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Typhoid Fever in Rural Communities of West Bengal, India—an Age-Wise Perspective

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Typhoid fever, caused by *Salmonella enterica* serovar Typhi, is an important global health problem, especially in developing countries where it claims 600,000 lives every year (1). It is endemic in Africa, Asia, and Latin America where there are poor sanitation conditions. It is transmitted from person to person via food and water contaminated with feces or urine from a typhoid case or carrier. Virtually, in all endemic areas, the incidence of typhoid fever is highest among children in the 5–19 year age group (2). In the Philippines, *S. Typhi* was the most common pathogen isolated from 422 patients (8.9%) in a hospital based surveillance of invasive bacterial infection comprising mostly of young adults and school children (3). In another study in Bangladesh, 49 cases from 888 blood cultures (5.5%) were positive for *S. Typhi*, of which 53% were from children under 5 years of age (4). In developing countries such as India, the disease remains an important public health problem. In Kolkata, India, the typhoid incidence rate is 214.2 (per 100,000/year). Annual typhoid incidence per 100,000 persons per year among 2–4 year and 5–15 year age groups in Kolkata, India have been estimated to be 340.1 and 493.5, respectively (5). Another prospective study from a Delhi slum inferred that the highest incidence occurred in children less than 5 years of age (6). However, others have reported the highest risk to be in the 20–40 year age group (7). This creates uncertainty about the optimum target age group for immunization. The typhoid vaccine was once available as whole cell inactivated typhoid/paratyphoid vaccines. In India, the vaccines were included in the Expanded Program of Immunization (EPI) in 1978, along with 5 other existing vaccines against vaccine preventable diseases: childhood tuberculosis, tetanus, diphtheria, pertussis, polio, and typhoid. Increased reactogenicity led to the discontinuation of these vaccines and since 1985 they have no longer been available (8). With this background, the present
study was undertaken to determine the prevalence of typhoid fever in different age groups in a rural community.

The study was carried out at Kalikapur primary health centers (PHCs) of South 24 Pargana District in West Bengal, India. Patients attending a PHC, with fever for at least 3 days and with a temperature of 38°C or greater were enrolled in the study. About 5-ml blood was collected aseptically and inoculated into 45 ml of glucose broth and processed at a central laboratory using conventional techniques (9). Briefly, inoculated glucose broth was incubated at 37°C for 7 days with occasional subculture on MacConkey agar (Becton Dickinson, Baltimore, Md., USA) on day 1, 4, and 7. On day 7, subculture was made on a nutrient agar (Becton Dickinson) plate to exclude any laboratory contamination. Any non lactose-fermenting colony on MacConkey agar was subjected to biochemical tests followed by serological identification using polyvalent somatic antiserum and monovalent Vi antiserum. As recommended (6), persons above the age of 45 years who had already received anti-typhoid medicine in the last 2 days and with reasons attributable to fever other than typhoid were excluded from the study.

Prior to initiation of the study, verbal consent of the local village council head and written consent from the district chief medical officer of health were obtained. The project was also approved in principle prior to initiation by the Institutional Ethical Committee (IEC). Between March 2003 and April 2005, in accordance with the inclusion criteria, a total of 520 patients were included in the study. Nineteen (3.65%) blood cultures from those suspected fever cases were positive for S. Typhi. The highest incidence of S. Typhi was isolated from the 10–14 year age group (8.99%), followed by the less than 5 year age group (3.13%), the 15–45 year age group (2.63%), and the 5–9 year age group (1.98%) (Table 1). Significant differences among the various age groups were observed ($P < 0.05$) using $n \times 2$ table for multiple comparison.

We attempted to work out the age-wise distribution of typhoid fever of a selected rural community of West Bengal, India, to re-evaluate the disease dynamics including determinants of this long-standing public health problem in this part of the subcontinent for the benefit of assisting health planners to undertake effective prophylactic and control measures.

The overall isolation rate during the study period was 3.65%, which can be attributed to the use of the blood culture (50% sensitive) method for detection and isolation of S. Typhi from suspected typhoid fever cases as advocated by Crump et al. (10).

The most vulnerable age group was found to be between 10–14 years, the reasons for which may be attributed to causative factors, viz., less restrictive nurturing at this age, increased consumption of unhygienic food and water, bathing/swimming in ponds etc., with a higher possibility of exposure to S. Typhi infection and consequently higher incidence of typhoid fever in this particular age group. It is assumed that careful nurturing of children up to 9 years of age may be a fugitive social factor for greater protection against typhoid fever. On the other hand, maturity at 15 years of age and above and a better understanding of normal behavioral health practices might be possible factors in a lower rate of infection in this age group.

Our finding, however, corroborates the reports of Saha et al., 2003 (11) which demonstrated that the identical age groups were at significant risk, in spite of the highest vulnerability age group being between 2–3 years, postulating the view that any future vaccination strategy should also target a higher age group (10–19 years of age) as a booster dose. However, it is difficult to arrive at a definite conclusion based on similarities between this rural community based present study and an urban hospital based one (11), but we strongly suggest the necessity of a longitudinal community based study inclusive of urban as well as rural settings.

In spite of the availability of hospital and urban slum based data, reports from rural community based typhoid prevalence is still rare in this part of the country. To fulfill that lacuna, the present pilot study was undertaken to identify and target the vulnerable age groups associated with typhoid fever infectivity in a rural community of eastern India. The study is the first of its kind for a rural community in this part of the subcontinent. Irrespective of the very small number of positive samples, the present study highlights the need and importance of proper planning for a longitudinal study including surveillance, involving a large population in order to provide a detailed evaluative understanding.

As of now, Vi polysaccharide vaccine and live attenuated Ty21a vaccine have both been tested in randomized controlled field trials including the susceptible age groups for typhoid fever (11,12). As the age group at highest risk of infection by typhoid fever has been established to be between 2–3 years of age (6,11,12), as discussed above, we hereby suggest that the immunization program against typhoid fever should be thoughtfully reassessed in its attempt to immunize children below 2 years of age in the first phase, which can help arrest infection in other age groups of children as well. At the same time, since young children in the 10–14 year age group were also prone to significant rates of infection by typhoid fever, as observed in the present community based study, administration of a subsequent booster dose in a higher age group (10–14 years) should be advocated in a potentially endemic population for reducing the disease burden.

**REFERENCES**