



## SEROLOGICAL DIAGNOSIS OF ENTERIC FEVER IN A DISTRICT, COASTAL ANDHRA PRADESH, INDIA

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### ABSTRACT

The Serological diagnosis of enteric fever indices were computed based on the factors influence the typhoid fever like age, sex, immunity between the males and females at different age groups and living areas in a district of Andhra Pradesh, India. The typhoid fever is endemic in India. In the urban, rural and slum populations a limited study showed that 1% of children up to 17 years of age suffer from typhoid fever every year. In the present study incidence of enteric fever was noticed during July (44.8%) and August (43.4%) this period coincides with the rainy season. In this season, stagnant water, lack of proper drainage facilities and contaminated drinking water are the main causes for occurrence of the disease. More number of positive enteric fever cases was noticed from rural area patients than urban area patients the reason may be due their illiteracy, lack of personal hygiene, poverty and intake of contaminated water and food.

**KEY WORDS:** Serological diagnosis, enteric fever, between sexes, rural and urban areas Andhra Pradesh, India.

### INTRODUCTION

The term enteric fever was proposed as an alternative designation to distinguish typhoid fever from typhus. The genus *Salmonellae* parasitise the intestines (entero-intestine) of large number of vertebrates. Typhoid fever is a systemic disease of gastrointestinal tract characterized by fever and abdominal pain caused by *Salmonellae enterica* serovar *typhi* and *paratyphi A, B & C*. The disease initially called typhoid fever because of its clinical similarity to typhus. The disease may occur sporadically, epidemically or endemically. Typhoid fever occurs in all parts of the world, where water supplies and sanitation are sub standard. The disease is now uncommon in the developed countries, where most of the cases that occur acquired abroad or imported immigrant. In UK, typhoid fever has been brought very close to eradication with approximately 1 case per 1,000,000 populations, which in perhaps the lowest incidence of typhoid in the world. Typhoid fever continues to be a global health problem with an estimated 12 to 33 millions cases occurring worldwide each year. *Salmonellae typhi* is human adopted serotype is estimated to cause annually 12-21 million cases of typhoid fever in humans and up to 7,00,000 deaths. With appropriate antimicrobial therapy, mortality is reduced from 30% to < 1%. Multi drug resistance in *S. typhi* strains has become a problem in many countries. *S. paratyphi A, B & C* causes paratyphoid fever. It is generally milder than typhoid caused by *S. typhi*. *S. paratyphi A* serotype, host adapted to humans, is an important cause of enteric fever in Asia, the Middle East, Africa and South America.

*S. paratyphi B*, this serotype can infect humans and animals. It is distributed in Western Europe, Britain and North America and *S. paratyphi C* in Eastern Europe and Guyana. Incidence with this serotype is very rare. A recent epidemiological study showed that South East and South Central Asia are the regions of highest endemicity with

rates greater than 100/1,00,000 cases per year, the rest of Asia, Latin America, the Caribbean and Oceania except Australia and New Zealand are the next highest, with incidence rates of 10 to 100/1,00,000 and Europe, North America and the rest of the developed world have low rates of disease. Typhoid fever represents the 4<sup>th</sup> most common cause of death in Pakistan.

Typhoid fever is endemic in India. A limited study in an urban and slum, showed 1% of children up to 17 years of age suffer from typhoid fever every year. Statistics for the period of 1980 to 1986 showed on an average more than 3,00,000 cases of enteric fever each year. Reported data for the year 2005 shows same picture with 6, 53,580 case a 417 death. Traditionally the age range considered to be at greatest risk was 5 to 25 years. However this has been questioned in a study from a private study in Bangladesh, which found that the 57% of *S.typhi* isolates were in children less than 5 years of age and 27% less than 2 years. This has significant implications for vaccination policies.

