

## EVIDENCE OF SALMONELLA TYPHI IN BAGHDAD CITY

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## ABSTRACT

A total of 986 blood bolts of carrier *Salmonella typhi* were transplanted to patients hospitalized in Ibn Al-Baladi Hospital between July and December of 2018 and from January to June 2019. Ten cases were recorded in 2018 compared to 2019, with 48 cases recorded .at an increase rate of 58% It was found that the most infections in the winter and unlike previous years and the most infections recorded between the ages of 6 to 10 years and more infections among males than females, as well as recorded the highest casualties in Sadr City, It is highly populated.

**KEYWORDS:** *Salmonella typhi*.

## INTRODUCTION

*Salmonella enterica* serotype typhi is a gram-negative bacterium that is responsible for typhoid fever and has been a burden on developing nations for generations. In 1829, Pierre Louis was the first to coin the term "typhoid fever" after identifying lesions in the abdominal lymph nodes of patients who had died from "gastric fever."<sup>[1]</sup> The term was derived from the Greek word "typhoid" which meant "smoky" and was used to describe the delirium that patients would exhibit with the disease.<sup>[2]</sup> Although first described in the early 1800s, it was not until 1880 when the organism for typhoid fever was discovered.<sup>[2]</sup> In 1880, German pathologist Karl Eberth identified *S. enterica*. It was first cultured in 1884 by Georg Gaffky. Several years later, Almroth Wright developed a vaccine for the disease.<sup>[6]</sup> Despite significant efforts in research and medical advancements, typhoid fever is still a major, worldwide, public health concern.

Typhoid fever is caused by *Salmonella typhi*, a Gram-negative bacterium. A very similar but often less severe disease is caused by the *Salmonella* serotype *paratyphi* A. In most countries in which these diseases have been studied, the ratio of disease caused by *S. typhi* to that caused by *S. paratyphi* is about 10:1.<sup>[5]</sup>

Typhoid fever remains a global health problem for *Salmonella typhi*. It is difficult to estimate the real burden of typhoid fever in the world because the clinical picture is confused with many other febrile infections, and the disease is underestimated because of the lack of laboratory resources in most areas in developing countries. As a result, many cases remain under-diagnosed. In both endemic areas and in large outbreaks.<sup>[14]</sup>

Mode of transmission is person-to-person, usually via the faecal-oral route. Faecally contaminated drinking water is a commonly identified vehicle. *S. typhi* may also be found in urine and vomitus and, in some situations, these could contaminate food or water. Shellfish grown in sewage-contaminated water are potential vehicles, as are vegetables. Flies can mechanically transfer the organism to food, where the bacteria then multiply to achieve an infective dose.<sup>[3]</sup>

Typhoid fever is an acute, life-threatening, febrile illness. Without treatment, the case fatality rate of typhoid fever is 10–30%, dropping to 1–4% with appropriate therapy.<sup>[4]</sup> Young children are at greatest risk. Common symptoms include sustained fever, chills and abdominal pain. The non-specific symptom profile complicates clinical diagnosis, with symptoms that are common to other diseases occurring in typhoid-endemic areas. The mainstay for laboratory confirmation is blood.<sup>[6]</sup>

*Salmonella Typhi* is the cause of typhoid fever in humans. It remains a major global health concern due to the continuous, widespread outbreaks in Southeast Asia and sub-Saharan Africa.<sup>[5]</sup>

**Typhoid fever**, also known simply as typhoid, is a bacterial infection due to specific type of *Salmonella* that causes symptoms. Symptoms may vary from mild to severe and usually begin six to thirty days after exposure. Often there is a gradual onset of a high fever over several days. This is commonly accompanied by weakness, abdominal pain, constipation, headaches, and mild vomiting. Some people develop a skin rash with rose colored spots. In severe cases people may experience confusion. Without treatment, symptoms may last weeks or months Diarrhea is uncommon. Other

people may carry the bacterium without being affected; however, they are still able to spread the disease to others Typhoid fever is a type of enteric fever, along with paratyphoid fever.<sup>[5]</sup>

### Salmonella

The genus *Salmonella* incorporates Gram-negative, facultative anaerobic rod shaped bacilli that are members of the family *Enterobacteriaceae*.

