



## ASSESSMENT OF HEMATOLOGICAL PARAMETERS IN TYPHOID FEVER OF SUSPECTED PATIENTS OF CHARSAJDA REGION PAKISTAN

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### Abstract

Typhoid is a bacterial disease caused by a gram-negative bacteria called *salmonella typhi*. It enters to body by ingestion of contaminated food and water. The study was carried out in tehsil Charsadda. This study was carried with the aim to find out the prevalence of malaria and to aware the people about this disease. For this purpose, a total of 152 samples were collected out of which 41 (26%) were found positive and 111 (73%) were negative. In month-based prevalence, high number of typhoid patients was found in August and September. The occurrence of typhoid fever appears high in female as compared to male. In age-based prevalence of typhoid, highest prevalence was found in age group of 21-40 years and lowest was found in age group of 51-60 years. The common symptoms include fever (26%) headache (29%) Abdominal pain (37%) Lack of appetite (29%) Myalgia (35%). According to present study the risk factors include previous history, lack of personal hygiene and use of contaminated water. The following hematological parameters; RBC, WBC, Hb, platelets and its effects were studied in both genders, in which WBC and platelets number increases while RBC and Hb become decreases.

**Key Words:** Typhoid, *Salmonella typhi*, Hematology, Prevalence, Parameters

## Introduction

Typhoid fever is emerging as a growing public health concern in underdeveloped regions and areas characterized by inadequate sanitation infrastructure. (1). It is a food born and water born disease (2). It is caused by gram negative bacterium *salmonella enterica* subspecies *enterica serovar typhi* (*salmonella typhi*), it enter to body by ingestion of contaminated water and food (3). The occurrence of typhoid fever has a long history, dating back to the comprehensive study conducted by Austin Flint in 1843. (4). Karl Joseph Eberth, a student of Rudolf Virchow, identified typhoid fever in abdominal lymph and the spleen in 1879. He published his findings in 1880 and 1881, with subsequent confirmation by English bacteriologists (5).

The elevated incidence of typhoid fever in Asia and Africa can be attributed to the lack of adequate sanitation systems and the absence of proper healthcare infrastructure (6). In 2013 it resulted in 161,000 deaths (7). Annually 26.9 million cases of typhoid fever occur worldwide (8).

There are four stages of typhoid fever. At first stage only few symptoms of typhoid fever will appear such as dry cough and headache. Fever may not be occur. The symptoms second stage are high fever, weight loss and hallucination. The patient may feel laziness and agitation sometime. The patients is too tired and high fever i.e about 40°C (104°F). The third, one of serious, stage in which intestinal infection and abdominal pain occur. Inflammation of brain may occur at this stage. The fourth and final stage in which fever become extremely high. Some other serious complications occur such as pneumonia, infection, kidney failure, inflammation of heart, inflammation of the pancreas and meningitis (9).

## Materials and Methods

The present study was completed in the period of 11 months (September 2021 to August 2022). A total of 152 Samples of blood were collected for determining prevalence and infestation of typhoid fever from both genders of different ages in human population of district Charsadda. The samples were collected at DHQ hospital Charsadda and DHQ Hospital Tangi Charsadda. A total of 3 to 5 milliliters of blood were collected with the help of clean disposable syringe.

Then centrifuged at 3000 rounds per minute (rpm) for 5 to 10 minutes. Then 40 microliter serum was isolated with the help of micropipette (Automatic jester) and agglutination test was use for analysis. The blood was then analyzed for CBC and Microscopic examination. CBC can help diagnose not only typhoid but a broad range conditions from anemia to cancer.