Typhoid fever is transmitted via the faecal-oral routes. This may take place directly, through soiled hands contaminated with faeces or urine of cases or carriers or directly by the ingestion of contaminated water, milk and food or through flies and risk is greatest for travelers to South Asia and developing countries in Asia, Africa, the Caribbean, and Central and South America. Travelers to South Asia are at highest risk for infections. Travelers who are visiting relatives or friends and who may be less likely to eat only safe foods and beverages are at greater risk. Travelers have acquired typhoid fever even during brief visits of less than 1 week to countries where the disease is endemic.

### Factors influence typhoid fever:

**Age:** Typhoid fever may occur at any age. Highest incidence of this disease occurs in the 5 to 19 years of age

group. After the age of 20 years, the incidence falls probably due to acquisition of immunity from clinical or sub-clinical infection.

#### Sex

More cases are reported among males than females, probably as a result of increased exposure to infection. But carrier rate is more in females.

#### Immunity

All ages are susceptible to infection. Antibody may be stimulated by the infection or by immunization however, the antibody to the somatic antigen ('O') is usually higher in the patient with the disease and the antibody to the flagellar antigen ('H') is usually higher in immunized individuals.

Serum antibodies are not the primary defenses against infection; *S. typhi* being an intracellular organism, cell-mediated immunity plays a major role in combating the infection. Natural typhoid fever does not always confer solid immunity; second attacks may occur when challenged with a large oral dose. Among the host factors that contribute to resistance to *S.typhi* are gastric acidity and local intestinal immunity.

The clinical picture is one of enteric fever with an incubation period of 10 to 20 days, but with outside limits of 3 to 56 days, depending on the infecting dose. Diarrhea starting from 3 to 4 days after onset of fever and lasting on average 6 days may occur in 50% of cases of typhoid fever and is more common in younger than in older children or older. The more prominent symptom of this systemic infection is prolonged fever 101.8<sup>0</sup>F to 104.9<sup>0</sup>F (38.8<sup>0</sup>C to 40.5<sup>0</sup>C).

A prodrome of non specific symptoms often precedes fever and includes chills, headache, anorexia, cough, weakness, sore throat, dizziness, and muscle pains. Gastrointestinal symptoms are quite variable patients can present with diarrhoea or constipation.

Early physical findings of enteric fever include rash (rose spots), hepatosplenomegaly, epistaxis and relative bradycardia. Rose spots make up a faint, salmon-coloured, blanching, maculopapular rash located primarily on the trunk and chest. The rash is evident in ~30 % of patients at the end of the first week and resolve after 2 to 5 days without leaving trace.

Man is the only know reservoir of infection viz. cases and carriers.

The cases may be mild, missed, or severe. A case or carrier is infectious as long as bacilli appear in stool or urine. The carriers may be temporary, incubatory, convalescent or chronic, convalescent carriers excrete the bacilli for 6 to 8 weeks, after which their numbers diminish rapidly. By the end of three months, not more than 4% of cases are still excreting the organisms, and by the end of one year, the average carrier rate around 3%. Persons who excrete the bacilli for more than a year after a clinical attack are called chronic carriers.

In most chronic carriers, the organisms persist in the gall bladder and in the biliary tract; a chronic carrier state may be expected to develop in 2 to 5% of cases. A chronic carrier may excrete the bacilli for several years, may be as long as 50 years either continuously or intermittently the most famous case of typhoid bacterium was Mary Mallon.

An article published in 1908 in the journal of American Medical Association referred to her as "TYPHOID MARY" she was held custody for 23 years until she died in 1938 as a life time carrier. Mary Mallon was positively linked with 10 out breaks of typhoid fever, 53 cases and 3 deaths. In the most notable outbreak in the last 15 years, 47 cultures proven and 24 potential cases were linked to contaminated orange juice, at a resort in New York.