The Kauffmann–White classification or Kauffmann and White classification scheme,<sup>[7]</sup> is a system that classifies the genus *Salmonella* into serotypes, based on surface antigens. It is named after Philip Bruce White and Fritz Kauffmann. First the "O" antigen type is determined based on oligosaccharides associated with lipopolysaccharide. Then the "H" antigen is determined based on flagellar proteins. Since *Salmonella* typically exhibit phase variation between two motile phenotypes,<sup>[8]</sup> different "H" antigens may be expressed. *Salmonella* that can express only one "H" antigen phase consequently have motile and non-motile phenotypes and are termed monophasic, whilst isolates that lack any "H" antigen expression are termed non-motile. Pathogenic strains of *Salmonella* Typhi, *Salmonella* Paratyphi C, and *Salmonella* Dublin carry the capsular "Vi" antigen (Vi for virulence), which is a special subtype of the capsule's K antigen.<sup>[15]</sup>

### Pathogenicity

*Salmonella* species are facultative intracellular pathogens.<sup>[9]</sup> A facultative organism uses oxygen to make ATP; when it is not available, it "exercises its option"—the literal meaning of the term—and makes ATP by fermentation, or by substituting one or more of four less efficient electron acceptors as oxygen at the end of the electron transport chain: sulfate, nitrate, sulfur, or fumarate.<sup>[16]</sup>

Most infections are due to ingestion of food contaminated by animal feces, or by human feces, such as by a food-service worker at a commercial eatery. *Salmonella* serotypes can be divided into two main groups—typhoidal and nontyphoidal. Nontyphoidal serotypes are more common, and usually cause self-limiting gastrointestinal disease. They can infect a range of animals, and are zoonotic, meaning they can be transferred between humans and other animals. Typhoidal serotypes include *Salmonella* Typhi and *Salmonella* Paratyphi A, which are adapted to humans and do not occur in other animals.

### Pathogenesis of *S.typhi*

The organisms attach themselves to the epithelial cells of the small intestines, penetrate the sub-mucosa, and pass from there into the blood stream via the lymphatics. A transient bacteremia follows and the bacteria seed the reticuloendothelial system (liver, spleen, bone marrow) and the gall bladder and kidneys. The organisms re-enter the intestine from the gall-bladder where it involves the

Peyer's patches, inflammation and ulceration. The incubation period is about 5 to 21 days.<sup>[15,16]</sup>

## MATERIALS AND METHODS

### Sample collection

A total of 986 blood samples were collected from children and young (under twenty years) in Baghdad city. A Whole blood sample was collected in a sterile bottles Bact alert, between period July and December of 2018 and from January to June 2019.

The BacT/Alert and Bactec systems detect the production of CO<sub>2</sub> as change in pH; this is accomplished by means of colorimetry in the BacT/Alert system and by means of a fluorescent sensor in the Bactec system.

Blood should be drawn by means of a sterile technique of venous puncture and should be inoculated immediately into a blood culture bottle with the syringe that has been used for collection. have recommended 1-2 mL of blood per culture for neonates, 2- 3 mL for infants aged 1 month to 2 years, 3-5 mL for older children, and 10-20 mL for adolescents.<sup>(11)</sup> The amount of blood withdrawn by the patient's age and the amount of the culture's fluid medium is determined for the growth of the bacteria

### Culture

Positive Cultures: subculture on Blood Agar (BA) MacConkey Agar (MAC) Chocolate Agar (CHOC) (CO<sub>2</sub>, 35°C .48 hours)

### Diagnoses

by testing. Gram-negative rods were identified by The VITEK 2 is an automated microbiology system utilizing growth-based. The gram negative card (GN card) is based on established biochemical methods and newly developed substrates measuring carbon source utilization, enzymatic activities.<sup>[12]</sup>

### Sensitivity test

The performance of the VITEK 2 system for direct rapid identification and antimicrobial susceptibility testing of the bacteria responsible for blood infections was determined.

## RESULTS AND DISCUSSION

Naturally, *S. typhi* infection rates are higher in hot and humid seasons than in cold seasons. However, the high incidence of these bacteria in the winter season is striking in our country where it was rare to record infections at this time and vary Infection from one country to another and also different ages where the infection is higher in children, including in adults and from The most important reason is that the bacterial dose that has the potential to cause infection is (10 – 10<sup>10</sup>): a cell of Bacteria in adults but less in infants and children (Asbkenazi and Cleary., 1996

