

ANTIBODY RESPONSE TO THREE DOSES OF STANDARD AND DOUBLE DOSE OF TRIVALENT ORAL POLIO VACCINE

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ABSTRACT

The study was undertaken to compare the antibody response of 6-12 weeks old infants after three doses of standard trivalent oral polio vaccine (TOPV) (Groups A; (n = 42) with three doses of double the amount of TOPV (Group B; n = 35). Seroconversions in Group A were 64.2, 80.9% and 57.1% for Types I, II and III polioviruses, respectively. The corresponding figures for Group B were 77.7, 80.0 and 60.6%, respectively, the differences being insignificant. Differences in feeding practices and presence of maternal antibodies did not affect seroconversion. This suggests that increasing the amount of vaccine virus in each dose is not an alternative to present strategy. Breast feeding and presence of maternal antibodies are not responsible for poor seroconversion.

Key words: Trivalent oral polio vaccine, Seroconversion factors.

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Paralytic poliomyelitis continues to be a threat to life and limb in tropical and sub-tropical countries, while it has been almost completely eradicated from most of the developed countries of the world. The Kalawati Saran Children's Hospital, sentinel centre for poliomyelitis in Northern India, has not reported any significant decline in the incidence of the disease over the last decade(1), except in the period of November, 1988 to July 1989, despite intensive immunization campaign in and around Delhi(2).

The percentage of cases of vaccine failure has risen dramatically over the past few years(1,3). Various factors have been incriminated in the past for poor seroconversion to oral polio vaccine including inadequate doses(4), interference by widely disseminated enteroviruses(5), presence of maternal antibodies(6), breast feeding(7) and impotent vaccine.

In the light of these observations this study was conducted to compare the seroconversion to three doses of conventional trivalent oral polio vaccine and three doses of doubled amount of same vaccine. Factors affecting seroconversion were also studied.

Material and Methods

For this study 148 infants, 6-12 weeks of age, were followed up in Child Health Promotion Clinic of Kalawati Saran Children's Hospital, during the period October 1988 to May, 1989. Three doses of standard amount (0.1 ml) of trivalent oral polio vaccine (TOPV) were given to one group (Group A) and three doses of doubled amount (0.2 ml) of TOPV were given to the second group (Group B), at the interval of 4-6 weeks.

The vaccine was obtained from Central

Government Hospital Supply. All batches of vaccine, tested at National Institute of Communicable Diseases, were potent.

Preimmunization blood samples were withdrawn before administering the first dose and post immunization samples were collected after 4-6 weeks of completion of three doses.

Assessment of antibody response was done by microneutralization technique using Hep 2 medium at Virology Section of National Institute of Communicable Diseases.

If no antibody was detected at 1 : 10 dilution, serum was considered negative. Detection of four fold rise in antibody titre or change in titre from less than 1 : 10 to 1 : 20 or more in paired sera was considered as seroconversion.

Of 77 infants who completed the study, 42 belonged to Group A and 35 belonged to Group B. These groups were compa-

rable in feeding practice, socio-economic status and nutritional status.

Results

Table I shows that of 42 children in Group A, 16 (38.1%) seroconverted to all three types. Seroconversions to Polio viruses Type I, II and III were 64.3, 80.9 and 57.1% respectively. Of 35 children of Group B, 17 (48.6%) seroconverted to all three types. Seroconversion for polio viruses, Types I, II and III were 77.7, 80.0, 60.0%, respectively. The difference in seroconversion of Group A and Group B was not statistically significant. Seroconversion after 3 doses of TOPV was maximum for Type II poliovirus in both groups of infants, followed by Types I and III.

Effect of Breast Feeding

Seroconversion of breast fed and top

TABLE I—Seroconversion of Infants to Three Doses of TOPV in Group A (Conventional Amount) and Group B (Double Amount)*

Seroconverted to	Group A (n = 42)	Group B (n = 35)
Type I only	3 (7.1)	1 (2.3)
Type II only	8 (19.0)	3 (6.8)
Type III only	1 (2.3)	0 (0)
Type I + II	6 (14.3)	7 (15.7)
Type II + III	4 (9.5)	2 (4.5)
Type I + III	3 (7.1)	2 (4.5)
Triple positive	16 (38.1)	17 (48.6)
Triple negative	1 (2.3)	3 (6.8)
Type I total	27 (64.3)	27 (77.7)
Type II total	34 (80.9)	28 (80.0)
Type III total	24 (57.1)	21 (60.0)

Protective titres in Group A and Group B did not show any difference ($p > 0.10$).