## Result

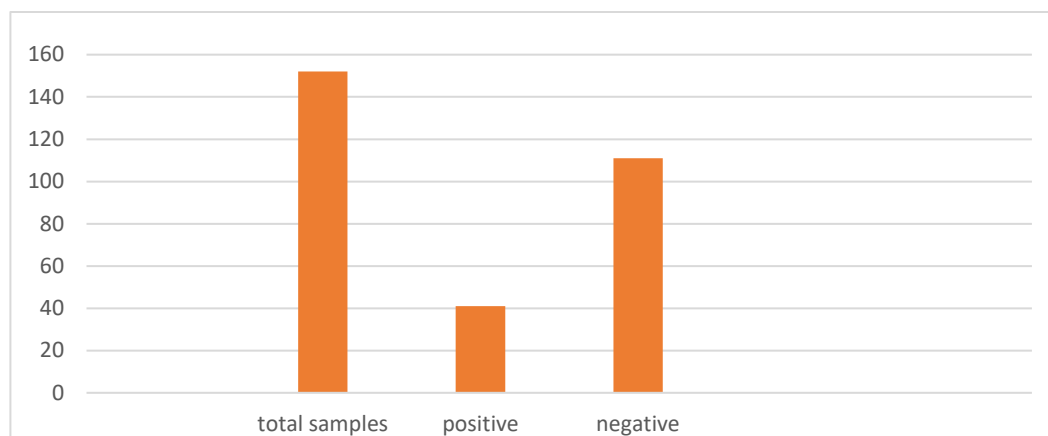
The present study was conducted in district charsadda. A total of 152 samples were collected from both males and females and tested through typhidot, also performed CBC for positive cases. Out of 152 samples 41(26%) were positive and 111(73%) were negative.

### Over all prevalence of typhoid

In overall prevalence a total of 152 samples are collected in which 41 (26%) were positive and 111 (73%) are negative.

**Table: 1 Overall prevalence of typhoid**

Total samples	Positive n (%)	Negative n (%)
152	41 (26)	111 (73)



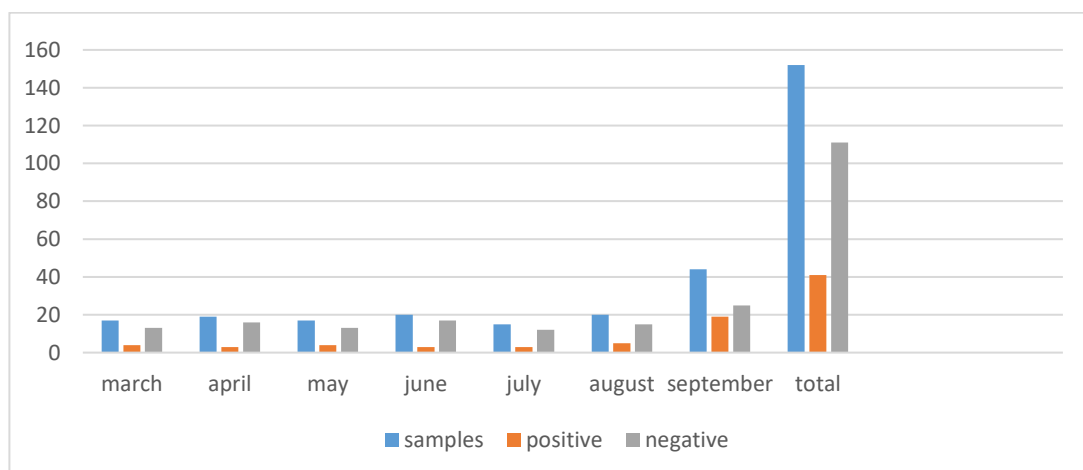
**Figure: 1 Overall prevalence of typhoid**

**Month based prevalence of typhoid fever**

Month wise data is collected from March to September 2022. Highest number of typhoid cases were found in August and September.

**Table: 2 Month-based prevalence of typhoid**

Months	Samples	Positive	Negative
March	17	4	13
April	19	3	16
May	17	4	13
June	20	3	17
July	15	3	12
August	20	5	15
September	44	19	25
<b>Total</b>	<b>152</b>	<b>41</b>	<b>111</b>



