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Oriainal Article

Clinical Assessment of Typhoid Fever among Febrile Patients with Positive Blood Cultures: A Hospital-Based Clinical Study

Hasan Joodi Abbas[1], Mohammed Jawad Kashkool Shubbar[2] and Basim Wajid Aboallol Al-Bujasim[3]

12.3.. MBChB, Diploma in Medicine, Najaf Health Directorate

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Abstract:

Background: *Typhoid fever is a signifciant health problem worldwide, however, it represents a challenge in developing countries like our country. Widal test has shown to be unreliable test for diagnosis while blood culture represent a good diagnostic tool among febrile patients*

Objective*: To assess the clinical profile, prevalence and risk factor of typhoid fever among febrile patients with positive blood culture.*

Patients and method: *A cross-sectional hospital based study conducted during a period of 18 months in the years 2022-2023 in Al Najaf province in Two main Hospitals ; Al-hakeem and AlManethra General Hospitals included 400 febrile patients. To whom blood culture, widal test, stool culture and serological testing were conducted accordingly.*

Results: *Among the 400 febrile patients, blood culture was positive in 17.75%. Acute form of the disease reported in 83.1% while 16.9% had chronic infection. The main risk factors were age below 40 years , Male gender, rural residence, low level of education and being unemployed, (P. value <0.05).*

Conclusion: *Prevalence of typhoid fever according to blood culture among febrile patients is relatively high. It is comparable to that reported in some other countries whereas much higher than some others. Blood culture was good and reliable diagnostic method compared to Widal test. Patients characteristics showed potential risk of harboring Typhoid fever. We recommend using blood culture to confirm the diagnosis as it represents a gold standard for diagnosis. Further studies still neede for more precise assessment.*

Keywords: Typhoid fever, Diagnosis, blood culture, Widal Test, serology, Prevalence

***Corresponding Author**, Hasan Joodi Abbas. Contact email: hasanjanabi_medicine@gmail.com*

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1. INTRODUCTION

Typhoid fever, alternatively referred to as enteric fever, is a bacterial infection caused by the bacterium Salmonella enterica serotype Typhi. This condition is a potentially widespread and multi-faceted ailment that has posed a significant public health concern, particularly in regions with emerging economies. The causative agents of this condition include Salmonella typhi and Salmonella Paratyphi. Specifically Enteric fever is a comprehensive phrase encompassing both typhoid fever and paratyphoid fever. In most endemic areas, approximately 90% of enteric fever is typhoid (1). Typhoid fever is a significant contributor to both mortality and morbidity in densely populated and unsanitary regions, however the implementation of extensive research and public health interventions has led to a reduction in its prevalence. The progression of the disease spans from initial gastrointestinal discomfort to a general systemic illness that lacks distinct symptoms, but ultimately can result in various problems (2).

Typhoid fever is a quickly spreading systemic febrile condition caused by Salmonella enterica serovar Typhi. Strains or subtypes. As usually called enteric fevers, both typhoid and paratyphoid are included. Paratyphoid fever has comparable clinical features but less severe symptoms. Tropical and subtropical locations are prone to enteric fever, especially in children and youth. Typhoid or typhoid fever is an infectious disease that is contagious and spreads through water and food contaminated with feces of an infected person. The symptoms of the disease appear after six to thirty days of infection and are usually associated with high fever , constipation , abdominal pain, weakness, mild nausea , loss of appetite , headache and musculoskeletal pain . In some patients, rashes and confusion have been reported, also diarrhea is not uncommon (3–6). This disease is specific to humans and grows and multiplies in the blood and intestines and then in other sites. The method of identifying this bacteria in the patient's body includes bacterial culture or bacterial DNA test in stool, blood and bone marrow samples of the patient. Bacterial culture is difficult and the best way to identify the bacteria is a bone marrow test (3). According to the global statistics and estimates , more than 10 million cases of typhoid fever have reported worldwide with more than 116000 deaths. An estimated 12.1% of the reported cases occurred in Sub-Saharan Africa . However, there is wide variation in the incidence of Typhoid fever globally, In general, typhoid fever becomes very rare in developed countries. Its prevalence is higher in Southeast Asia , Central Asia and South Africa (7,8)