Figures in parentheses are percentages.

fed infants did not reveal any statistically significant difference in Groups A and B (Table II).

Effect of Maternal Antibodies

Antibodies in a young unimmunized infant are maternal in origin. The effect of presence of antibodies prior to immunization or in other words effect of maternal antibodies on seroconversion was, therefore, studied in Groups A and B.

Table III shows that the difference in

seroconversion of infants with maternal antibodies and those without maternal antibodies was not significant in either of the groups.

Discussion

In the present study, the seroconversion was highest for Type II, lowest for Type III and intermediate for Type I Polio viruses. Similar results have been reported earlier from India(8,9). However, Jhala and Goel reported best seroconversion to

TABLE II—Effect of Feeding Practice on Seroconversion*

Seroconverted to	Group A		Group B	
	Breast fed (n = 26)	Top fed (n = 16)	Breast fed (n = 22)	Top fed (n = 13)
Type I	17 (65.4)	10 (62.5)	19 (86.3)	8 (61.5)
Type II	21 (80.6)	13 (81.2)	17 (77.2)	11 (84.6)
Type III	15 (57.7)	9 (56.2)	14 (63.6)	7 (53.8)
Triple positive	10 (38.4)	6 (37.5)	11 (50.0)	6 (46.2)

Difference in breast fed and top fed infants was not statistically significant in both groups. Figures in parentheses are percentages.

TABLE III—Effect of Presence of Maternal Antibodies on Seroconversion*

Seroconverted to	Group A		Group B	
	Maternal antibodies present (n = 16)	Maternal antibodies absent (n = 26)	Maternal antibodies present (n = 13)	Maternal antibodies absent (n = 22)
Type I	9 (56.2)	18 (69.6)	8 (61.5)	19 (86.3)
Type II	12 (75.0)	22 (84.6)	9 (69.2)	19 (86.3)
Type III	8 (50.0)	16 (61.5)	7 (53.8)	14 (63.6)

Seroconversion of infants with absent maternal antibodies and those with positive maternal antibody titres was not statistically different. Figures in parentheses are percentages.

Type I, followed by Type II and Type III(10), while Ghosh found highest seroconversion for Type II, lowest for Type I and intermediate for Type III(11).

In the present study no statistically significant difference was found in seroconversion of children given either conventional or double dose. Similar results have been reported by Jhala and Goel(10).

It is to be emphasized that after three properly spaced doses of oral polio vaccine, only 38% of infants had satisfactory seroconversion to all 3 types.

Adverse influence of breast feeding on seroconversion to TOPV has been reported earlier from India(5,6). However, Idris found that Poliovirus Type I alone showed poor response in breast fed children(7). The present study highlights no adverse effect of breast feeding on seroconversion. Similar results have been reported by others(12,13).

In the present study, presence of maternal antibodies at the time of starting vaccination did not influence antibody response in children. Similar results have been reported by Jacob John(14).

Sero response to three conventional doses of TOPV is far from satisfactory. However, individual type seroconversion is in the range of 64.3% (Type I), 80.0% (Type II) and 52.6% (Type III). Breast feeding and presence of maternal antibodies are not responsible for poor seroconversion. Doubling the vaccine virus content in each dose does not improve the seroconversion. Therefore, some alternative strategies have to be considered urgently to control poliomyelitis. These include introduction of neonatal OPV on the 3rd postnatal day along with BCG and if still seroconversion is poor with all the 4

doses (1 neonatal + 3 doses at 6, 10, 14 weeks), a 5th dose along with measles vaccine at 9-12 months or ideally an annual pulsing exercise at National level.

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NOTES AND NEWS

INTERNATIONAL SYMPOSIUM

Lessons from Laron Type Dwarfism

An International symposium on 'Lessons from Laron Type Dwarfism' will be held at Lisbon, Portugal from 25th-26th May, 1992.

Laron Type Dwarfism (LTD) is a new kind of genetic dwarfism, clinically, and by many biochemical criteria, indistinguishable from congenital isolated growth hormone deficiency (IGHD). In contradistinction to IGHD, the LTD patients have high levels of circulating hGH, which is unable to generate IGF-I, thus a disease associated with GH resistance.

The aim of the present workshop is to review the large amount of data accumulated during the long-term follow-up of a large cohort of patients and its molecular defect.

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