#### MATERIALS & METHODS

The present study on "Serological Diagnosis of Enteric Fever" was carried out at Microbiology Section of Clinical Laboratory of G.S.L General Hospital and Medical College, Rajahmundry. During the period of November to September. The total 463 blood samples of clinically suspected cases of enteric fever with symptoms of fever, headache and abdominal discomfort were included in this study. Venous blood samples were collected from patients of different age groups. After that, the collected samples were analyzed by the serological widal tube dilution methods. The qualitative widal slide agglutination (screen) method and quantitative widal tube agglutination (dilution) method by using commercial stained antigens ('O' 'H' 'AH' \$ 'BH') of Beacon Diagnostics Company Antigens.

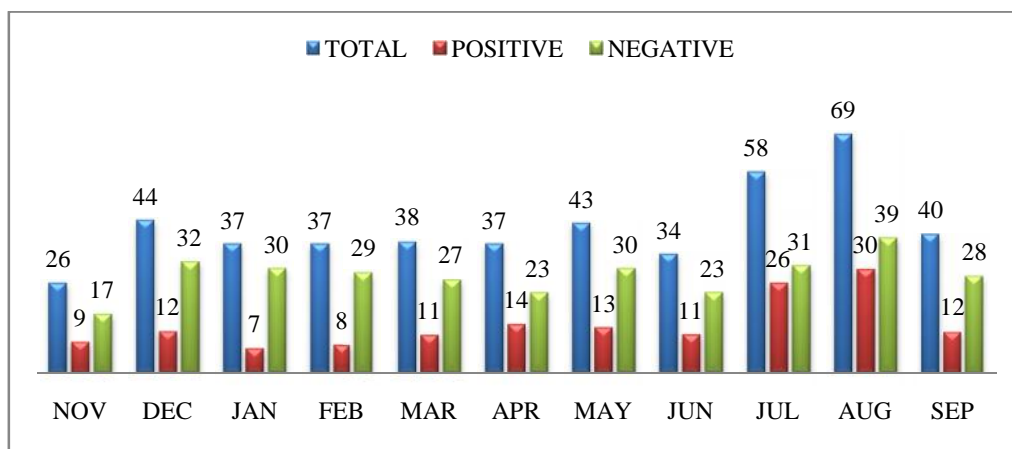
#### RESULTS & DISCUSSION

The blood samples were collected for the "Serological Diagnosis Of Enteric Fever" from November 2006 to September 2007 and the work was carried out at central laboratory of G.S.L .General Hospital and Medical College, Rajahmundry. During this period I collected 463 blood samples from clinically suspected cases of enteric fever of different age groups. These samples were analyzed by serological methods with widal slide and tube agglutination tests.

More positive cases 26 (44.8%) were observed in July out of 58 suspected cases, in August 30 (43.4%) positive cases out of 69 suspected cases, in April 14 (37.8%) out of 37 suspected cases, in November 9 (34.6%) out of 26 suspected cases, in June 11(32.3%) out of 34 suspected cases, in May 13 (30.2%) out of 43 suspected cases, in September 12 (30%) cases out of 40 suspected cases, in March 11 (29.9%) out of 38 suspected cases, in December 12 (27.2%) out of 44 suspected cases, in February 08 (21.6%) out of 37 suspected cases and in January 07 (18.9%) cases were positive to enteric fever out of 37 suspected cases, as per the figure given in table number-1. More number of positive cases with enteric fever were found in rural area 98 out of 316 suspected cases (64.1%), and less number of enteric fever cases were noticed in urban area 55 (35.9%) out of 147 cases, when compared with rural area, as per the figure given in table number-2. As per the data male patients were 236 and female patients were 227 and the total number were 463 among their 66 male patients were positive to enteric fever out of 236 (percentage 27.9%) and 87 female patients were positive to enteric fever out of 227 (percentage 38.4%), as per the figure given in table number-3.

