

# EXTENT OF OCCURRENCE OF THE SIX VACCINE PREVENTABLE DISEASES IN VACCINATED/UNVACCINATED CHILDREN

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## ABSTRACT

Sixty two children who were diagnosed to be suffering from any of the six vaccine preventable diseases were studied to know their vaccination status prior to the occurrence of these diseases.

A total of 33.9% of these children had developed these diseases inspite of full immunization. Nearly 75% of immunized children had received the vaccine from Government sources.

The break-up diseases among the children studied was tetanus (35.5%), poliomyelitis and pulmonary tuberculosis (22.6% each), measles (11.3%), diphtheria (6.4%) and pertussis (1.6%).

The vaccinated children who developed poliomyelitis belonged to a relatively higher age group. Seventy one per cent of measles cases developed bronchopneumonia as a complication.

Seventy five per cent of the mortality in the children studied was due to tetanus neonatorum. Since one third of the children studied had developed diseases inspite of full immunization, it is inferred that closer monitoring of the Cold Chain System and intensive surveillance at peripheral levels are required.

**Key words:** Vaccine preventable diseases, Immunization.

Diseases of early childhood, preventable by vaccination remain a serious pediatric problem in developing countries despite the continuing increase in proportion of children receiving vaccines(1). Many reports have appeared in the literature showing poliomyelitis(2-8) among the fully vaccinated children. However, there is paucity of such reports regarding tetanus neonatorum(9,10), measles(11), diphtheria, pertussis and tuberculosis. This study was, therefore, planned to know the extent of occurrence of the six killer diseases in those children who have been vaccinated against those diseases.

## Material and Methods

The present study was conducted in the Department of Pediatrics, Dayanand Medical College and Hospital, Ludhiana. Sixty seven children who attended the Out Patient Department or were admitted to the Pediatrics Ward between April, 1988 and March, 1990 for any of the six killer diseases, viz., diphtheria, pertussis, tetanus, acute poliomyelitis, measles and tuberculosis comprised the material for this study. Along with collection of data on socio-demographic variables, a detailed evaluation of the patients included history taking, clinical examination and relevant investigations. Vaccination status was ascertained from the available immunization cards/slips and also presence/absence of

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*Received for publication May 10, 1990;*

*Accepted December 20, 1990*

scar mark in case of BCG vaccination. Children who had received one dose of BCG vaccine between 0-9 months of age, three doses of DPT and oral polio vaccines between 6 weeks and 9 months of age with atleast one month's interval in between the doses and one dose of measles vaccine at or after 9 months of age were considered as fully immunized against these diseases(12). Children having vaccine coverage less than that mentioned above for a respective disease were taken as unimmunized against that disease. The diagnosis of these six diseases was made mainly by the typical findings on physical examination(13) and laboratory investigations. The data collected were then analyzed. Three suspected cases of pertussis and one each of measles and tuberculosis could not be followed up and hence were excluded from the study.

## Results

Among the sixty two children studied the most common disease observed was

tetanus (35.5%) followed by poliomyelitis (22.6%), tuberculosis (22.6%), measles (11.3%), diphtheria (6.4%) and pertussis (1.6%) (Table I). A total of 33.9% children had been fully immunized. Of these 76.2% had received the vaccines from Government sources. Seventy one per cent of them were males and 29% females. Forty seven children (75.8%) were from rural and 15 (24.2%) from urban areas (Table II).

Tetanus was observed in 22, i.e., 35.5% of children studied, 11 cases among neonates and 11 among others. Of the 11 cases of tetanus neonatorum 8 (72.7%) were observed in infants below 10 days of age. Ten (90.9%) of them were males and one female. Ten were from rural areas and one from urban area. There were 9 (81.8%). Hindus and 2 (18.2%) Sikhs. Of the total 12 deaths, tetanus neonatorum was responsible for 9 (75%). None of the mothers of the deceased infants had received tetanus toxoid during their antenatal period.

Acute poliomyelitis was seen in 14

TABLE I—Percentage Occurrence of the Six Killer Diseases and Vaccination Status Among Children Studied

Disease	Number of children				Total (n = 62)	
	Vaccinated		Unvaccinated			
Acute poliomyelitis	8	(57.14)	6	(42.9)	14	(22.6)
Tetanus						
(a) Neonatal	Nil		11	(100)	11	(17.75)
(b) Others	2	(18.1)	9	(81.9)	11	(17.75)
Tuberculosis	8	(57.14)	6	(42.86)	14	(22.6)
Measles	1	(16.6)	6	(83.4)	7	(11.3)
Diphtheria	2	(50)	2	(50)	4	(6.4)
Pertussis	Nil		1	(100)	1	(1.6)
Total	21	(33.9)	41	(66.1)	62	(100.0)

Figures in parentheses indicate percentages.

(22.6%) children. Of these (57.14%) had been vaccinated and 6 (42.86%) unvaccinated. Among the unvaccinated children, there were 5 (83.3%) males and one (16.7%) female. Rural children formed 83.3% of the unimmunized children. In the vaccinated children the age group mainly

affected was 2-3 years whereas in the unvaccinated it was 6-12 months. The majority of cases, 7 (87.5%) in the vaccinated and 4 (66.7%) in the unvaccinated were of the spinal type. Six of the vaccinated (75%) had developed paralysis of two limbs (Table III).