Typhoid fever is transmitted by fecal-oral route, it is an orally transmitted disease by ingestion of contaminated water or food. Infected person may eliminates the bacteria and spread the disease further through their faeces contaminating food or water(9,10). Typhoid Fever can be mild manifested with low grade fever, headache, fatigue, dizziness, disturbed sleep, bitter mouth constipation, skin rashes or red spots and gradually, these symptoms intensify, the fever constantly remains at 40 degrees Celsius, there is a slight difference between morning and night. Severe headache, forehead pain, back and neck pain, and lethargy, the abdomen becomes bloated and painful , especially on the right and lower side of the abdomen, or diarrhea occurs instead of constipation. The disease may progress and complicated with in some cases fatal complications such as intestinal perforation, bleeding, encephalitis and neuritis (11). Without proper treatment, this disease can be fatal between 10-20% (12). Abdominal ultrasound examination may shows splenomegaly, mesenteric lymphadenopathy, bowel thickening, ascites, and other findings in cases with Typhoid fever. The clinical and ultrasound findings are mainly diagnostics regardless the results of Widal test and sterility of blood culture (13).

Diagnosis of the disease can be done through blood tests, bone marrow or stool cultures. One of the usual methods is the Widal test , which uses the reaction of antigen and antibodies to check the presence of bacteria. This method is time-consuming and has little accuracy, and there is a possibility of errors and false positive or negative results in this test(14,15). Recently, rapid and highly accurate tests have been produced and are available, among which Test-it tests, Tubex test and Typhidot test can be mentioned (16).

The most important things to prevent this disease are hygiene and proper treatment and disposal of waste water and garbage. So far, two types of vaccines have been produced to prevent typhoid. Oral vaccine and injectable vaccine are both effective and their use is recommended for residents of disease outbreak areas and people who intend to travel to those areas (17–19).

Developing countries are burdened by rapid population expansion, urbanization, and limited access to safe water and healthcare. This underrepresented disease has up to 1600 cases per 100,000 people Higher prevalence rates are reported in the middle east , North Africa and other low income countries with a higher case fatality among children in south Asia . Case fatality rates range from 10 to 30% when untreated When antimicrobial therapy is timely and effective, patient fatality drops to 1-4% [6,7,9]. Blood culture can isolate

Salmonella Typhi more easily than bone marrow culture, but it is less sensitive. However, its availability is not assured, and the process usually takes 3–5 days. Thus, delayed or missed diagnosis may result in unnecessary and inappropriate antimicrobial treatment for non-enteric fever patients. However, the presence of an antibody response suggests enteric fever but is not definite (20–24)

For documentation of diagnosis, Salmonella Typhi somatic (O) and flagella (H) agglutinin in addition to specific lipopolysaccharides are tested . For more than a century, Widal test was the commonest laboratory tests that used in diagnosis (25,26). Nonetheless, clinical evidence and Widal test results are used to diagnose enteric fever in Iraq and other developing nations (27). The Widal test is inexpensive, easy, and requires only basic experience and practice. Widal test is commonly performed without tube dilution, has been debated for detecting enteric fever antibody production (14). Therefore, this test's efficacy must be assessed to appropriately interpret the results (26). However, blood culture still the gold standard for diagnosis of typhoid fever (28). From other point of view, multi-drug resistance is a significantly emerged problem in the treatment options of enteric fever and represent a major public health issue. This makes enteric fever treatment and control more complicated. Enteric fever patients must be managed using local antibiotic resistance trends and antimicrobial susceptibility tests to choose the best antimicrobial for the patient's Salmonella strain . Enteric fever therapy is becoming more difficult due to the availability of non-prescription drugs and their resistance in high-prevalence areas (9,29)

Earlier evidence-based literatures referred that all patients with suspected typhoid fever should be treated with a quinolone or a third-generation cephalosporin until culture and susceptibility results are available. Quinolones are very active against salmonellae in vitro, therefore, ciprofloxacin (500 mg PO twice/day for 10 days) is still the drug of choice for the treatment of typhoid fever due to multiresistant S.Typhi strains. At present it is recommended to avoid the use of quinolones in children under 10 years of age or in pregnant women (30,31). The drug of choice in these cases for the treatment of typhoid fever due to proven or suspected multi-resistant strains is a parenteral third-generation cephalosporin, preferably ceftriaxone. The final decision on the use of a certain antibiotic and on its dosage not only depends on the results of the susceptibility tests but also on their interpretation by the health team and in our country, which is in the process of development, of the resources available both privately and institutionally (29,32).

