

Detection of Typhoid IgG and IgM in Selected Students of Kwararafa University, Wukari, Nigeria

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ABSTRACT

Introduction: Typhoid IgG and IgM detection is used in estimating or predicting the presence of typhoid. The prevalence of typhoid is believed to be currently on the increase and has become a health challenge in many parts of the world. Typhoid fever is classified as enteric fever. It has become a public health concern because of its health consequences, affecting both the young and the old. This study aimed to evaluate the detection of Typhoid IgG and IgM in selected Kwararafa University, Wukari, Nigeria, students.

Methods: A total of eighty (80) students of Kwararafa University, Wukari, Taraba State, Nigeria were used for this research. They include forty (40) male and forty (40) female students. The detection of Typhoid IgG and IgM in the blood samples of the volunteers was carried out using a Typhoid IgG and IgM rapid test device.

Results: The results showed that there was a negative result for Typhoid virus specific-IgG antibodies in thirty male students tested and a positive result for Typhoid virus specific-IgG antibodies in ten male students. There was a positive result for Typhoid virus specific-IgM antibodies in only four (4) students, and a negative result for Typhoid virus specific-IgM antibodies in thirty-six male students. There was a negative result for Typhoid virus specific-IgG antibodies in thirty-four female students tested and a positive result for Typhoid virus specific-IgG antibodies in six female students. There was a positive result for Typhoid virus specific-IgM antibodies in only six (6) female students, and a negative result for Typhoid virus specific-IgM antibodies in thirty-four female students. Sixty-four students tested negative for Typhoid virus specific-IgG antibodies, while sixteen students tested positive for Typhoid virus specific-IgG antibodies. Seventy students tested negative for Typhoid virus specific-IgM antibodies, while only ten students tested positive for Typhoid virus specific-IgM antibodies. The results showed that among all students tested, only ten (10) out of the eighty (80) students had primary typhoid infection. This study result showed that more female students of Kwararafa University, Wukari may be suffering typhoid than male students.

Conclusion: The result showed that the prevalence of typhoid among students of Kwararafa University, Wukari, Nigeria may be about 12.5% of the students' population.

Keywords: Antibodies; Prevalence; Typhoid; Typhoid IgG and IgM; Water Contamination

Introduction

A complex illness, typhoid fever has emerged as a public health issue, particularly in developed nations. Salmonella typhi and Salmonella paratyphi are the microorganisms that cause typhoid fever. Enteric fever includes both typhoid and paratyphoid fever [1]. Raw food, tainted water, and big gatherings of sick people can all spread salmonella. It is especially common in densely crowded cities, places with poor sanitation, and situations where there is civil unrest. Sal-

monella is most commonly found in milk, chickens, and rare tortois-es. In addition, a recent investigation regarding the transmission of salmonella-graded genome sequences in Chinese poultry slaughter-houses discovered that 57% of the samples were correct [1]. In third-world nations, especially those in Africa, Asia, and Latin America, the frequency of typhoid outbreaks and associated illnesses has shifted recently. In these underdeveloped countries, about 20 million cases happen every year. Pakistan, India, and Bangladesh together account

for about 85% of all cases reported globally [2]. The highest prevalence of typhoid and associated infections is found in children and young people. A once-yearly disease, typhoid makes up 45% of all cases reported in the natural world each year. In South Asia, the disease is most prevalent during the rainy season, which runs from July to October. Therefore, it is advised that epidemiological tests for typhoid be conducted appropriately [3]. A dangerous bacterial infection that can impact numerous body organs is typhoid fever. It can cause serious problems and even death if left untreated.

Cells in the small and large bowel walls may die as a result of this disease, allowing the contents of the gut to seep into the body. Sepsis, a common infection, severe stomach pain, and vomiting can result from this. The germs are present in the intestinal tract and bloodstream of people who have typhoid fever. Typhoid fever symptoms include a high temperature that does not go away, headaches, nausea, constipation, diarrhoea, and stomach pain. Additionally, some patients might have a rash. Serious complications or even death may result from severe cases. Antibiotics like ciprofloxacin and ofloxacin can be used to treat typhoid; however, the increase in antibiotic resistance has been shown to have made numerous drug classes useless for treating the illness, which has increased the disease's spread [4]. Due to a lack of funding, difficult access to medical care, undertrained personnel to identify and treat the illness, and a significant reliance on blood culture for diagnosis, typhoid fever is difficult to manage in Africa [5]. Typhoid is a common disease in Nigeria and other countries. It is a serious public health problem because of its rising prevalence. Typhoid can be lethal if untreated. Consequently, it is critical to identify and resolve this issue. It is crucial to routinely check the prevalence of typhoid in people because of the high frequency of illnesses like this and the possibly lethal outcomes of untreated cases. This will make it possible for those who are impacted to get the right medical attention and stay healthy.