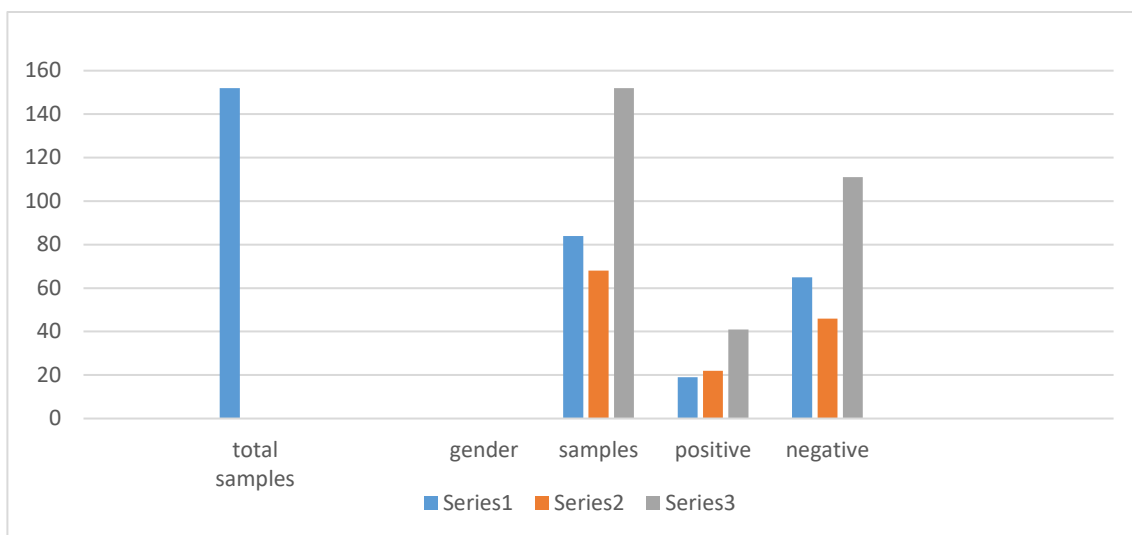
**Table: 2 Month-based prevalence of typhoid**

**Gender based prevalence of typhoid**

The prevalence of typhoid fever is also observed on the basis of gender. Out of 152 samples total males examined were 84 in which 19 (22%) were positive and 65 (77%) were negative and total females examined were 68 in which 22 (32%) were positive and 46 (67%) were negative.

**Table: 3 Gender based prevalence of typhoid fever.**

Total Samples	Gender	Samples	Positive	Negative
<b>152</b>	Male	84	19 (22%)	65 (77%)
	Female	68	22 (32%)	46 (67%)
	<b>Total</b>	152	41 (26%)	111 (73%)



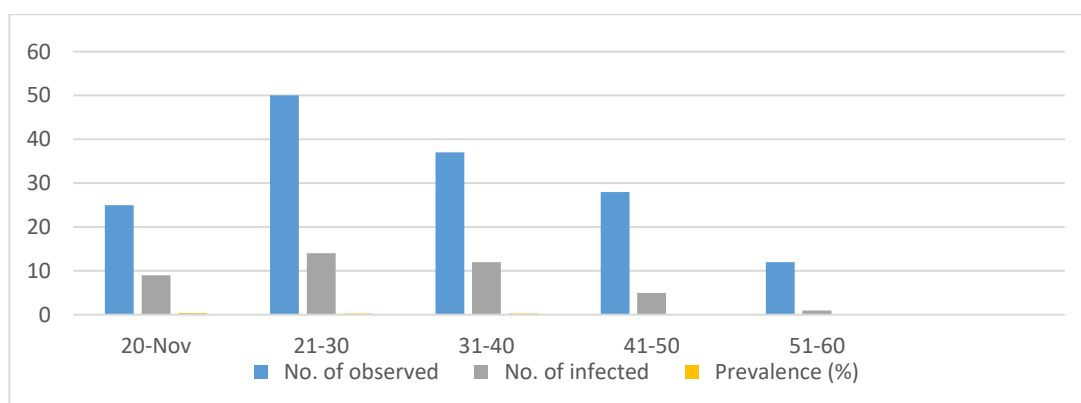
**Figure: 3 Gender based prevalence of typhoid fever**

### Age based prevalence of typhoid

The prevalence of typhoid fever is recorded in different age group ranges from 11 years to 60 years. In age group of 11-20 the prevalence recorded is 17.8%, in age group of 21-30 the prevalence recorded were 28%, in age group of 31-40 samples the prevalence recorded is 36%, in age group of 41-50 is 32.4%, and in age group of 51-60 the prevalence recorded is 8.33%.

