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Sex-differential and non-specific effects of routine vaccinations in a rural area with low vaccination coverage: an observational study from Senegal

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Abstract

Background: We examined the potential sex-differential and non-specific effects of bacille Calmette-Guérin (BCG), diphtheria-tetanus-pertussis (DTP) and measles vaccine (MV) in a rural area of Senegal.

Methods: The 4133 children born in the area between 1996 and 1999 were included in the study. Vaccinations were provided at three health centres. Vaccine information was collected through 3-monthly home visits. The survival analysis compared the effects of BCG and DTP according to the

following sequence of vaccinations: BCG-first, BCG+DTP1-first, or DTP1-first. We compared DTP and MV between 9 and 24 months of age, as 9 months is the minimum age for MV.

Results: At 12 months the vaccination coverage was 44%, 46% and 9%, respectively, for BCG, DTP1 and MV. Most children received BCG+DTP1-first and this combination was associated with a significantly lower mortality rate ratio (MRR) of 0.69 (0.53-0.89) compared with unvaccinated children. There was no benefit for children receiving BCG-first or DTP1-first. The female-male MRR was 0.79 (0.64-0.96) among unvaccinated children, but was significantly inversed with 1.45 (1.00-2.10) for children receiving DTP vaccination (test of homogeneity, p=0.006). Children who had received DTP simultaneously with MV or DTP after MV had significantly higher mortality (MRR=2.59 [1.32-5.07]) compared with children having MV-only as their most recent vaccination. After 9 months, the female-male MRR was 0.61 (0.31-1.19) for measles-vaccinated children but remained 1.54 (1.03-2.31) for DTP-vaccinated children who had not received MV (p=0.01).

Conclusions: The sequence of routine vaccinations is important for the overall impact on child survival and these vaccines are associated with sex-differential effects.

Keywords: BCG; DTP; Measles vaccine; Non-specific effects of vaccines; Sequence of vaccinations; Sex-differential effects.

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