Gathering data on the detection of typhoid IgG and IgM in students at Kwararafa University in Wukari, Nigeria, is the aim of the current study. The results of the tests will confirm the prevalence of typhoid cases among the students and will also assist government and health agencies in understanding the rate of typhoid cases among the student population. This information will aid in developing effective management and control strategies to combat typhoid among the students.

Materials and Methods

Study Area and Duration

This project research study was conducted from May, 2024 to June, 2024 in Kwararafa University, Wukari, Taraba State, Nigeria.

Study Population

A total of eighty (80) students of Kwararafa University, Wukari, Taraba State, Nigeria were used for this research. They include forty

(40) male and forty (40) female students who volunteered for the testing. They were selected at random.

Materials Used

The following materials were used during the present study: Sterile wipe, Typhoid IgG and IgM Rapid Test Device, Cotton wool, Lancet, Blood specimens (from the volunteers), Reaction buffer, Disposable plastic pipette and Timer.

Kits for Typhoid IgG and IgM Rapid Test

The detection of Typhoid IgG and IgM in the blood samples of the volunteers was carried out using Typhoid IgG and IgM rapid test device manufactured for NODEHENZ MEDICS INT'L CO. NIG. LTD. The Typhoid IgG and IgM rapid test device is a lateral flow immunoassay for the simultaneous detection and differentiation of anti-Salmonella typhi (*S. typhi*) IgG and IgM in human whole blood, serum or plasma, thus, to aid in the determination of current or previous exposure to the *S. typhi*.

Procedure for Detection of Typhoid IgG and IgM

Before testing, the specimen, test apparatus, and reaction buffer were allowed to reach room temperature.

Before opening the pouch, it was allowed to come to room temperature. The patient's (student's) identifying number was written on the test gadget once it was taken out of the sealed pouch. The test apparatus was set up on a spotless, level surface. The student's finger was then chosen to be punctured. After cleaning the finger with a sterile cloth and letting it air dry fully, a sterile lancet was used to puncture the skin to draw blood. Two droplets of blood were aspirated from the student's pierced finger and promptly transferred to the test device's specimen well (S) using the disposable plastic pipette that came with the kit. One (1) drop of the reaction buffer was then added to the specimen well and the timer was started. The test result was read at 10 minutes and recorded.

Result Interpretation

- **IgG Positive Result:** If a coloured line emerged in the test line region IgG and the control line region (C) also had a coloured line. The result indicates a secondary typhoid infection and is positive for IgG antibodies specific to the typhoid virus.
- **IgM Positive Result:** If a coloured line emerged in the test line region IgM and the control line region (C) also had a coloured line, this indicates an IgM positive result. Typhoid virus specific-IgM is positive, which is likely a sign of a primary Typhoid infection.
- **Positive Result for IgG and IgM:** If two colored lines emerged in the test line sections for IgG and IgM and the colored line appeared in the control line region (C). The lines' colour intensities do not need to coincide. IgG and IgM antibody levels are positive,

which suggests a subsequent typhoid infection. The intensity of the colour in the test line region(s) will vary depending on the concentration of Typhoid antibodies in the specimen. Therefore, any shade of colour in the test line region(s) should be considered positive.

- **Negative Result:** Appearance of coloured line in the control line region (C) and no appearance of colour in the test line regions IgG or IgM.
- **Invalid Result:** Absence of coloured at the control line (C) region, with or without coloured line at the test regions indicates invalid results.

Results

The results are presented in figures and table below: Figure 1 showed there was a negative result for Typhoid virus specific-IgG antibodies in thirty male students tested: indicative of no secondary Typhoid infection and a positive result for Typhoid virus specific-IgG antibodies in ten male students (indicative of secondary Typhoid in-

fection). There was a positive result for Typhoid virus specific-IgM antibodies (indicative of primary Typhoid infection) in only four (4) students and a negative result for Typhoid virus specific-IgM antibodies (indicative of no primary Typhoid infection) in thirty-six male students. Figure 2 showed there was a negative result for Typhoid virus specific-IgG antibodies in thirty-four female students tested: indicative of no secondary Typhoid infection and a positive result for Typhoid virus specific-IgG antibodies in six female students (indicative of secondary Typhoid infection). There was a positive result for Typhoid virus specific-IgM antibodies (indicative of primary Typhoid infection) in only six (6) female students and a negative result for Typhoid virus specific-IgM antibodies (indicative of no primary Typhoid infection) in thirty-four female students. Table 1 showed that sixty-four students tested negative for Typhoid virus specific-IgG antibodies, while sixteen students tested positive for Typhoid virus specific-IgG antibodies. Seventy students tested negative for Typhoid virus specific-IgM antibodies, while only ten students tested positive for Typhoid virus specific-IgM antibodies (indicative of primary Typhoid infection).

