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**Original Research Article**

# Changes in some haematological parameters in typhoid patients attending University Health Services Department of Michael Okpara University of Agriculture, Nigeria

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**Keywords**

Typhoid fever; some haemato-logical parameters.

**A B S T R A C T**

Changes in some haematological parameters were studied in 42 typhoid patients and 22 non-typhoid apparently healthy individuals who attended University Health Services Department of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. The study showed no significant difference($P>0.05$) in the mean values of total white blood cell count, monocyte and eosinophil counts of the typhoid patients and the non-typhoid individuals[(5.7+/-0.8*$10^9$/l,5.4+/-1.3*$10^9$/l),(3+/_1.9%,3+/_0.8%) and 1+/_0.4%,1+/_0.6%)] respectively. But there was significant difference($P<0.05$) in the mean values of PCV, neutrophil and lymphocyte counts of the typhoid patients and the non-typhoid apparently healthy individuals[(26+/_4.9%,43+/_1.4%),(23+/_14.4%,54+/_17.3%) and (61+/_15.5%, 42+/_17.2%)] respectively. The study was done to ascertain the level of changes in some haematological parameters of typhoid patients as it is a multi-systemic disease

## Introduction

Typhoid fever cases after malaria infection is the second most frequently health cases perturbing patients that visit University Health Services Department of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria. An estimated 16-33 million cases of typhoid fever occur annually globally. Its incidence is highest in children and young adults between 5-11 years old(WHO,2007) These cases as of 2010 caused about 190,000 deaths up from 137,000 in 1900(Lozano,2012 ).Historically,in the pre-antiboitic era,the case fatality rate of typhoid fever was 10-20%.Today with prompt treatment, it is less than 1%( Heymann, 2008).

Typhoid fever also known as typhoid (Medlineplus Encyclopedia ) is a common

worldwide bacterial disease transmitted by the ingestion of food or water contaminated with the faeces of an infected person ,which contain the bacterium *Salmonella typhi*. The disease has received various names such as gastric fever, abdominal typhus, infantile remittant fever, slow fever, nervous fever and pathogenic fever. The name typhoid comes from the neuropsychiatric symptoms common to typhoid (Oxford English Dictionary, 2011 ).

The Salmonella is a genus in the family Enterobacteriaeceae that has more than 2300 serotypes. Salmonella are grouped based on the somatic O antigen and futher divided into serotypes based on surface Vi antigens. *S.typhi* is similar to other Salmonella in that it is gram-negative,flagellate,nonencapsulated,nonsporulating,facultative aenerobic bacillus that ferments glucose, reduces nitrate to nitrite, and synthesizes peritricous flagella when motile. *S.typhi* has O and H antigens,an envelope(K) antigen and a lipopolysaccharide macromolecular complex called endotoxin, that forms the outer portion of the cell wall.

Multiple serotypes of Salmonellae cause the syndrome of enteric fever, of which typhoid fever is the best studied and described, caused by *S.typhi* and occurring only in humans,typhoid fever is a severe, multisystemic illness characterized by the classic prolonged fever, sustained bacteremia without endothelial or endocardial involvement, and bacteria invasion and multiplication within mononuclear phagocytic cells.The hallmark of typhoid fever is the invasion of and multiplication within the mononuclear phagocytic cells in the liver, spleen, lymph nodes, and peyers patches of the ileum.

The impact of this disease fell sharpely in the developed world with the aplication of 20th Century sanitation techniquess. Classically, the course of untreated typhoid fever is divided into four individual stages, each lasting approximately one week. Over the course of these stages, the patients become exhausted and emaciated (Merriam Webster Dictionary, 2013).In the first week, the temperature rises slowly, and fever fluctuations are seen with relative bradycardia, malaise, headache, and cough. A bloody nose(epixtasis) is seen in a quater of cases, and abdominal pain is also possible. There is a decrease in the number of circulating white blood cells with eosinopenia and relative lymphocytosis, blood cultures are positive for *Salmonella typhi* or *S.paratyhi*. The widal test is negative in the first week.

In the second week of the infection,the patients lies prostrate with high fever in plateau around $40^{o}$C and bradycardia, classically with dicrotic pulse wave. Derilium is frequent, often calm,but sometimes agitated. This derilium gives to typhoid the nickname of nervous fever, Rose spots appear on the lower chest and abdomen in around a third of patients. There are rhonhi in long bases.The abdomen is distended and painful in the right lower qundrant, where borborygmi can be heard. Diaarhoea can occur in this stage:6-8 stools in a day,green,comparable to pea soup, with a characteristic smell. However,constipation is also frequent in the spleen and liver are enlaged (hepatospleenmegaly) and tender, and there is elevation of liver transaminases. The Widal test is strongly positive, with anti O and anti H antibodies. Blood cultures are sometimes still positive at this stage. The major symptom of this fever is that the fever usually rises in the afternoon up to the first and second week.

In the third week of typhoid fever, a number of complications can occur: intestinal haemorrhage due to bleeding in congested peyer's patches;this can be very serious but is usually not fatal. Intestinal perforation in the distal ileum, this is a very serious complication and is frequently fatal. It may occur without alarming symptoms until septicaemia or diffuse peritonitis sets in.Encephalitis, neuropsychiatric sympyoms with picking at bed clothes or imaginary objects. Metastatic abscecces, cholecystitis, endocarditis and osteitis. The fever is still very high and oscillates very little over 24 hours. Dehydration ensues,and the patients is derilious. One third of the affected individual develop a muscular rash on the trunk. By the end of third week, the fever starts subsiding.

