Evaluate the efficiency of Widal test in diagnosis of typhoid Fever in arriving patients to Kirkuk hospitals

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Abstract

The aim of this study was to investigate the accuracy of widal test by compared with enzyme linked immunosorbent assay (ELISA) as standard method and for this purpose 150 blood samples were pulled from patients suspected infected with typhoid fever coming to Azadi Teaching Hospital and Children’s Hospital in Kirkuk Governorate from 1-09-2016 to 1-11-2016, and 20 sample of blood were pulled from healthy people considered as a control group. The sample tested by tube titration method of Widal test and also by using ELISA test (antibodies IgM and IgG). The results showed that the percentage of infection in patients with typhoid fever were 74% (111:150) when diagnosed by widal test, and IgM antibodies increasing in ratio 32.6% (49:150) Which indicate as acute phase. IgG antibody recorded increasing with ratio 2.7% (4:150) this indicate as chronic phase. Both types of Ab (IgM and IgG) increasing in ratio 12% (18:150). the accuracy of widal test showed that the Positive and negative predictive value were 49.45%, 87.17% respectively. While the percentage of sensitivity and specificity were 92.95% and 43.03% respectively. We conclude from this study that widal test have high sensitivity for diagnosis typhoid fever but its haven't good Specificity and it must be replace with more accurate testing such as ELISA.

Keyword: Typhoid fever, Widal test, ELISA

Introduction

Typhoid fever is a life-threatening disease. It is a major health problem and is endemic in developing countries due to pollution of drinking water, poor health awareness, increased illegal immigration, and antibiotic resistance to antibiotics [1,2]. The confirmation of the diagnosis of typhoid fever is not based solely on clinical symptoms, which are not specialized and similar to other pathological symptoms such as malaria, dengue fever, rickettsiosis, etc. [3,4]. Some studies have focused to the importance of using more than one method to confirm typhoid fever, and that the most important of these methods are blood culture and DNA detection tests, which are sensitive and high Specificity [5]. The ELISA technique which detects the immune response of the body, is diagnosed infection by detecting the presence of antibodies in the body in the acute and chronic phases [6]. Another method that used to diagnosis typhoid fever was Widal test which is one of the oldest and most widely used diagnostic tests for typhoid fever in developing countries, because that it is easy to perform and is inexpensive [7]. However, one of the disadvantages of this test is a possible to give wrong results in the case of taken antibiotics and vaccines, because the antibodies remain in the body for a long time as well as the infection with members of Enterobacteriaceae family which cross reactions leads to false positive results [8].

Material and methods

A- Samples collection

A total of 170 blood samples were collected, 20 sample were belonged to healthy people who were considered as control and 150 samples of persons suspected infected with typhoid fever. All patients were attended to Azadi Teaching Hospital and Children’s Hospital in Kirkuk Governorate. Blood samples were left for 20 minutes to coagulate in the tubes without anticoagulant and then placed in a centrifuge for the purpose of obtaining the serum for the performance of serological examination [9].

B- Widal test

The production kit was used by the British Plasmatic Company and samples were tested according to the company’s instructions.

C- Salmonella typhi IgM and IgG ELISA

The production kit was used by the American MyBiosource company and samples were tested according to the company’s instructions.

D- statistical analysis

The results were statistically analyzed using the SPSS program. The efficiency of the test was measured and reported as reported in [10] as following:

- Positive predictive value (PPV) = true positive / (true positive + false positive) x 100
- Negative predictive value (NPV) = (real negative) / (real negative + false negative) x 100
- Sensitivity = (true positive) / (true positive + false positive) x 100
- Specificity = (real negative) / (real negative + false positive) x 100

Results and discussion:

The percentage of infection was 74% (111:150) by widal test depending on tubes titration method of the somatic antigen with or without flagellate antigen, and 30% (6:20) of control group was positive (Table 1). This result of present was higher than that recorded by Rada (2013) [5] and Abass (2012) infection ratio was 53.7% and 46.1% [6] respectively, but less than study of Al-Asadi (2011) which recorded 94.37% [11]. This may due the location, time of collection samples and number of samples.
Table (1): Result of widal test depending on somatic and flagellate antigens

<table>
<thead>
<tr>
<th>Samples</th>
<th>Total number</th>
<th>Positive cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>patients</td>
<td>150</td>
<td>111</td>
<td>74%</td>
</tr>
<tr>
<td>Control group</td>
<td>20</td>
<td>6</td>
<td>30%</td>
</tr>
<tr>
<td>Total number</td>
<td>170</td>
<td>117</td>
<td>68.8%</td>
</tr>
</tbody>
</table>

By using ELISA assay, the incidence of typhoid fever was different (Table 2). The results showed that the acute incidence of typhoid fever based on IgM antibody, it was 32.6% (49:150), while chronic incidence of IgG antibody was 2.7% (4:150). Both types of antibodies was 12% (18:150) in patients, and no positive case were detected with high antibodies in control group.