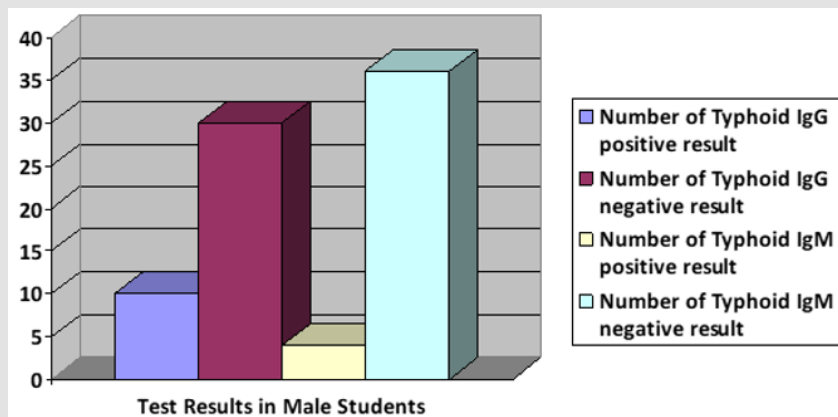


Figure 1: Typhoid IgG and IgM Test Result in Selected Male Students of Kwararafa University, Wukari, Nigeria.

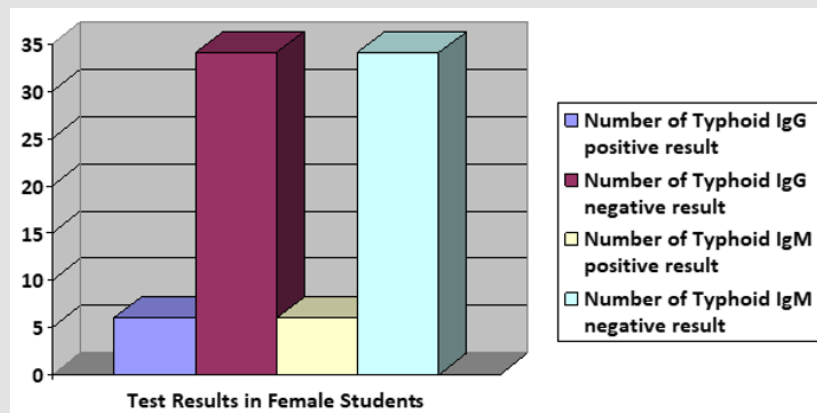


Figure 2: Typhoid IgG and IgM Test Result in Selected Female Students of Kwararafa University, Wukari, Nigeria.

Table 1: Typhoid IgG and IgM Detection in Eighty (80) Selected Students of Kwararafa University, Wukari, Nigeria.

Indices	Male Students	Female Students	Male and Female Students	Remark
Number of Typhoid IgG positive result	10	6	16	Sixteen cases of secondary typhoid infection
Number of Typhoid IgG negative result	30	34	64	Absence of secondary typhoid infection in sixty-four students
Number of Typhoid IgM positive result	4	6	10	Ten cases of primary typhoid infection
Number of Typhoid IgM negative result	36	34	70	Absence of primary typhoid infection in seventy students

Discussion

The detection of typhoid IgG and IgM is used to estimate or predict the presence of typhoid. In many regions of the world, typhoid is now considered to be a health concern due to its estimated rising prevalence. Enteric fever is said to include both typhoid and paratyphoid fevers [1]. Since typhoid affects both young and old at different times of the year, it has become a public health concern due to its negative health effects. According to Crump et al. [3], this has led to the recommendation that epidemiological testing on typhoid be conducted appropriately. The results of this study demonstrate how common it is among Kwararafa University students in Wukari, Nigeria. The results of this study (Figure 1 & Table 1) showed Typhoid IgG and IgM test results in selected male students of Kwararafa University, Wukari, Nigeria. Among the male students tested, only four (4) tested positive for Typhoid IgM. This indicates that four out of forty male students had primary typhoid infection, and as a result, may be suffering typhoid. It implies that about 10% of the male students are affected by typhoid. The students who tested positive may have consumed foods or water infected by *Salmonella typhi*. *Salmonella* was reported to spread by polluted water, raw food, and large groups of sick people, and is most prevalent in heavily populated cities, civil disorder, and inadequate sanitation [1]. The result also showed that thirty male students do not have the primary typhoid infection, since they tested negative for Typhoid IgM detection. The result showed that 90% of the male students were free from primary typhoid infection.