Diagnosis of a typhoid fever can be confirmed and primarily relies on blood culture which is not expensive and easily performed, however, the efficacy of blood culture increases significantly when larger volume of blood samples are cultured. However, the accuracy of blood cultures can vary, with false negative results ranging from 30% to 50%, depending on factors such as the technique used and the timing of the culture collection (33).

Stool culture is also used in detection of typhoid fever, but it is less effective than blood culture in bacteremic phase but its efficacy and diagnostic accuracy increases in the second and third week . Stool culture has low sensitivity of only 31.3% but high specificity of 91.5% and in 37% of cases who received antibiotics stool culture yield positive results (34). The accuracy of stool culture relies mainly on the disease duration and the amount of collected stool samples. From other point of view, due to presence of chronic carriers, several stool samples are needed and must be taken at different time (35). Bone morrow (BM) culture is the gold standard for diagnosing typhoid. BM culture is more sensitive and specific the blood and stool cultures. It has an accuracy 90% and remains positive in 50% of cases after antibiotic treatment. The disadvantage of BM culture is that highly invasive and costly that prohibit its routine use in clinical practice (34).

Widal test is a serological test for enteric fever, the approach of this test is the detection of antibodies against O & H antigens which are the surface and flagellar antigens (Ag) , respectively. Titers higher than 1:160 for antibody, higher than 1:180 for anti flagellar (H) and anti-surface (O) Ag are the optimal levels to detect recent infection (34). However, these levels varied according to the populations. On the other hand, in endemic areas higher levels are considered. Other tests used in diagnosis include Skin Snip test , PCR , ELIZA, Urine culture, and others (36).

Public health in Iraq is threatened by enteric fever; it is a common febrile infection and an endemic infectious disease in Iraqi population (37). Thus, multiple researches are performed about enteric fever in our country since 1970s. However, enteric fever surveillance and monitoring infrastructure is insufficient (38,39). The literature on this topic does not cover all regions or demographics. Thus, epidemiological and clinical data relevant to the risk factors, diagnosis, treatment, morbidity and mortality associated with enteric fever are still needed because the situation is expected to worsen. Therefore, the current study was designed to fill part of the gap in this topic taking into account four objectives, these are firstly, assessing the incidence of typhoid fever among total febrile cases visiting our hospitals, secondly comparison of the accuracy of different diagnostic methods, Widal test, stool culture compared to blood culture , thirdly we aimed to assess the sensitivity of these pathogens to the antimicrobial agents and finally the fourth objective is to assess the main risk factors that contribute to the incidence of typhoid fever among febrile patients visiting our hospitals in Al-Najaf province.

2. PATIENTS AND METHODS

This was Health facility cross-sectional study conducted at two general hospitals in Al-Najaf province these are Al-Hakeem and Al-Manethra general hospitals during the period from the 30th of December 2021 to the 30th July 2023. Al-Najaf Province is one of Al-Forat Al-Awsat governorates located in the central Iraq about 160 km south of Baghdad, the Iraqi Capital. The estimated population is about 1,631,000 people according to the annual statistical report of the ministry of Health in Iraq, 2022 with almost equal distribution of males and females (40)

Study population and sample:

The target population included all febrile patients who visited the hospitals during the study period. The total study population reported during the study period was 2678 febrile patients (1511 at Al-Hakeem hospital and 1167 at Al-Manthera Hospital) with an average of 74 patients per month in each hospital.