TABLE II—Rural Distribution of Cases

Disease entity	Number of children						Total
	Vaccinated (n = 21)		Unvaccinated (n = 41)				
	Rural	Urban	Rural	Urban			
Acute poliomyelitis	4 (28.6)	4 (28.6)	5 (35.7)	1 (7.1)		14	
Tetanus							
(a) Neonatal	—	—	10 (90.9)	1 (10.1)		11	
(b) Others	2 (18.2)	—	7 (63.6)	2 (18.2)		11	
Tuberculosis	6 (42.8)	2 (14.3)	4 (28.6)	2 (14.3)		14	
Measles	1 (14.3)	—	4 (57.1)	2 (28.6)		7	
Diphtheria	2 (50.0)	—	1 (25.0)	1 (25.0)		4	
Pertussis	—	—	1 (100.0)	—		1	
Total	15 (24.2)	6 (9.7)	32 (51.6)	9 (28.1)		62	

Figures parentheses indicate percentages.

TABLE III—Distribution of Poliomyelitis Cases among the Vaccinated/Unvaccinated Children by Type of Involvement and Extent of Paralysis

Disease status	Number of children				Total	
	Vaccinated		Unvaccinated			
A. <i>Type of involvement</i>						
Spinal	7	(87.5)	4	(66.6)	11	(78.7)
Bulbospinal	1	(12.5)	1	(16.7)	2	(14.2)
Encephalitic	Nil		1	(16.7)	1	(7.1)
B. <i>Extent of paralysis</i>						
One limb	2	(25.0)	Nil		2	(14.3)
Two limbs	6	(75.0)	2	(33.4)	8	(57.1)
>Two limbs	Nil		4	(66.6)	4	(28.6)
Total	8	(100.0)	6	(100.0)	14	(100.0)

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(22.6%) children. Of these (57.14%) had been vaccinated and 6 (42.86%) unvaccinated. Among the unvaccinated children, there were 5 (83.3%) males and one (16.7%) female. Rural children formed 83.3% of the unimmunized children. In the vaccinated children the age group mainly

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Out of the 14 (22.6%) cases of tuberculosis, 8 (57%) had been immunized and 6 (43%) unimmunized. More of the immunized (75%) and unimmunized (66.7%) children were from rural areas. Age distribution of these cases did not show any difference between vaccinated and unvaccinated children. The organ system involved were respiratory system, central nervous system and abdomen in that order.

Of the 7 (11.3%) cases of measles, only one had been unimmunized, a majority (71.1%) of them developed bronchopneumonia, encephalitis and diarrhea was seen in one case each. Four (66.7%) of the 6 unvaccinated children were below two years of age while the only vaccinated child who had measles was more than two years of age.

All the four cases of diphtheria were between 5-9 years of age. Of these 2 (50%) had been vaccinated. The only case of pertussis observed was in an unvaccinated seven year old Sikh child from a rural area.

## Discussion

In this study only 33.9% of the affected children had been immunized. More of the measles and neonatal tetanus cases were among the unimmunized children. These two are the biggest killers among the vaccine preventable disease. Measles still claims 1.5 million young lives each year. Thus measles is still the single most deadly threat to children of the 1990(14). Some workers have reported measles in 30% of the immunized children(15) with no difference in its severity and complications. Measles vaccine failure has been documented to occur as a result of improper vaccine handling, use of killed virus vaccine and use of immunoglobulins with vaccine(11). However, Natsu *et al.*(16) did not find any case of measles among the immu-

nized in their study. In our study out of the seven cases of measles, only one was in an immunized child and majority of them (71%) developed bronchopneumonia. This is consistent with the reports of previous workers(17).

Antenatal tetanus toxoid immunization in developing countries is still below 30%. Thus the number of recorded tetanus cases among newborns has fallen very little in the 1980s(14). In our study, 75% of the total deaths were due to tetanus neonatorum in babies born to mothers with no immunization against tetanus. Various workers(18-20) have also reported high mortality among tetanus cases. The large number of neonatal tetanus cases occurring among Hindus compared to Sikhs in this study may be due to different social beliefs and customs related to child birth and care of umbilical cord of newborn.

The age group involved in poliomyelitis among unimmunized children in this study was 6-12 months while in the immunized group it was 2-3 years. Various workers(5,21,22) have also reported poliomyelitis predominantly in children below 2 years of age. It has also been reported that only 60% of the children immunized against poliomyelitis develop protective antibodies against all the 3 types of polio viruses(5).

The protective value of BCG vaccine has been doubted from time to time. In this study also more than half (57.1%) of the cases had occurred among the vaccinated.

It was observed that two-thirds of the immunized children had received their vaccines from Government sources. This observation goes well with the earlier reports(5,21). More than half (52%) of the cases of the six killer diseases occurred among rural immunized children. This may be due to some failure in the Cold Chain

System at peripheral levels which needs further investigations.

The occurrence of diseases among immunized children immediately warrants intensive surveillance, adequate coverage of the target population, a close examination of the Cold Chain System and provision of constant power supply to at least Primary Health Centres.

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