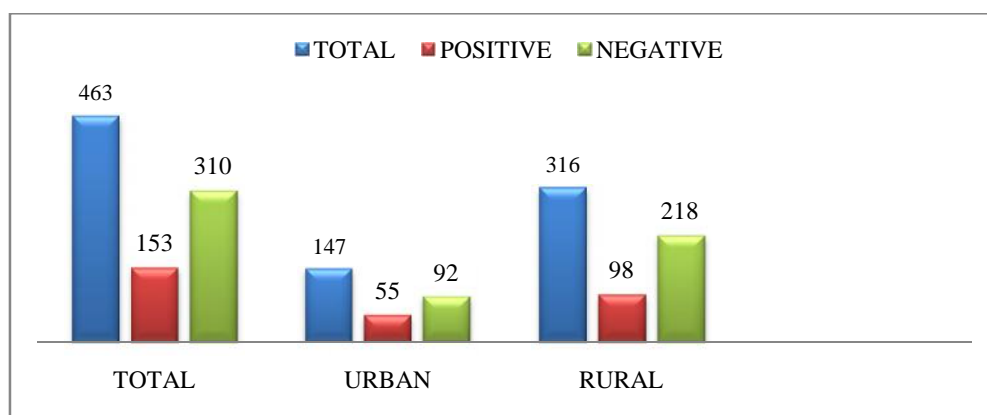
**TABLE: 1** month wise distribution of patients

| Month | Total Number of Patients | Test Positive | Positive Percentage (%) | Test Negative | Negative Percentage (%) |
|-------|--------------------------|---------------|-------------------------|---------------|-------------------------|
| NOV   | 26                       | 09            | 34.6 %                  | 17            | 65.4 %                  |
| DEC   | 44                       | 12            | 27.2 %                  | 32            | 72.8 %                  |
| JAN   | 37                       | 07            | 18.9 %                  | 30            | 81.1 %                  |
| FEB   | 37                       | 08            | 21.6 %                  | 29            | 78.4 %                  |
| MAR   | 38                       | 11            | 29.9 %                  | 27            | 70.1 %                  |
| APR   | 37                       | 14            | 37.8 %                  | 23            | 62.2 %                  |
| MAY   | 43                       | 13            | 30.2 %                  | 30            | 69.8 %                  |
| JUN   | 34                       | 11            | 32.3 %                  | 23            | 67.7 %                  |
| JUL   | 58                       | 26            | 44.8 %                  | 31            | 55.2 %                  |
| AUG   | 69                       | 30            | 43.4 %                  | 39            | 56.6 %                  |
| SEP   | 40                       | 12            | 30 %                    | 28            | 70 %                    |



**TABLE-2** urban and rural area patients split- UP

| Total Number of Cases | No. of Urban Area Cases | Urban Positive Cases | No: of Rural Area Cases | Rural Positive Cases | Total Positive Cases |
|-----------------------|-------------------------|----------------------|-------------------------|----------------------|----------------------|
| 463                   | 147 (31.7%)             | 55 (35.9 %)          | 316 (68.2%)             | 98 (64.1%)           | 153                  |

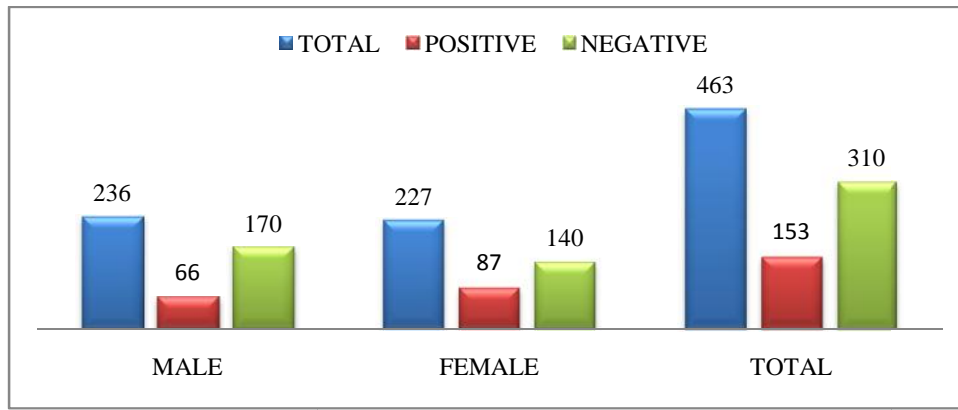


**TABLE-3** sex wise distribution of patients

Total number of samples collected from patients during November to September .