Sample size (N) was calculated using the standard equation for cross-sectional studies (41) as followed:

$$N = \frac{Z^2 \text{ X } PQ}{d^2}$$

Where

N = the required sample size

- Z is the critical value from the standard normal distribution corresponding to the desired level of confidence (e.g., 1.96 for a 95% confidence level)
- P is the estimated proportion of the population with the characteristic of interest
- Q is the complement of P (i.e., 1 - P)
- d is the desired level of precision, also known as the margin of error

When the equation was applied the calculated sample size was 384 patients and were approximated to 400 patients who were recruited using sequential sampling technique, we selected 224 patients from Al-Hakeem hospital and 176 from Al-Manthera Hospital.

Inclusion criteria:

1. Iraqi adult febrile patients of both genders
2. Resident in Al-Najaf province
3. Agreed to participate in the study

Exclusion criteria:

1. Cases suspected or proved to have COVID-19
2. Patients who received antibiotic treatment for any cause
3. Patients with malignant disease and received chemotherapy or radiotherapy
4. Patients who received immunosuppressant treatment
5. Patients with a surgical intervention during the previous 14 days
6. Pregnant women
7. Tuberculosis patients who were currently on anti-tuberculosis treatment

Data collection:

Data were collected using a pre-constructed data collection sheet (Questionnaire) including the demographic data, clinical and laboratory findings.

The data collected through full-history taking and thorough clinical examination of all patients.

Blood samples and cutler:

A 10 ml of venous blood was collected from each patients under aseptic technique in a sterile test tube using 70% alcohol by the Lab staff. Blood samples divided into two parts; 5 ml were centrifuged at 3000 RPM for 5 minutes to separate serum. And the remaining blood samples were sent for cultivation. Antibiotic sensitivity was assessed using standard laboratory methods under supervision of professional Lab senior physician (42) .

Stool samples:

A febrile patient supplied almost 10 gram fresh faeces, which was packed in a screw-capped container, marked, and brought and managed in the hospitals' Laboratory for cultivation.

The stool sample was incubated at 37 °C for 24 hours on MacConkey agar. Salmonella isolation was the goal. Isolates were identified by their distinctive visual characteristics. Standard phenotypic microbiological identification and serotyping methods were used to identify suspected colonies. Antisera specific to serotypes were used. Laboratory antimicrobial susceptibility testing determines antibiotic efficacy against particular pathogens (42)

Serology test:

According to the manufacturer instructions of the testing kits, Widal agglutination test was performed using the S. typhi O and H antigens. A qualitative approach was used to measure sera's agglutination capacity. Overall, one droplet of serum, O antigen, and H antigen were placed on a slide. After shaking the slide back-and-forth for one minute, the mixture was tested for macroscopic agglutination. Agglutination within one minute indicated reactivity; otherwise, non-reactivity (14).

Diagnosis and case definition:

The diagnosis of S. Typhi isolates was conducted based on colony morphology, routine microbiological assays were applied using the available system test (ViteK2) (43). For the diagnosis and differentiation of chronic and acute infections, the IgG/IgM combo fast tests were utilized and the procedure of testing was applied according to the Kit manufacturer instructions . The CTK Biotech Kits were used. Acute infection was considered when the individuals had a positive blood culture and IgM positivity . Cases with positive stool culture and positive IgG were considered to have chronic infection (44,45)

Statistical analysis:

The data were maintained, processed, and analyzed using the Statistical Package for Social Sciences (SPSS) for Windows, specifically version 26. The statistical tests and techniques were appropriately employed.

3. RESULTS

A total of 400 febrile patients were enrolled in this study with a mean age of 32.1 ± 13.4 (range: 18-71) years. Males were relatively dominant contributed for 57.8% of the studied group. More than 70% of the patients residents in urban areas, 53.6% had secondary and higher level of education and 73.5% were unemployed, (**Table 1**). Among the 400 febrile patients, typhoid fever was proved by blood culture in 71 cases giving a prevalence rate of