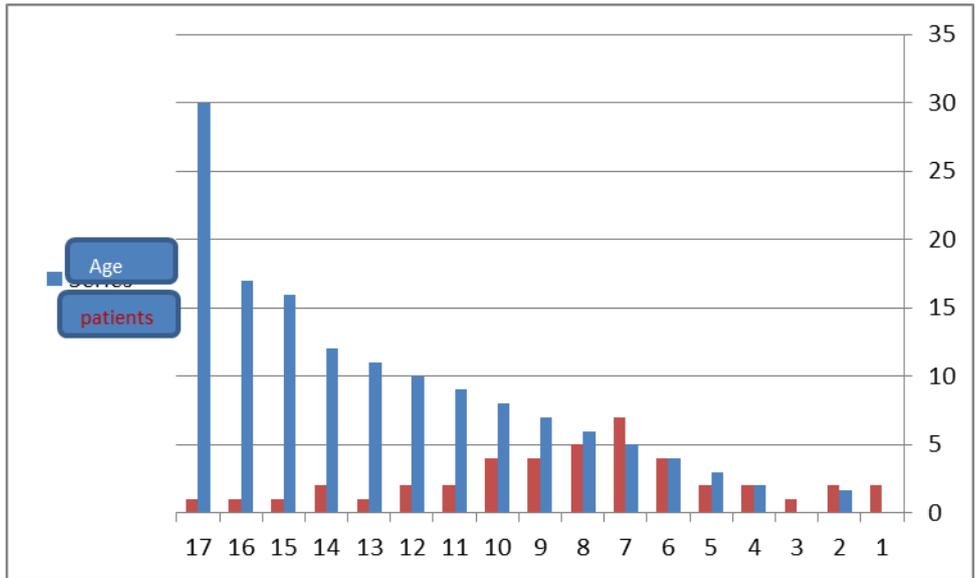


Figure 1: Shows the number of typhoid infections by age. The most vulnerable group are children aged 1.6 to 16 years.

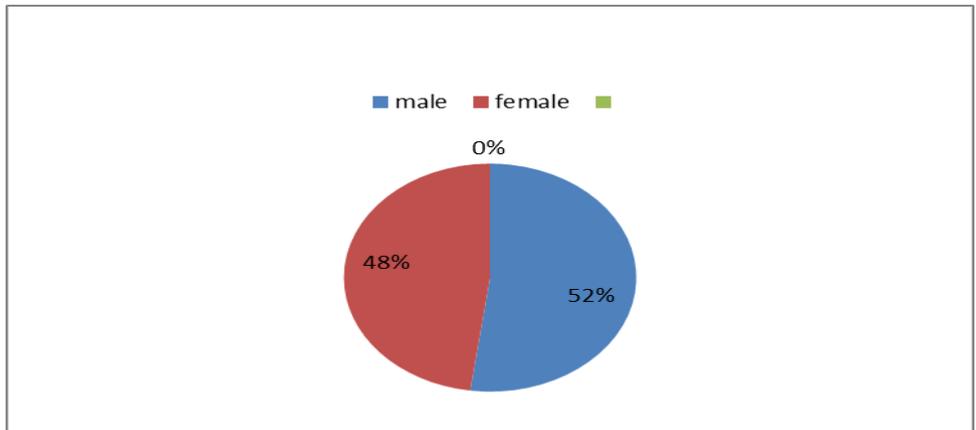


Figure 2: Shows the percent of cases of *S. typhi* infection by sex. The percentage of infection in males was higher than that of females. The number of infected males was 52% and In females, 48.7%

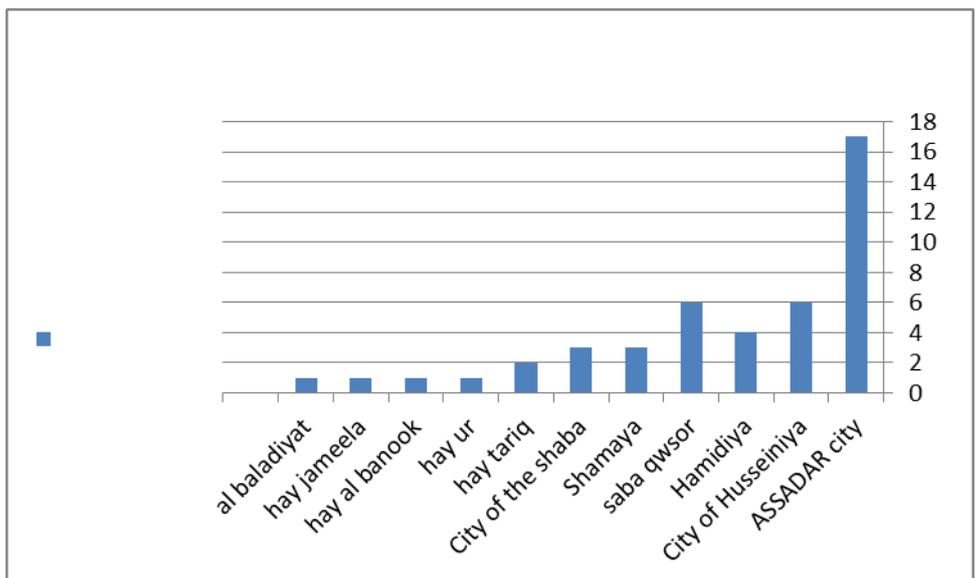


Figure 3: Shows the geographical distribution of the number of *S. typhi* infections in the city of Baghdad where most of the casualties in economically poor areas.

Studies were consistent with a study carried out by Dr. Salah (2013) on patients with typhoid fever and included 120 samples.

The number of infected males was 77 and 64.1%, while the number of infected females was 43 and 35%.

