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Epidemiological Trends of Enteric Fever in and around Aligarh Region- A 2 year Study

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An estimated 13 million cases occur annually in Asia alone and the morbidity and mortality attributable to enteric fever in India still remains enormous. A 2 year retrospective study was done at Microbiology Department, JNMCH, AMU to study the prevalence of enteric fever. The baseline titers were also recorded. Results of Widal test on 7325 serum samples showed significant titers in 704 (10.4%) samples: 662 (94.3%) to *S. typhi* - TO & TH, 32 to *S. paratyphi A* (4.8%), and 10 for *S.paratyphi B*(1.5%). Prevalence of Enteric fever in Aligarh based on results of Widal test was found to be 10.4% stressing it's correlation with poor sanitary conditions. Pediatric age group was most affected with no significant sex predilection. Endemicity of enteric fever in Aligarh was also established by Widal test. These findings are of importance in therapeutic decision making and implementing health measures for disease control.

Key words: Enteric fever, *Salmonella* Typhi and Paratyphi, Widal, endemicity.

Enteric fever, caused by *Salmonella enterica*, is an important global health problem, especially in developing countries where it claims 6,00,000 lives every year[1]. It is endemic in Africa, Asia, and Latin America where crowded and impoverished populations with inadequate sanitation conditions prevail. Hospital based studies and outbreak reports from India indicate that enteric fever is a major public health problem in this country, with *Salmonella* Typhi the most common aetiologic agent but with the number of cases due to *S. paratyphi* A apparently on the rise. *S. paratyphi* B and *S. paratyphi* C are relatively uncommon in India[2]. In developing countries, diagnosis of enteric fever continues to be made using Widal test despite the pitfalls of it's results being confounded by prior antibiotic intake and repeated exposure to *S. typhi* in endemic areas. However, establishing the endemicity and baseline, or steady state titre of Widal agglutination is possible with Widal test.

With this background, this study was conducted to estimate the prevalence of enteric fever and other epidemiological factors associated with it in and around Aligarh.

MATERIAL AND METHODS

A 2 year retrospective study was done at Microbiology Department, J.N Medical College and Hospital, AMU from August 2009 to July 2011 to study the prevalence of enteric fever, it's seasonal variation, age and sex predilection in Aligarh. Patients with pyrexia of unknown origin (PUO) were included in the study. All blood samples sent to

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Immunology lab. were tested for significant titres of *S. typhi* H & O antigen and *S. paratyphi* H antigen. Baseline titers were also recorded. History of antibiotic intake and vaccination was also recorded.

RESULTS

Results of Widal test on 7325 serum samples showed significant titers in 704 (10.4%) samples: 662 (94.3%) to *S. typhi*-TO & TH, 32 (4.8%) to *S. paratyphi* A and 10 (1.5%) to *S. paratyphi* B. Among the remaining 6621 samples, 6102 were from patients with history of antibiotic intake. 200 (28.4%) of total (704) were from age

Table 1.

TITRE < 200	
S. Typhi H antigen	1638 (22.4%)
S. Paratyphi *A* H antigen	150 (2.05%)
S. Paratyphi *B* H antigen	60 (0.82%)

Table 2.

TITRE < 200 (*S.* Typhi)	
25-50	764 (46.6%)
50-100	483 (29.5%)
100-200	391 (23.9%)