17.75%, Among these 71 cases, serological tests revealed acute infection in 59 cases (83.1%) and chronic in 12 cases (16.9%), (**Figures 1 and 2**). Fever was the commonest presentation, in all patients. Headache reported in 51.7%, nausea and vomiting in 38% , abdominal pain and tenderness in 25.4% and fatigue in 53.5%. Clinical examination revealed splenomegaly and hepatomegaly in 36.6% and 32.4% of cases, respectively. Rash was found in only 3 cases (4.2%) while two cases had other symptoms (constipation and cough), (**Table 2**). Unfortunately, some patients had complications including enteric hepatitis (24/71), thrombocytopenia (4/71), leukopenia (3/71), GIT bleeding (1/71), myocarditis (1/71) and sepsis (1/71), (**Table 3**). We assessed the potential relationship between type of infection (chronic or acute) with the patients' characteristics including the age, gender, residence, education and occupation using cross-tabulation and chi-square test. We did not find any significant correlation between these variables and type of infection. In all comparisons, P. value >0.05, not significant), (**Table 4**). We further assess the correlation between patients' characteristics as potential risk factor for getting typhoid fever. We used regression analysis which revealed that younger age patients (≤ 40 years) were more likely to have typhoid fever, the risk estimator (Odds ratio) was 1.87-fold compared to patients older than 40 years. Females were about 1.67-fold more likely to have typhoid fever than males (Odds ratio (OR) = 1.67). Rural residents were about two-fold more likely to have typhoid fever compared to urban residents (OR = 2.12). Low education was significant risk factor for typhoid fever by about 1.44 fold. Unemployed individuals were about 2.2-fold more likely to harbor typhoid fever compared to employed (OR=2.18). In all correlations, P. value was <0.05, significant, indicated the potential risk factors. The seasonal variation of the registered cases is shown in (**Table 6**) and (**Figure 3**), we observed a peak incidence in the April-June season, (32.4%) and July-September (35.2%) compared to 14.1% in January-March and 18.3% in October-December quarters of the year.

Table 1. Baseline demographic characteristics if the studied group

Variable		**No.**	**%**
Age	< 30	118	29.5
	30 - 39	172	43.0
	40 - 49	69	17.3
	50 - 59	26	6.5
	≥ 60	15	3.8
	Mean (SD)	32.1 (13.4)	-
Gender	Male	231	57.8
	Female	169	42.3
Residence	Urban	284	71.0
	Rural	116	29.0
Education	Illiterate/read and write	71	17.8
	Primary	115	28.8
	Secondary	151	37.8
	Institute, college or higher	63	15.8
Employment	Unemployed	294	73.5
	Employed	106	26.5

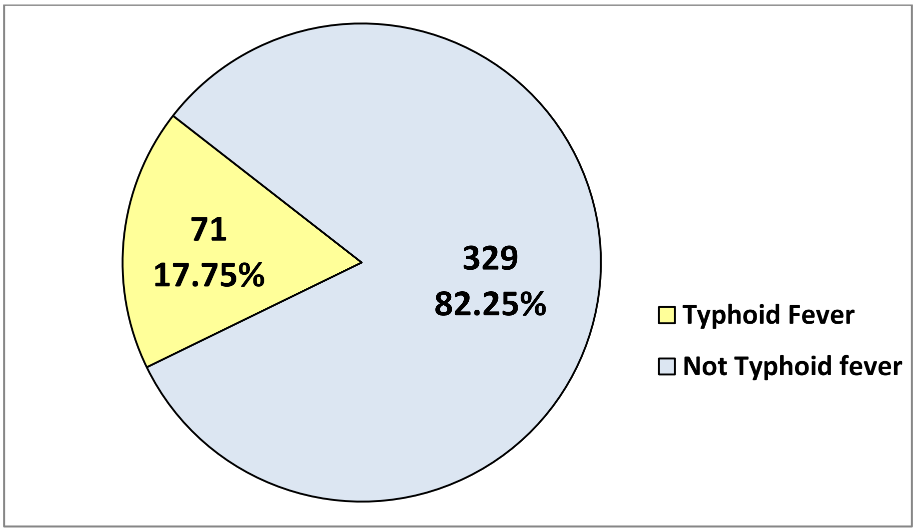

Figure 1. Distribution of the 400 febrile cases according to the final diagnosis (blood culture approved cases)