**Table 4: Age based prevalence of typhoid**

Age group	11-20	21-30	31-40	41-50	51-60
No. of observed	28	50	25	37	12
No. of infected	5	14	9	12	1
Prevalence (%)	17.8%	28%	36%	32.4%	8.33%



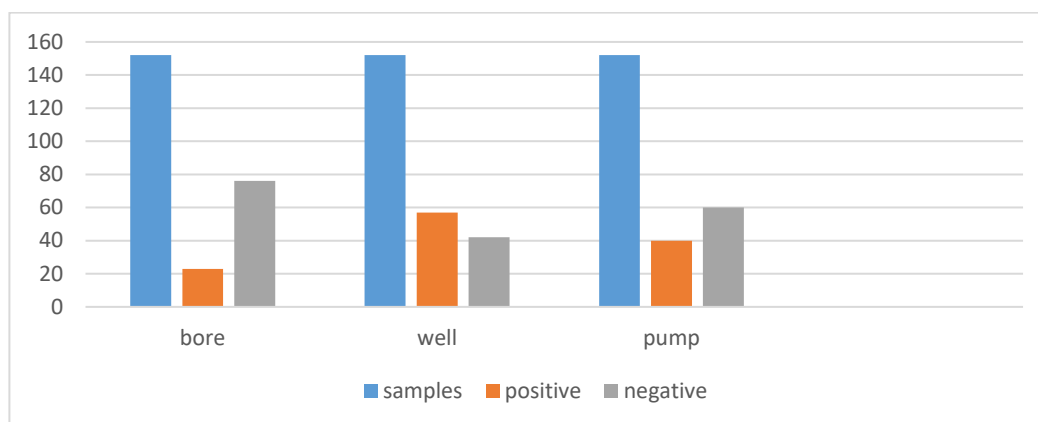
**Figure 4: Age based prevalence of typhoid**

### Prevalence of typhoid on the basis of water

The prevalence of typhoid were also recorded on the basis of water consumption (bore, well and pump). Out of 152 samples, 130 were of bore water among which 31 (23) had positive results and 99 (76) had negative results. Also 7 cases were recorded from well water in which 4 (57) had positive results while 3 (42) had negative results. Similarly 15 cases were also recorded from pump water whose positive cases are 6 (40) and negative cases are 9 (60). The ratio of typhoid fever is high in well water users as compared to bore and pump water users and less ratio is observed in bore water users.

**Table: 5 Prevalence of typhoid on the basis of water**

Water	Samples/total	Positive (%)	Negative (%)
Bore	130/152	31 (23)	99 (76)
Well	7/152	4 (57)	3 (42)
Pump	15/152	6 (40)	9 (60)



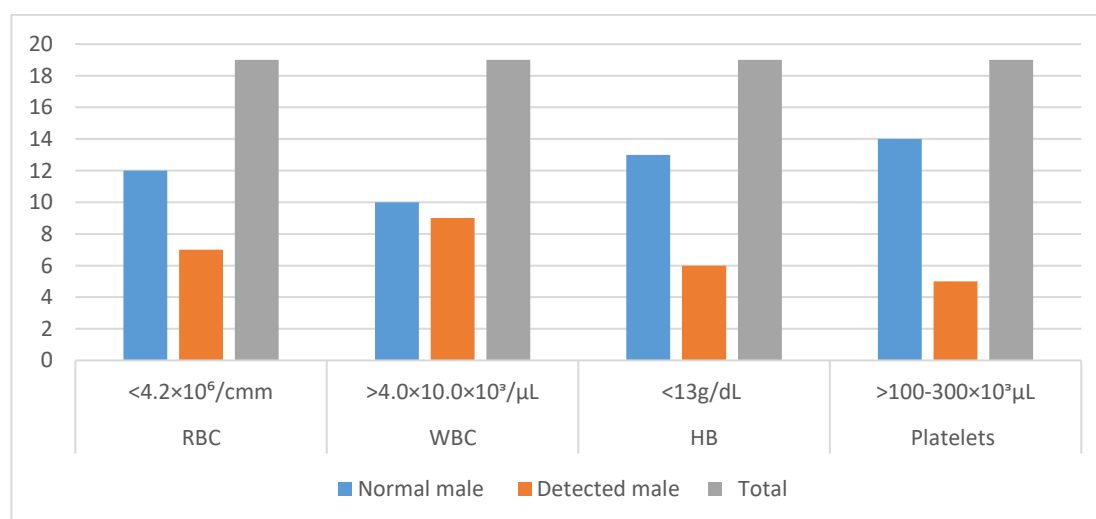
**Figure: 5 Prevalence of typhoid on the basis of water**

**Prevalence of hematological changes in male**

Out of 19 positive cases in male in which, RBC count for normal male is 12 and detected male is 7, WBC count for normal male is 10 and detected male is 9, Hb observed for normal male is 13 and detected male is 6 and platelets observed for normal male is 14 and for detected male is 5.