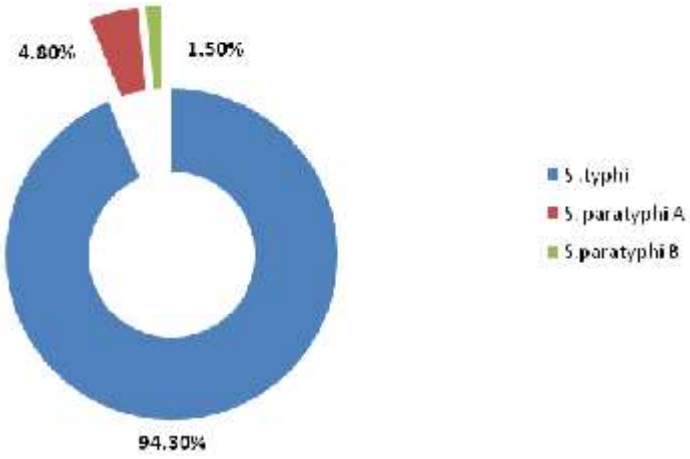

Fig. 1. Comparaive prevalence of typhoid paratyphoid fever in Aligarh

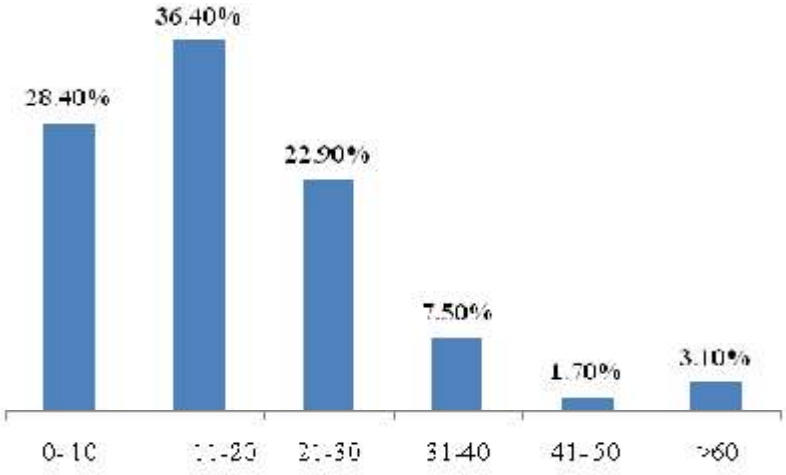

Fig. 2. Age wise distribution of enteric fever

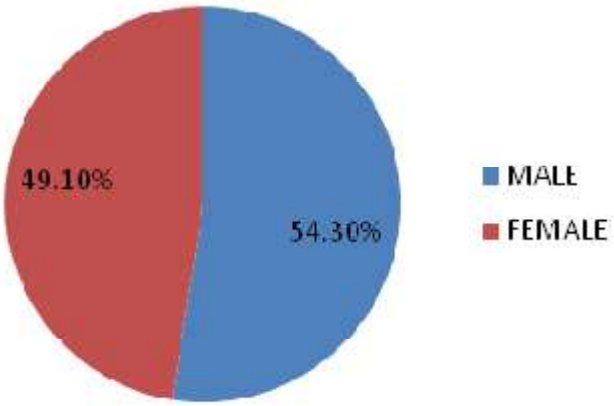

Fig. 3. Sex distribution of enteric fever

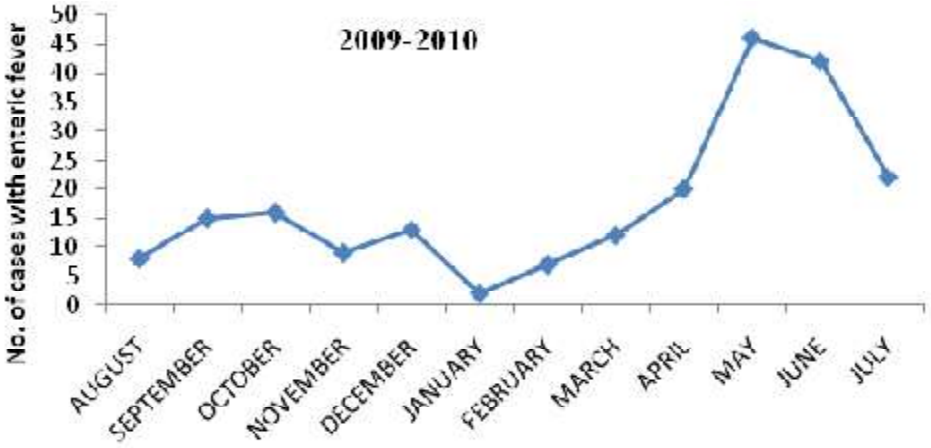

Fig. 4. Showing seasonal variation of enteric fever cases in and around Aligarh

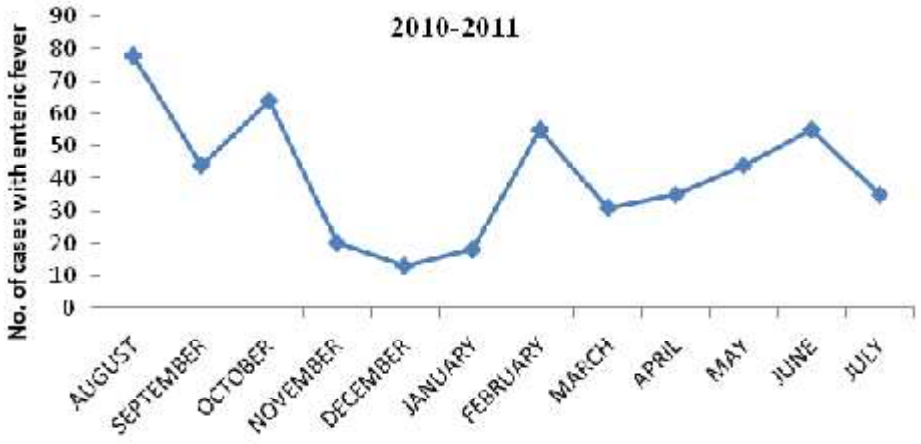

Fig. 5. Showing seasonal variation of enteric fever cases in and around Aligarh

group upto 10 years, 256 (36.4%) , 161 (22.9%), 53 (7.5%), 12 (1.7%), 22 (3.1%) from 11-20 years , 21-30 years, 31-40 years, 41-50 years and > 50 years respectively. 382 (54.3%) patients were males & 346 (49.1%) females. A higher incidence of enteric fever was observed in the months of May to October (Monsoon period). Another peak was observed in the month of February in 2011. Also titre 25 to < 200 for *S. typhi* H antigen were observed in 1638 (22.4%) samples, O antigen in 1518 (20.7%) samples, *S. paratyphi* A H antigen in 150 (2.05%) & *S. paratyphi* B H antigen in 60 (0.82%) samples. Among patients having titre 25 to < 200 for *S. typhi*, 764 (46.6%), 483 (29.5%), 391 (23.9%) had H antigen titre of 25-50, 50-100, 100-200 respectively.

