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### A Note on Incidence of Typhoid Fever in Diverse Age Groups in Kolkata, India

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Typhoid fever occurs both in epidemic and endemic forms and remains a public health problem in developing countries (1). Since 1990, the epidemics of *Salmonella enterica* serovar

Typhi have been reported from different parts of India (2,3), including Kolkata (4). The present retrospective and prospective study was undertaken to ascertain which particular age group is more affected and as such should be the target age group for an immunization program.

From 1990 to 2002, a total of 1,736 blood samples were collected from patients with a clinical diagnosis of enteric fever admitted to either the Dr. B.C. Roy Memorial Hospital for Children or Beliaghata General Hospital, Kolkata. The samples were processed for *S. enterica* serovar Typhi

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Table 1. Age-wise distribution of *Salmonella enterica* serovar Typhi isolated in Kolkata, India

Age group (years)	Total no. of blood culture (n = 1736)	No. of cultures positive (%)	ANOVA (one way)
0-1	19	2 (10.5)	—
1-2	78	17 (21.8)	5.6*
2-3	132	47 (35.6)	12.6**
3-4	159	33 (20.8)	5.1*
5-9	552	127 (23.0)	6.3*
10-19	622	134 (21.5)	5.5*
>20	174	6 ( 3.4)	3.6
Total	1736	366 (21.1)	

\*  $P < 0.05$  i.e., 5% level significance.

\*\* $P < 0.01$  i.e., 1% level significance.

according to the standard procedures (5). All isolates were confirmed serologically by slide agglutination test using commercially available specific antisera (Denka-Seiken, Tokyo).

Out of 1,736 blood cultures, 366 (21.1%) were positive for *S. enterica* serovar Typhi (Table 1). Only 10-30% of the blood samples with clinically diagnosed enteric fever were culture-positive which may be due to the fact that the other patients although clinically diagnosed to be suffering from enteric fever initially, were later diagnosed to be suffering from respiratory tract infection (14.8%), bronchopneumonia (25.4%), urinary tract infection (19.4%), or meningitis (18.0%).

It is evident that children between 2-3 years of age are most susceptible age group (35.6%) and thereby are the highest risk group against *S. enterica* serovar Typhi infection as compared to other age groups.

ANOVA (one way) tests were conducted for testing significance at 5% and 1% levels, respectively, between different age groups. Data were analysed statistically in order to ascertain the target age group for immunization purposes. Children between 2-3 years of age were the most susceptible age group with increased risk of typhoid fever ( $P < 0.01$ ).

Our results corroborate the findings of an earlier study from Bangladesh amongst hospitalized patients which shows 6 (16.2%) out of 37 patients in the age group of 2-3 years are more susceptible to infection (6). Similarly, in a community-based study done in an urban area at Delhi, 5.2% infectivity was detected in children >2-3 years of age (7).

It is interesting to note that although the child population between 2-3 years was most prone to infection, which may be due to a lack of immunity transferred by mother's milk or the nonconsumption of potable drinking water as is the common practice in rural/urban slum dwelling areas of eastern India. Children of other age groups viz., 1-2 years, 3-4 years, 5-9 years, and young patients of age groups between 10-19 years were also at risk of being exposed to infection against typhoid fever ( $P < 0.05$ ) as evident from the analysis of our results. Adult patients of >20 years were less in number in this study which may be due to the fact that they were treated by private practitioners with different susceptible antimicrobials at the domiciliary level (8).

At present, two types of vaccine against typhoid fever, such

as the Vi antigen vaccine or live attenuated Ty21a vaccine, are available. Both the vaccines have been tested in randomized controlled field trials including the susceptible age groups for typhoid fever (9,10).

As the highest risk group of infection against typhoid fever in child population was found to be between 2-3 years, we hereby propose that the immunization program against typhoid fever be reassessed with an aim to immunize younger children below 3 years of age in the first phase that will help arrest infection in other age groups of children as well. However, since the young patients of the age group between 10-19 years were also prone to significant infection of typhoid fever, administration of a subsequent booster dose in a higher age group (preferably at the age between 10-19 years) may be also advocated in a potentially endemic population for eradication of the disease burden.

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