**Table: 6 Prevalence of hematological changes in male**

Parameters	WHO values	Normal male	Detected male	Total
<b>RBC</b>	$<4.2 \times 10^6/\text{cmm}$	12	7	19
<b>WBC</b>	$>4.0 \times 10.0 \times 10^3/\mu\text{L}$	10	9	19
<b>Hb</b>	$<13\text{g/dL}$	13	6	19
<b>Platelets</b>	$>100-300 \times 10^3/\mu\text{L}$	14	5	19



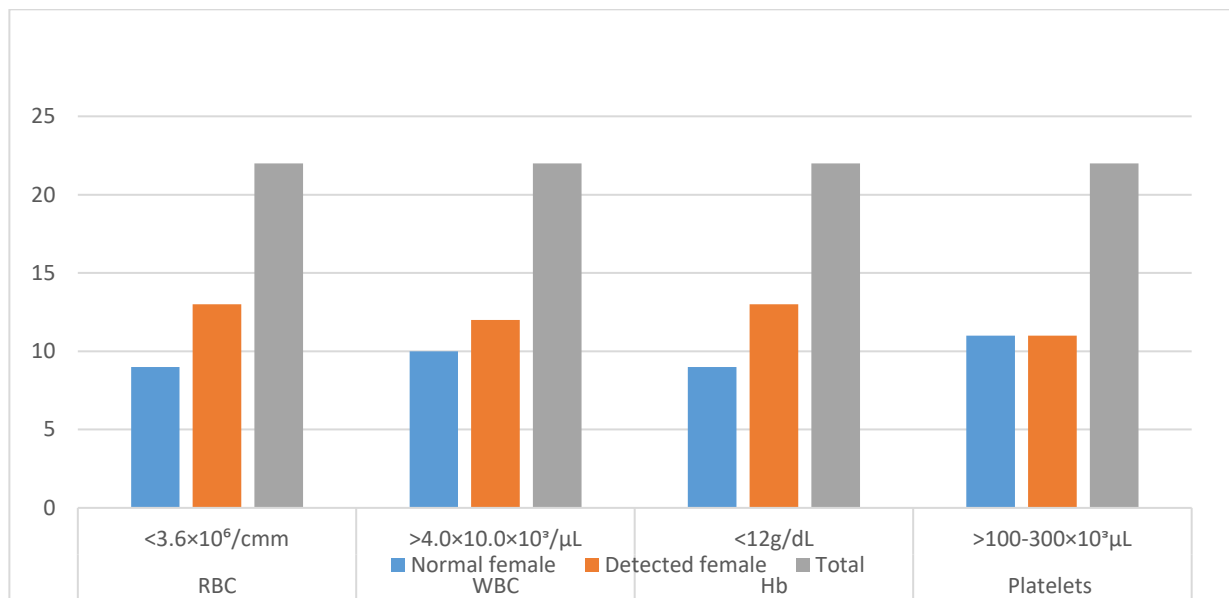
**Table: 6 Prevalence of hematological changes in male**

**Prevalence of hematological changes in females**

Out of 22 positive females in which, RBC count for normal female is 9 and detected female is 13, WBC count for normal female is 10 and detected female is 12, Hb for normal female is 9 and detected female is 13 and platelets for normal female is 11 and detected female is 11.