DISCUSSION

Although enteric fever is not common in industrialized countries, it remains an important and persistent health problem in developing nations[3]. The prevalence of enteric fever as reported by our study is 10.4% with maximum cases by *S. typhi* (94.3%) and cases due to *S. paratyphi* A and *S. paratyphi* B accounting for 4.8% and 1.5% of the total respectively. Similar results of typhoid fever have also been reported in a study done in rural communities of West Bengal[4]. Researchers from New Delhi, India, reported that *S. typhi* (75.7%) was the predominant serovar isolated during the study period followed by *S. paratyphi* A (23.8%) (5). The incidence of *S. typhi* and *S. paratyphi* A seen in this study was similar to the findings reported by Mubeena *et al* from Pakistan[6].

The age groups most affected were found to be 11-20 years followed by 0-10 years. The age predilection may be attributed to factors like 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 age group. Virtually, in all endemic areas, the incidence of typhoid fever is highest among children in the 5-19 year age group[7-9]. A study done in Kolkata also found the most vulnerable age group to be 10-14 years (4). Another prospective study from Delhi slum inferred that the highest incidence occurred in children less than 5 years of age (10). However, a study by ICMR has reported the highest risk to be in the 20-40 year age group[11].

Males were slightly more commonly affected than females (1.1:1) in our study. The male preponderance seen could be due to their relatively more outdoor activities exposing them to the source of infection. Similar results have also been showed by Bhattarai *et al* (1.2:1)[12] and Ansari *et al* (1.3:1)[13].

Enteric fever is found throughout the year, however, peak of the disease was found in the months May- October in our study. This confirms the food/water borne mode of transmission of the disease and thus, maximum transmission occurs in the rainy season due to water contamination. Similar seasonal predilection has also been shown in the study done in Kolkata urban slums[14].

In an individual with no prior exposure to *S. typhi* infection (either lack of active infection or absence of passive immunisation), a higher than 1:50 or 1:100 titre on an initial single test, usually correlates fairly well with exposure to typhoid fever. However, even these single high value titres in an endemic area where repeated exposures to *S. typhi* may have occurred, do not have any clinical relevance in the absence of a positive isolate of the causative organism or its antigen[15]. It is found that the titre of agglutinins detectable in the infected population of different areas vary considerably[16]. The cut-off for a positive Widal, chosen in a particular community depends on the background level of typhoid fever (i.e., the prior probability) and the level of typhoid vaccination, which may vary with time[17]. The result may lack sensitivity and specificity particularly in a community with endemic typhoid fever[18]. This study has also taken into account the titres of *S. typhi* H and O antigens and *S. paratyphi* H antigen 25 to < 200 to assess the endemic titres of these agglutinins in this area. The high percentage (22.4%) of cases having low titres of *S. typhi* agglutinins denotes the endemicity of our region. In endemic typhoid regions, a single testing of a serum specimen for Widal agglutinin cannot provide a reliable diagnosis.

Although a number of reports from some developing countries have suggested that a single Widal test is sufficient to make the diagnosis of typhoid fever[19,20], others have disputed the usefulness of such a single test result[21,22]. In some

developing countries where the use of a single Widal test appears to be the norm, there has been an increase in the rate of false-positive results. We consider that serologic studies are helpful in typhoid fever cases in endemic regions only if patients have four-fold or greater increases in O or H agglutinin titres in serum specimens obtained 2–3 weeks apart.

CONCLUSIONS

High prevalence of enteric fever seen in Aligarh region based on results of Widal test (10.4%) stresses it's correlation with poor sanitary conditions. Endemicity of enteric fever in Aligarh is also established by Widal test. Improvements in the provision of clean water and sanitation are critical to reduce the burden of typhoid in the region.

Scarcity of diagnostic facilities in areas of high typhoid endemicity has probably led to an underestimation of the burden of typhoid fever worldwide. Population-based studies have demonstrated a wide variation in the incidence of typhoid fever both globally and within India (23,24). Information on typhoid case fatality rate is also scant, with current estimates based on hospital data. This highlights the need for more population-based studies in different regions of the country. This would help to prioritise the use of health-care resources for disease control and target vaccination and other preventive health measures in the community.

With the new finding that a high percentage of typhoid infection occurs in children five years old and younger, the need to develop an effective bivalent vaccine that protects against *S. paratyphi* and *S. typhi* and which can be given as part of the Expanded Program of Immunization should be a priority

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