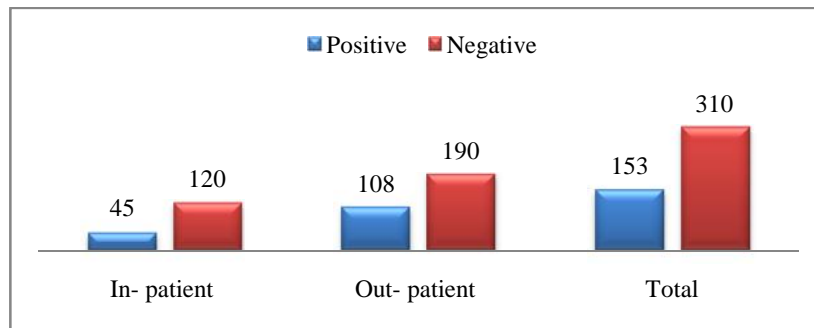
| Sex    | Total Number Patients | Test Positive | Positive percentage (%) | Test Negative | Negative Percentage (%) |
|--------|-----------------------|---------------|-------------------------|---------------|-------------------------|
| Male   | 236                   | 66            | 27.9 %                  | 170           | 72.1 %                  |
| Female | 227                   | 87            | 38.4 %                  | 140           | 61.6 %                  |

Serological diagnosis of enteric fever



**TABLE 4:** positivity of in-patients and out-patients  
Samples collected from In-patients & Out-patients during November to September.

| Result   | In- patient | Out- patient | Total |
|----------|-------------|--------------|-------|
| Positive | 45          | 108          | 153   |
| Negative | 120         | 190          | 310   |



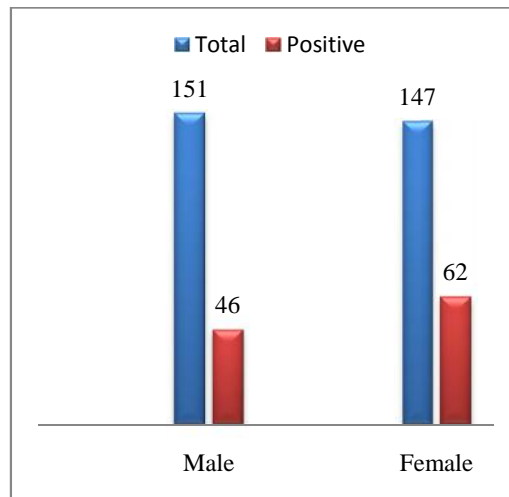
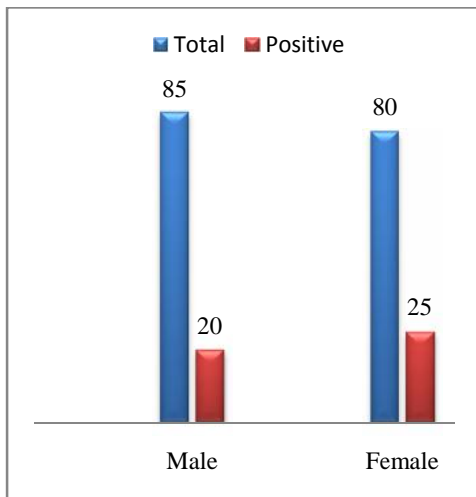
**TABLE-5** Sex wise distribution of in-patients & out-patient  
Samples collected from In-patients & Out-patients during November 06 to September 07.