The results shown in Figure 2 & Table 1 showed Typhoid IgG and IgM test results in selected female students of Kwararafa University, Wukari, Nigeria. The result showed that among the female students who volunteered and were tested, only six (6) out of forty tested positives for Typhoid IgM. The result indicates that six out of forty female students had primary typhoid infection, while thirty-four female students did not have primary typhoid infection. This showed that 15% of the female students are affected by typhoid, while 85% of the female students tested are free from primary typhoid infection. Detection of the Typhoid IgM supports the claim that Typhoid fever remains a formidable challenge to many parts of the world, and its widespread is highly localized in the African continent [6]. Among all the students who volunteered and were tested, sixty-four students tested negative for Typhoid virus specific-IgG antibodies: indicative of no secondary Typhoid infection in the sixty-four students, while sixteen students tested positive for Typhoid virus specific-IgG antibodies,

which is indicative of secondary Typhoid infection in the sixteen. The positive test in the sixteen students for Typhoid virus specific-IgG antibodies implies that the sixteen students may have been infected by *Salmonella typhi* as a result of previous infection or treatment of other diseased conditions. Secondary typhoid infection does not imply to mean primary typhoid infection.

Seventy students tested negative for Typhoid virus specific-IgM antibodies, while only ten students tested positive for Typhoid virus specific-IgM antibodies, which is indicative of primary Typhoid infection in the ten students. The results showed that among all students tested, only ten (10) out of the eighty (80) students had primary typhoid infection. This implies that the ten students may be suffering typhoid which may be a result of a new infection with *Salmonella typhi*. This means that 12.5% of the population tested had typhoid, while 87.5% did not have typhoid. Those that had primary typhoid infection may have gotten it through several ways, such as through water, food, etc. This is because exposure to the primary Typhoid infection could arise due to some condition. It was reported in research that the risk factors that predispose individuals to typhoid fever include; consumption of food and water contaminated with faeces and urine of the disease carriers, contaminated water bodies around the environment, poverty, lack of hygiene, consuming contaminated milk or milk products and also contact with a chronic disease carrier [7]. Also, inhabiting in a congested locality or household has been reported to be significantly related to typhoid fever [8]. The spread of this typhoid can be curtailed through various way in order to reduce this prevalence rate. The habit of washing vegetables and compulsory use of sanitary latrines for defecation has been reported to prevent typhoid [9]. Improving the surveillance system has also been reported to be essential in order to accurately assess the prevalence of typhoid fever, identify patterns of resistant strains, recognize areas with high levels of transmission, and implement control measures [10].

Most of the students who tested positive were symptomatic. The symptomatic students support the WHO report which stated that after being infected, typhoid fever manifests between 1 and 3 weeks and presents with features like; high fever, headache, malaise, diarrhoea, constipation, hypersplenism and rose-coloured spots on the chest [11]. The students who tested positive are expected to go for treatment. Typhoid fever has been identified in research as one of the potential deadly illnesses upon which control and treatment are becoming tremendously challenging to achieve due to the emergence of antibiotic-resistant strains. Azithromycin has been reported to be

effective in treating typhoid fever in both adults and children. Cefixime, a third-generation cephalosporin, has also been widely used, while intravenous third-generation cephalosporins such as ceftriaxone and cefotaxime have also been found to be effective. Aztreonam and imipenem are documented to be potential alternatives if other treatments are not effective [12]. This study result showed that more female students of Kwararafa University, Wukari may be suffering typhoid than male students. The result also showed that the prevalence of typhoid or typhoid fever among students of Kwararafa University, Wukari, Nigeria may be about 12.5% of the students' population.

Conclusion

The study showed that four out of forty male students had primary typhoid infection, and as a result, may be suffering typhoid. It implies that about 10% of the male students are affected by typhoid. Six out of forty female students had primary typhoid infection, while thirty-four female students did not have primary typhoid infection. Among all the students who volunteered and were tested, sixty-four students tested negative for Typhoid virus specific-IgG antibodies which is indicative of no secondary Typhoid infection in the sixty-four students, while sixteen students tested positive for Typhoid virus specific-IgG antibodies, which is indicative of secondary Typhoid infection in the sixteen. The results showed that among all students tested, only ten (10) out of the eighty (80) students had primary typhoid infection. This study result showed that more female students of Kwararafa University, Wukari may be suffering typhoid than male students. The result also showed that the prevalence of typhoid or typhoid fever among students of Kwararafa University, Wukari, Nigeria may be about 12.5% of the students' population.

Conflict of Interest

The authors declare no conflict of interest.

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