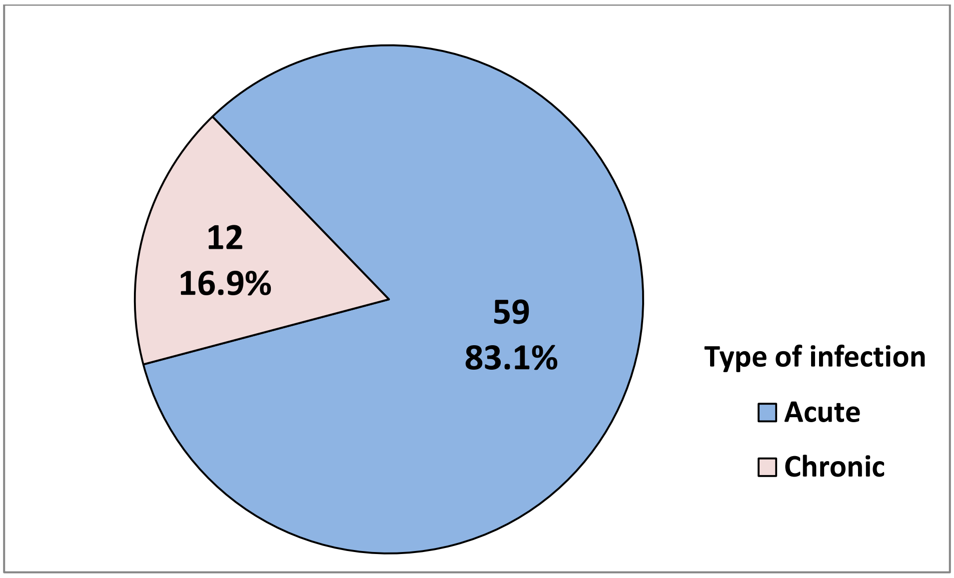

Figure 2. Distribution of 71 Typhoid cases according to the Type of infection

Table 2. Presentation reported by the 71 typhoid approved cases

Presentation	No.	%
Fever	71	100.0
Headache	58	81.7
Nausea / Vomiting	27	38.0
Abdominal pain/tenderness	18	25.4
Fatigue	38	53.5
Splenomegaly	26	36.6
Hepatomegaly	23	32.4
Rash	3	4.2
Others*	2	2.8

*Constipation and cough

Table 3. Common complications reported by the 71 typhoid approved cases

Outcome and complications	No.	%
Enteric hepatitis	24	33.8
Thrombocytopenia	4	5.6
Leukopenia	3	4.2
GIT bleeding	1	1.4
Myocarditis	1	1.4
Sepsis	1	1.4

Table 4. Relationship between infection type and patients characteristics of 71 blood culture approved cases

Variable	Acute (n=59)		Chronic (n=12)		Total (n=71)		P. value
	No.	%	No.	%	No.	%	
Age							
< 30	18	85.7	3	14.3	21	29.6	0.860 ns
30 - 39	25	83.3	5	16.7	30	42.3	
40 - 49	9	75.0	3	25.0	12	16.9	
50 - 59	4	80.0	1	20.0	5	7.0	
≥ 60	3	100.0	0	0.0	3	4.2	
Gender							
Male	36	83.7	7	16.3	43	60.6	0.880 ns
Female	23	82.1	5	17.9	28	39.4	
Residence							
Urban	42	80.8	10	19.2	52	73.2	0.665 ns
Rural	17	89.5	2	10.5	19	26.8	
Education							
Below secondary	28	84.8	5	15.2	33	46.5	0.960 ns
Secondary or higher	31	81.6	7	18.4	38	53.5	
Employment							
Unemployed	41	83.7	8	16.3	49	69.0	0.881 ns
Employed	18	81.8	4	18.2	22	31.0	

ns: not significant

Table 5. Results of regression analysis for the potential risk factor of typhoid fever among the studied group

Variable*	**Odds ratio (OR)**	**95% CI of OR**	**P. value**
Age 19- 39	1.87	1.42 - 3.57	0.001 sig
Gender (Male)	1.67	1.22 - 2.54	0.014 sig
Residence (Rural)	2.12	1.18 - 4.36	0.009 sig
Education (Low)	1.44	1.12 - 2.35	0.033 sig
Employment (unemployed)	2.18	1.31 - 5.12	0.001 sig

