – = Decrease; VPD = Vaccine preventable disease; TPA = Total pediatric admissions.

TABLE III—*Mortality Rates in Relation to Total Vaccine Preventable Deaths and Total Pediatric Deaths*

Diseases	1972-1975			1986-1989			p value	
	Total	% VP deaths	% TP deaths	Total	% VP deaths	% TP deaths	% VP deaths	% TP deaths
Tuberculosis								
Total	232	19.8	8.3	216	24.5	5.4	<0.05 (+)	<0.05 (–)
CNS	192	13.4	6.8	181	20.5	4.6	<0.05 (+)	<0.05 (–)
Non-CNS	40	3.4	1.4	35	4.0	0.9	>0.05 (+)	>0.05 (–)
Poliomyelitis	48	4.1	1.7	56	6.4	1.4	<0.05 (+)	>0.05 (–)
Measles with complications	88	7.5	3.1	103	11.7	2.6	<0.01 (+)	>0.05 (+)
Tetanus								
Total	675	57.6	24.1	478	54.3	12.1	>0.05 (–)	<0.00 (–)
Neonatal	–	–	–	412	46.8	10.4	–	–
Post-neonatal	–	–	–	66	7.5	1.7	–	–
Typhoid	121	10.4	4.3	14	1.6	0.4	<0.001 (–)	<0.001 (–)
Pertussis	4	0.3	0.1	1	0.1	0.0	–	–
Diphtheria	4	0.3	0.1	13	1.4	0.3	–	–
Total	1172		41.7	887		22.2		

+ = Increase; – = Decrease; VP = Vaccine preventable; TP = Total pediatric.

TABLE VI—*Mortality in Vaccine Preventable Diseases (Disease wise)*

Diseases	1972-1975		1986-1989		p value
	Admissions	Deaths	Admissions	Deaths	
Tuberculosis					
Total	949	232 (20.4)	1487	216 (14.5)	<0.001
CNS	428	192 (44.9)	647	181 (28.0)	<0.001
Non-CNS	521	40 (7.7)	840	35 (4.2)	<0.05
Poliomyelitis	584	48 (8.2)	440	56 (12.7)	>0.05
Measles	454	88 (19.4)	757	103 (13.6)	>0.05
Tetanus					
Total	1308	675 (51.6)	1143	478 (41.8)	<0.001
Neonatal	–	–	704	412 (58.5)	–
Post-neonatal	–	–	439	66 (15.0)	–
Typhoid	1191	121 (10.2)	427	14 (3.3)	<0.001
Pertussis	66	4 (6.1)	23	1 (4.4)	>0.05
Diphtheria	20	4 (20.0)	41	13 (31.7)	>0.05

has high mortality and serious sequelae in survivors. Typhoid fever cases, however, have shown a significant fall in admission rates, although it is possible many of these cases are now treated as outpatients. Tetanus and polio cases have also registered lower admission rates though absolute number of cases has come down only marginally. The status of diphtheria and pertussis cases could not be studied properly, as the number of cases are low in both the periods. Further the former is admitted in a separate infectious disease hospital and the latter is mostly treated from Outpatient Department.

Mortality in VPDs has shown a declining trend. This is probably due to availability of potent antibiotics and improvement in health care facilities. In polio and diphtheria, deaths have marginally increased, possibly due to an increase in admission of severe forms. However, the increase is not significant. Although mortality in measles and CNS tuberculosis has declined, these are contributing to larger percentage of vaccine preventable deaths due to higher admission rates.

Deivanayagam *et al.*(11) in their series have also made similar observations except a relatively low admission for tetanus and lower mortality in tuberculosis. Our centre being a referral unit for tetanus a large number of such cases get admitted which could have influenced admission rates.

The relatively poor impact of immunization programme on measles could be due to late introduction of measles vaccine. Implementation of immunization programme especially with respect to measles has also been shown to be poor in field studies. In the survey, out of 43 study districts in India, 20 districts achieved more than 50% coverage without measles. With measles, this number was brought down to only two. In the same study percentage coverage for Delhi without measles was

76-85% and with measles 51-75%(12).

Poliomyelitis has shown a declining trend and lameness survey has shown that annual incidence rate has come down from 1.5-1.9 per thousand in 1981 to 0.90 per thousand in recent years(13). However, it is a matter of concern that about 20-30% cases of poliomyelitis in the country had received polio immunization(12). Equally disturbing is absence of decline in death rate in poliomyelitis cases, as noted in our series, which could be due to an increase in severe forms.

The present hospital data suggest that the goal of 'Health for All by 2000 AD', can be achieved in relation to vaccine preventable diseases, although control of tuberculosis may be a problem.

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