Early antiboitic therapy has transformed a previously life-threathenig illness of several weeks duration with an overall mortality rate approaching 20% into a short-term febrile illness with negligible mortality. Case fatality rates of 10-50% have been reported diagnosis or in cases of severe typhoid fever not treated with high-dose corticosteroid therapy as well as antiboitics.

Most patients are moderately anaemic,have an elevated Erythrocytes Sedimentation Rate(ESR), thrombocytopenia, and relativelympho penia. Most also have a slightly elevated prothrombin time (PT) and Activated Partial Thromboplastin Time(APTT), decreased fibrinogen levels, and circulatig fibrin degradation products. Liver transaminase usually are elevated to twice.The normal level, as is the serum bilirubin. Mild hyponatremia and hypokalemia commonly are encountered.
The bacterium that causes typhoid fever may be spread through poor hygiene habits and public sanitation conditions, and sometimes also by flying insects feeding on faeces. Public Health campaigns encouaging people to wash their hands after defecating and before handling food are an important component in controlling spread of the disease. According to statistics from the United States Centers for Disease Control and Prevention(CDC), the chlorination of drinking water has led to dramatic decreases in the transmission of typhoid fever in the U.S.A.

## Materials and Methods

The study was carried out in the Diagnostic Laboratory Unit of University Health Services Department of Michael Okpara University of Agriculture, Umudike, Abia State, Nigeria.

### Subjects and Methods

42 confirmed typhoid patients and 22 non-typhoid patients were chosen for the study. Venous blood of the subjects were collected into EDTA containers and plain tubes. EDTA anticoaglated blood samples were used for full blood count while the sreum samples were used for Widal tests.

### Ethics

Oral consents were made to the subjects prior to the sample collection.Stastistical Analysis: The data were analysed with t-Test.

## Results and Discussion

There was no significant difference in the mean Total White Blood Cell Count of those affected with typhoid fever ($5.7*10^9$/L+/_0.8) and the non-typhoid

**Table.1** Mean WBC values for the typhoid patients and non-typhoid individuals

| Subjects | WBC(*$10^9$/L) | SD(*$10^9$/L | P-VALUE |
|---|---|---|---|
| Typhoid patients(42) | 5.7 | +/_0.8 | |
| Non-typhoid Individuals(22) | 5.4 | +/_1.3 | P>0.05 |

**Table.2** Mean PCV values of the typhoid and non-typhoid subjects

| Subjects | PCV(%) | SD(%) | P-VALUE |
|---|---|---|---|
| Typhoid Patients(42) | 26 | +/-4.9 | |
| Non-typhoid Individuals(22) | 43 | +/_1.4 | P<0.05 |

**Table.3** Mean relative Neutrophil values of the typhoid and non-typhoid subjects

| Subjects | Neutrophil(%) | SD(%) | P-VALUE |
|---|---|---|---|
| Typhoid Patients(42) | 23 | +/_14.3 | |
| Non-typhoid Individuals | 54 | +/_17.3 | P<0.05 |

**Table.4** Mean relative Lymphocytes values of the typhoid and non-typhoid subjects

| Subjects | Lymphocytes(%) | SD(%) | P-VALUE |
|---|---|---|---|
| Typhoid patients(42) | 61 | +/_15.5 | |
| Non-typhoid Individuals(22) | 42 | +/_17.2 | P<0.05 |

**Table.5** Mean relative Eosinophilic values of the typhoid patients and the non-typhoid subjects

| Subjects | Eosinophil(%) | SD(%) | P-VALUE |
|---|---|---|---|
| Typhoid Patients(42) | 1 | +/_0.4 | |
| Non-typhoid Individual(22) | 1 | +/_0.6 | P>0.05 |

Individuals (5.4*$10^9$/L+/_1.3) as seen in table 1(P>0.05). Table 2 showed significant difference (P<0.05) in the mean PCV values of the typhoid (26%+/_4.9%) and the non-typhoid individuals (43%+/_1.4%).Typhoid fever infection may have suppressive effect on the bone marrow activity. Table 3 showed significant decrease (P<0.05) in the mean neutrophil values of typhoid patients (23%+/_14.4%) and non-typhoid subjects.Table4 showed significant difference(P<0.05) in the mean values of lymphocytes(61%+/_15.5%) 0f the typhoid patients and the non-typhoid subjects(42%+/_17.2%).This shows neutropenia and lymphocytosis in typhoid fever. Table 5 and 6 showed no significant difference in the mean values of monocytes and eosinophils of the typhoid

patients and non-typhoid subjects(P>0.05) but in the work done by Lalitha et al., (2008) on typhoid patients there was eosinpoenia. No Basophils was observed in the study. The study is in accordance with the work of Unaiza and Javeria(2013).

Neutropenia in typhoid fever has been attributed to increased margination and defective granulopoiesis (Unaiza and Javeria,2013).Relative lymphocytosis is followed by neutropenia during recovery phase, however, neutrophilic leucocytosis is considered to be a feature of complicated typhoid fever (Hoffbrand et al,1996).

The haematological changes are common in typhoid fever and these include anaemia, leucopenia, eosinophilia, thrombocytopenia and sub-clinical disseminated intravascular coagulation. Bone marrow suppresion and haemophagocytosis are considered to be an important mechanism in producing haematological changes (Khosla et al,1995).Typhoid fever is a multi-system disease that affects the whole systems including the bone marrow which caused the decrease in PCV, Neutrophil but increased lymphoctes.

Typhoid fever has significant effect on some haematological parameters studied. These changes could be useful in the diagnosis of typhoid fever. Therefore, Full Blood Count tests should be ordered early by the clinicians for effective and prompt diagnosis of typhoid infection and proper treatment of the patients and these haematological parameters have to be monitored closely.

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