Independent Variables. The dependent variable in the regression equation was the final diagnosis (blood culture proved) vs. blood culture Negative cases

Table 6. Rates of blood culture confirmed typhoid cases according to the year quarter in relation to the total febrile cases

Season (year quarter)	No. of typhoid cases	% out of 71 typhoid cases	% out of all 400 febrile cases
January - March	10	14.1	2.50
April - June	23	32.4	5.75
July - September	25	35.2	6.25
October - December	13	18.3	3.25
Total	71	100.0	17.75

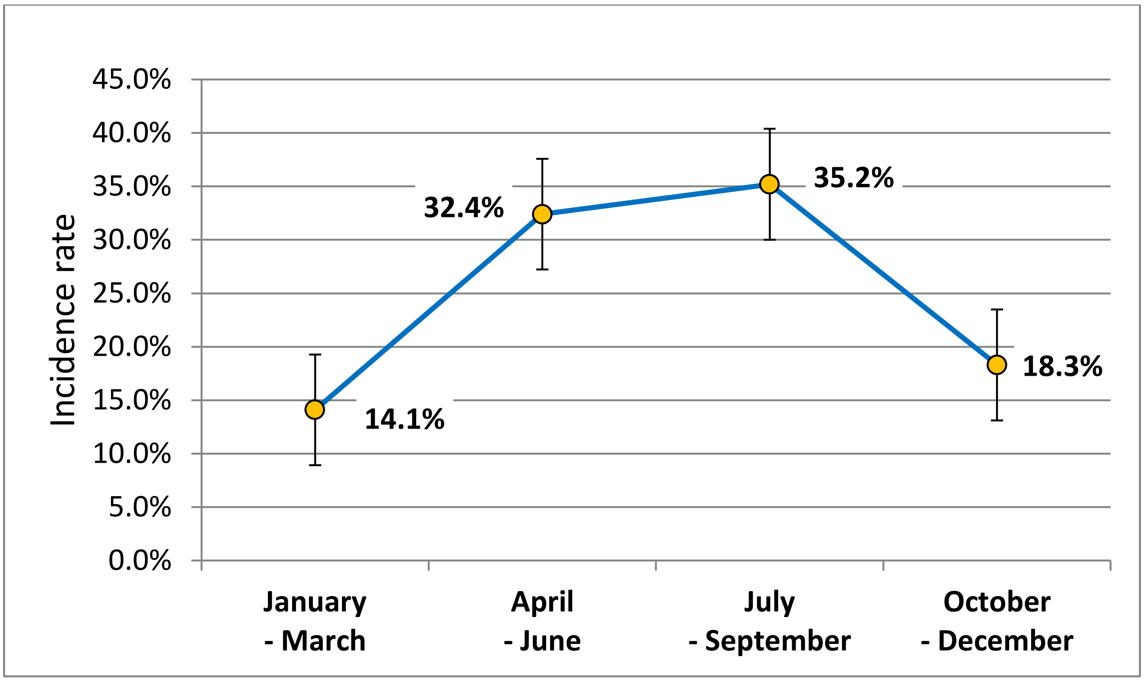

Figure 3. Seasonal variation in the incidence of typhoid fever among the 71 approved typhoid cases

4. DISCUSSION

Typhoid fever is an important health problem worldwide, however, it is a significant challenge in developing countries like ours. Annually, up to 27 million new cases with up to 217000 deaths are reported (46). Typhoid fever is endemic in many developing countries, Iraq is not a way from this race where typhoid fever is an endemic communicable disease in our country. It remains a significant contributor to morbidity and even mortality. Possible risk factors for enteric fever include consuming contaminated food and water, being in close proximity to someone recently diagnosed with enteric fever, living in substandard housing with a mixture of sewage and drinking water supplies, and practicing inadequate personal hygiene. The diagnosis of has grown increasingly challenging due to the varying clinical presentations in different age groups and the increasing number of culture-negative cases caused by the early and unintentional use of antibiotics (46).