**Sex wise distribution of in-patient**

| Sex    | Total | Positive |
|--------|-------|----------|
| Male   | 85    | 20       |
| Female | 80    | 25       |

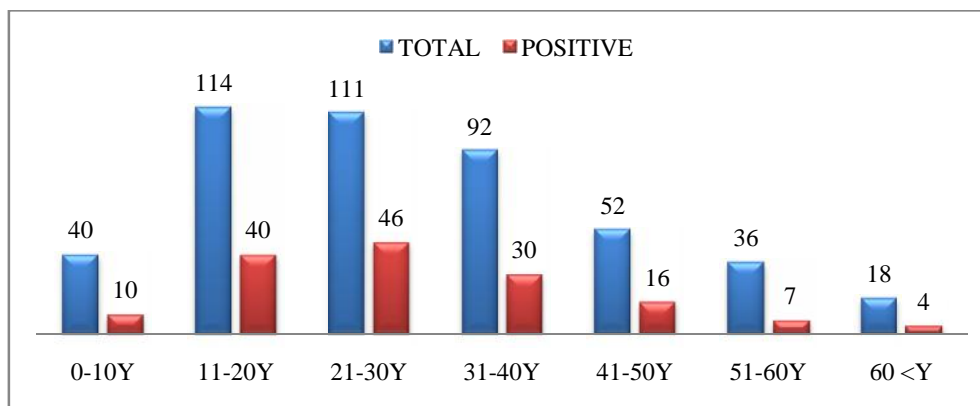
**Sex wise distribution of out-patient**

| Sex    | Total | Positive |
|--------|-------|----------|
| Male   | 151   | 46       |
| Female | 147   | 62       |



**TABLE- 6** Age wise distribution of patients

| Age Group | Total Number Of Tests | Test Positive | Positive Percentage (%) |
|-----------|-----------------------|---------------|-------------------------|
| 0-10Y     | 40                    | 10            | 25 %                    |
| 11-20Y    | 114                   | 40            | 35.1 %                  |
| 21-30Y    | 111                   | 46            | 41.4 %                  |
| 31-40Y    | 92                    | 30            | 32.6 %                  |
| 41-50Y    | 52                    | 16            | 30.7 %                  |
| 51-60Y    | 36                    | 7             | 19.4 %                  |
| 60 <Y     | 18                    | 4             | 22.2 %                  |



In total patients, 298 serum samples were collected from out-patient department and 165 serum samples were collected from in-patient wards. 108 cases were positive to enteric fever out of 298 out-patients, and 45 cases were positive to enteric fever out of 165 in-patients, as per the figure given in table number-4.

46 male patients from out-patient department were positive to enteric fever out of 151 male out-patients, and 20 male patients from in-patients were positive to enteric fever out of 85 male in-patients, as per the figure given in table number-5.

Enteric disease found more in serum samples were collected from out-patients than from in-patients wards. In 21 to 30 years age group patients are more positive (41.4%) to enteric fever followed by 11 to 20 years age group (35.1%), 31 to 40 years age group (32.5%), 41 to 50 years age group (30.7%), 0 to 10 years age group (25%), above 60 years age group (22.2%) and 51 to 60 years age group (19.4%) as per the figure given in table number-6.

## CONCLUSION

The peak incidence of enteric fever was noticed during July (44.8%) and August (43.4%) this period coincides with the rainy season. In this season, stagnant water, lack of proper drainage facilities and contaminated drinking water are the main causes for occurrence of the disease. More number of positive enteric fever cases was noticed from rural area patients than urban area patients the reason may be due their illiteracy, lack of personal hygiene, poverty and intake of contaminated water and food. The incidence is more in females than males probably due to the lack of health education and better understanding towards the infection in rural areas. The positive rate was more in out-patients than in-patients due to lack of medical care and lack of understanding towards the personal health

for out-patients. The high incidence of enteric fever was noticed in 21 to 30 years age group, in this age group persons are more exposed to infection due to their ignorance, negligence and taking food outside in hotels and road side fast foods.

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