**Table: 7 Prevalence of hematological changes in females**

Parameters	WHO values	Normal female	Detected female	Total
RBC	$<3.6 \times 10^6/\text{cmm}$	9	13	22
WBC	$>4.0 \times 10.0 \times 10^3/\mu\text{L}$	10	12	22
Hb	$<12\text{g/dL}$	9	13	22
Platelets	$>100-300 \times 10^3/\mu\text{L}$	11	11	22

**Figure: 7 Prevalence of hematological changes in females**

## Discussion

Pakistan is a low income country, where the ratio of infectious diseases is high as compared to developed countries. Similarly, typhoid is one of the most major health concerns. The present study was undertaken to determine the occurrence of typhoid fever among the general population of tehsil Charsadda, Khyber Pakhtunkhwa, Pakistan. For this purpose total of 152 samples were collected from both gender (male and female) in tehsil Charsadda. Overall occurrence of typhoid fever in positive cases was 41 (26%) which is less than lower Dir, Khyber Pakhtunkhwa 37.26% (10). The difference in above ratio is due to hygienic condition and vaccination.

On the basis of seasonal variation, the disease progression was recorded high in September while found low in April, June and July. The study was recorded high in March while found low in January (1). The result of this study is in contrast to present study due to climatic condition like flood. According to 11 peak rainfall was in December and January, and steady rise in the number of cases per month was observed after the rainy season. More cases were diagnosed in May and June than in any other month, which is in contrast to present result.

In present study females (32%) were more affected than males (22%). Similar result also found in Charsadda 487 (51%) females and 476 (49%) males were found infected (12). A study conducted in Islamabad reported high ratio of disease in female (13) The disease is high in female due to weak immune system as compare to male, low level of awareness, low access to health facility and ignorance. The immune system of female is weak which put them in a high risk to get infected (14). Male predominance with 63 (54.8%) males and 52 (45.2%) females which is contrast to present study. (15) Also reported male patients dominant in their studies, where the ratio of male patients was 71.1% and female 61.29%.

The present study showed that the age group of 31-40 (36%) and 41-50 (32.4%) has high rate of typhoid fever while the age group 51-60 years (8.33%) has low rate of typhoid fever. (10) Also reported that rate of typhoid fever is higher in age of 20-40 years. (16) Reported 51.3% typhoid cases in between the age of 12-22 years and 28.7% in the age group of 23-32 years. (17) Has also reported the same in his study where more than 50% of the patients were less than 35 years of age.

Present study shows that observed fever is (26%), headache (29%), abdominal pain (37%), lack of appetite (29%) and myalgia (35%) as the most common symptoms in the patients suffering from typhoid fever. (18) Obtain Fever, headache, abdominal pain, myalgia and loss of appetite in typhoid patients. (19) Also studied headache, abdominal pain, fatigue and fever as a highly typical signs of typhoid fever.

Personal hygiene, previous typhoid history and difference in water uses (bore, well and pump) are observed as common risk factors for typhoid fever. In present study typhoid ratio were high in well users as compared to bore and pump. In contrast to our results (20) detected largest ratio in peoples who used river water. (21) Study Food and personal hygiene as risk factor in typhoid patients.

In present study, hematological changes are RBC, WBC, Hb and platelets studied in both male and female. Total patients detected in case of RBC 16, WBC 21, Hb 19 and platelets 16. (22) Also observed 20 patients had anemia which has close resemblance to our result. (14, 15) Also obtain same result for anemic patients. In contrast to our result, (23) Observe Hemoglobin value low in 5 patients, highest platelet count was found in 7 and WBC in 3 patients.

The differences in the results of typhoid fever in different areas is due to various reasons, like climatic conditions (flood), temperature and hygienic conditions. Peoples with more outdoor activities, weak immune system and less access to safe drinking water are more exposed to typhoid fever.

### Conclusion

To summarize, our study aimed to assess the current prevalence of typhoid fever in Tehsil Charsadda, Pakistan, utilizing a sample of 152 individuals through questionnaires and CBC analysis for positive cases. Out of these samples, 41 tested positive and 111 negative, revealing a higher prevalence among females. Potential factors contributing to this gender discrepancy include weaker immune systems, lower awareness levels, and higher susceptibility due to societal factors. The age group 21-40 years exhibited a higher prevalence, while those aged 50-60 showed lower rates. Common symptoms included fever, headache, abdominal pain, lack of appetite, and myalgia. Contaminated food and water emerged as significant risk factors. Hematological effects were more pronounced in females than males, and the study identified a spike in typhoid cases in September, attributed to flooding.

### Acknowledgment

The present study was financed by project MECESUP UCT 0804, May 2023.

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