In the present study we aimed to assess the prevalence of typhoid fever among febrile patients presented to our hospitals and to address the main presenting features, blood culture results, complications and the potential risk factors. We randomly selected 400 febrile patients who attended the outpatient clinic of the internal medicine in the two hospitals during a period of 18 months (2022-203). They were fully investigated and thoroughly examined clinically. We depend the result of blood culture to prove the diagnosis. Blood culture till now represents the gold standard of diagnosis of typhoid fever (28,34). This is due to the fact that Widal test can produce false positives due to other infections like Enterobacteriacae. From other point of view, Widal test when performed at early stage before a complete antibody response has developed may produce false negative results. However It is difficult to rule out a patient with a clinical history and symptoms of enteric fever when Widal test is negative, on the other hand Widal test had low sensitivity and specificity , so that when depend mainly on the results of single test, misdiagnosis and unfavorable treatment may happen or we missed the effective treatment (28,34,47).

We found that blood culture was positive in 17.75% and the serological tests revealed acute infection in majority of these cases. Our reported rate of blood culture proved typhoid fever is close to that reported in previous studies; Amatya et al. (48) and Maskey et al. (49) who were documented a positive rate of 23.1% and 18.8%, respectively. Conversely, our positive rate was much higher than that reported by Pokharel et al. (50) from Nepal who found a rate of 5.4%. Additionally much lower rate reported in another recent Nepali study conducted in 2021 by Manandhar et al. (51) where the prevalence rate was only 0.51% based on blood culture.

However, some limitations are associated with blood culture use in detection of enteric fever when compared to bone morrow detection due to the fact that blood culture has a sensitivity of 40-80%. Nonetheless, it is extremely difficult to perform Bone morrow culture testing in routine investigation for typhoid fever. There is a widely acceptable sensitivity rate of 50% for blood culture makes it much better than Widal test (33). Previous studies reported different seroprevalence rates based on Widal test; a low seroprevalence of typhoid disease of 14.1% to 19% was reported among febrile patients (47). From other point of view, Mawazo et al. (34) concluded that widal test was not reliable test due to its high false positive and false negative rate and had a poor agreement with blood culture in contrast to stool culture which has good agreement with blood culture. However, stool culture also had its pitfalls because it has low sensitivity of 31.1% and low positive predictive value of 29%. Regarding the common presentation and complications of typhoid fever, our findings consistent with that reported in most studies and literatures and agreed the clinical picture of typhoid and enteric fever diseases (8,11,37,46).

We reported some potential risk factors for typhoid fever among our studied group; we found that younger age, male gender, Rural residence, low education and unemployment were significant risk factors for harboring Typhoid fever. Moreover, we found a seasonal variation in the incidence of typhoid fever with a peak rates during the second and third quarter of the year. These findings agreed that reported in previous epidemiological studies concerned with Typhoid fever in our country and other countries in our region (42,52–55)

Despite the fact that our study is the first one conducted in our province and included larger sample size and longer duration in addition to inclusion of two main hospitals, it is not free of limitations; we were unable to determine antibody concentration, lack of screening of blood films for other febrile illnesses, failure to culture blood samples in some cases, and limited availability of all recommended drugs for antimicrobial susceptibility testing. Thus, extrapolating these findings to the wider community should be done with caution. However, our data can be used for population-based typhoid fever prevalence studies and represent a baseline to shed the light on an endemic communicable disease that need further assessment and monitoring.

5. CONCLUSION

Prevalence of typhoid fever according to blood culture among febrile patients is relatively high. It is comparable to that reported in some other countries whereas much higher than some others. Blood culture was good and reliable diagnostic method compared to Widal test. Patients characteristics showed potential risk of harboring Typhoid fever these include, age below 40 years, male gender, rural residence, low education and unemployment. To effectively treat enteric fever, proper sanitation facilities, regular monitoring and surveillance, antimicrobial susceptibility testing, and proper antimicrobial medication use are needed. To generate more solid population-level data, epidemiological research in community settings must be conducted instead of hospital-based sampling. This method is essential for lowering enteric fever. Further studies are recommended particularly on national level.

Ethical Issues: All ethical issues were approved by the authors. Verbal and signed informed consents were obtained from all patients who included in the study before the intervention. Our investigation was executed following the requisite approvals from the local ethics committee.

Conflict of interest: None

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