Table (2): ELISA test result among febrile patients

<table>
<thead>
<tr>
<th>Samples</th>
<th>Total number</th>
<th>IgM (%)</th>
<th>IgG (%)</th>
<th>IgM / IgG (%)</th>
<th>Total positive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient</td>
<td>150</td>
<td>49 (32.6%)</td>
<td>4 (2.7%)</td>
<td>18 (12%)</td>
<td>71 (47.3%)</td>
</tr>
<tr>
<td>Control group</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total number</td>
<td>170</td>
<td>49(32.6%)</td>
<td>4 (2.7%)</td>
<td>18 (12%)</td>
<td>71 (47.3%)</td>
</tr>
</tbody>
</table>

These results not compatible with many studies, Nirmala and Asha (2015) which recorded 71.9%, 11.57%, 16.53% in acute infection, chronic infection and co-infection respectively[12]. Kumar and his colleagues indicated 104 and 116 infections per 197 suspected cases of acute infection, chronic infection and co-infection, respectively [13]. This may suggest that the differences may return to difference in the area and the season of study, stage of disease, the cultural and health level, and the number of samples in each study.

In present study, ELISA test was used to evaluate widal test. The sensitivity and specificity of the test was 92.95% while the specificity of the test was 43.03%. The positive and negative predictive value was 49.45% and 87%, respectively (Table 3). The sensitivity was nearly to study [13] which recorded 98% of sensitivity, while the sensitivity ratio recorded in this study differed from study [13,16] which recorded 84% and 85.71% respectively. on the other hand the Specificity in our study was agreed with [13] which record 43.7%. While the percentage of Specificity recorded in this study decreased from many studies which recorded Higher percentage of specificity of widal test [15,17,13].

The value of positive and negative predictive were 49.45% and 87.17%, respectively. These values in the current study are agreed with previous study [17] that achieved 46.6% and 88.5% for the value of positive and negative prediction, respectively. In previous studies [13] and [14] showed it showed high prediction values of positive and negative.

Table (3): Comparison of Widal test with ELISA

<table>
<thead>
<tr>
<th>Test</th>
<th>ELISA</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Widal test</td>
<td>66</td>
<td>45</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>34</td>
</tr>
<tr>
<td>Total</td>
<td>71</td>
<td>79</td>
</tr>
</tbody>
</table>

*PPV= 49.45%, NPV= 87.17%, Sensitivity = 92.95%, Specificity = 43.03%
References
2- G. Andualem. (2011). A Comparative Study of Blood Culture and Widal test in the Diagnosis of Typhoid Fever in Febrile Patients . MSc Thesis , Department of Microbiology, Immunology and Parasitology School of Medicine, Addis Ababa University, Ethiopia.
تقييم اختبار ويدال لتشخيص حمى التيفوئيد للمرضى الوافدين إلى مستشفيات كركوك

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الملخص

هدف الدراسة لمعرفة دقة تشخيص اختبار الاليزا كطريقة تشخيصية قياسية، وليذا الغرض تم اخذ 150 عينة دم من الأشخاص الوافدين والمشكوك بإصابتهم بحمى التيفوئيد إلى مستشفيات إزادي التعليمي ومستشفى الأطفال من 1-9-2012 إلى 1-11-2016 واحذرت 20 عينة دم من الأشخاص الاصحاء كمجموعة سيطرة. وتم تشخيص العينات باختبار الاليزا بطريقة المعايرة في الأدبيب واختبار الاليزا

المضد المناعي IgM و IgG للعديد من ال숙ية IgM و Rand внешنت الدراسة أن نسبة الإصابة بحمى التيفوئيد كانت 74% (111:150) عند تشخيصها باختبار ويدال. وعدد ارتفاع نسبة انتشار IgM باختبار الاليزا سجلت متوسط 32.6% (49:150) من العينات والتي تمثل الإصابة في المرحلة الحادة، وسجلت إصابة الأشخاص المبتدين من الاليزا (IgM & IgG) نسبة بلغت 2.7% (4:150) والتي تمثل المرحلة المزمنة للمرض، وسجل كلا النوعين من الإصابة (IgM و IgG) نسبة بلغت 12% (18:150). وعند تقسيم اختبار ويدال اعتمادًا على نتائج اختبار الاليزا بلغت قيمة التنبؤ الإيجابي والسالبي 49.45% و 87.17% على التوالي، في حين بلغت قيمة الحساسية والنوعية له 92.95% و 4.3% على التوالي. إذا استنتج من هذه الدراسة أن اختبار ويدال له حساسية عالية لكن لا يمكن إنكار نعومة جديدة لتشخيص الإصابة بحمى التيفوئيد ويبعد تأكيد نتائج اختبار الاليزا باختبار أكثر دقة كاختبار الاليزا.

الكلمات المفتاحية: حمى التيفوئيد، اختبار الاليزا، الأنزال