The results of studies were different from those of Shamkhi, (2017). The study found that the incidence of *S.typhi* was equal in males and females if the number of infected males 23 and by 50% and 23 women were infected and by 50%. This study is in the summer.

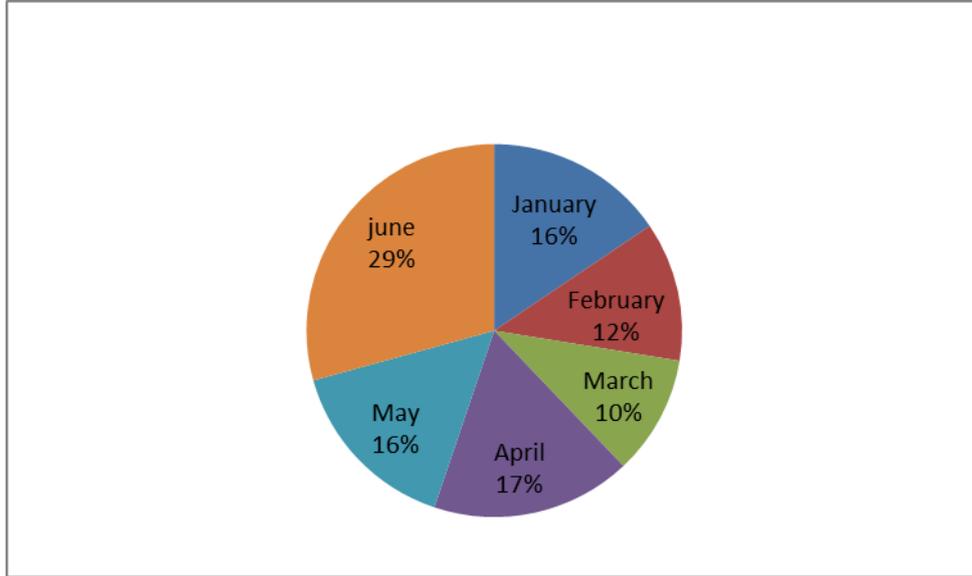


Figure 4: Shows the effect of the seasons on the spread of Salmonella. If the variability of the climate during the different seasons of the year affects a transition, we found in this study the prevalence of winter injuries and the previous years, which were the most common in the summer where contaminated water and contaminated food.

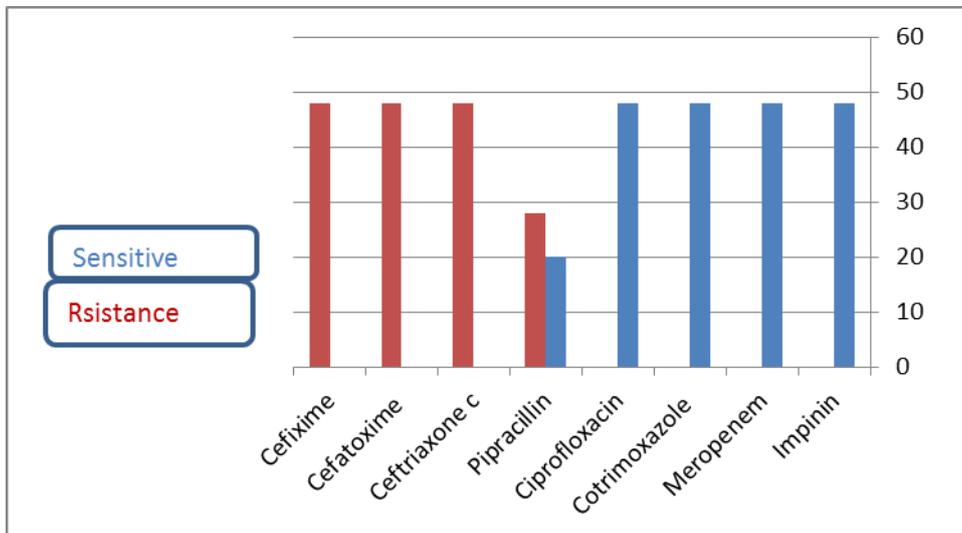


Figure 5: Show the effect of antibiotic.

We found by examining the most effective antibiotic against *Salmonella typhi* bacteria is cotrimoxazole, Ciprofloxacin Impinin, meropenem, Pipracillin While the bacteria were resistant to the treatment of cefotaxime, ceftriaxone.Cefixime Which is contrary to previous years

*Salmonella typhi* causes the enteric fever that is a major public health problem, both in developing as well as developed economies.

The death rate in enteric fever is expected to increase by 30% without appropriate diagnosis and effective antibiotic therapy. (Dutta, 2013).

**CONCLUSION**

1. *Salmonella typhi* was the most common *Salmonella* species.
2. High incidence in cold months is an unusual period of infected to *Salmonella typhi*.

