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Detection of salmonella typhi transmitted by housefly in patient's blood in al-Diwaniyah province, Iraq

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Abstract---Salmonella typhi is a gram- negative bacterium, it is causes disease called typhoid fever. House flies are play important role in transmission of Salmonella. This study aimed to detect Salmonella typhi transmitted by house flies in patient's blood in Al-Diwaniyah province of Iraq. This study was collected 30 blood samples from patient's in Al-Diwaniyah teaching hospital from November 2021 until to end March 2022 from both sexes (17 males and 13 females) and age groups ranged between (10-50) years. The results of study revealed that high prevalence of disease in males 17(56.66%), but revealed low prevalence of disease in females13(43.33%). According to age groups the result was recorded high incidence of disease in age group (10-20) (40%), while it was recorded low incidence of disease in age group (40-50) (10%). In current study, 10 serum samples out of 30 samples were detected 6(60%) positive samples for IgM, whereas 4(40%) positive samples for IgG in rapid test of Salmonella typhi.

Keywords---Salmonella typhi, housefly, transmission, Rapid test

Introduction

Salmonella typhi and *Salmonella paratyphi* are Gram Negative Rods caused disease called typhoid fever, it is mostly a disease of developing countries due to

poor values of hygiene (1). The housefly (*Musca domestica*) was the greatest active agent in the transmission of typhoid fever. Presently, *Musca domestica* is documented as the mechanical vector of a wide range of bacterial, protozoal, viral, and pathogens (2). House fly, *M. domestica* L. (Diptera: Muscidae), "is the most common and widespread species of fly in the world", it is assumed to have created from the Central Asia (savannahs) and distribute throughout the world, and may be found in both urban and rural regions of temperate and tropical climates (3). The main symptoms of disease involved fever and rigor, the peripheral blood of these patients discovered different haematological changes, like leucopenia, bicytopenia, pancytopenia and normocytic anaemia (4). Typhoid fever is a main public health problem worldwide; the intensity pathogenesis of *Salmonella* is detected by the presence of several virulence factors expressed on "Salmonella pathogenicity islands" (SPIs) (5). *Salmonella* is one of the most common in the world causes poisoning of food, such as bacteria can infect a wide variety products of food for example dairy products, or meal, poultry, involving those of animal source (6). Diagnosis of *Salmonella* depending on bacterial culture, serological assays such as (antibody detection, rapid serologic tests), and molecular assays according to (7). The aim of this study was conducted to detect *Salmonella typhi* transmitted by house fly in patient's blood in Al-Diwaniyah province of Iraq.

Method

Material and methods

Study design

This study was collected 30 blood samples from patient's vein suffer from typhoid fever in Al-Diwaniyah teaching hospital from November 2021 until to end of March 2022, from both sexes (17 males and 13 females), which age groups ranged between (10-50) years.

Samples collection

The blood sample was obtained from patient's vein by using disposable syringes in the sitting position after sterilized by 70% alcohol, and it putted in sterile test tube (3) ml and centrifuged at 3000rpm per 5 minutes to separate serum, then the serum was collected in sterile appendrofe tube transported to microbiological laboratory of Islamic university in Al-Diwaniyah for examination by used the Rapid Test.

The Serology Test (Rapid Test)

1.The principle

The typhoid IgG/IgM rapid test is lateral flow chromatography immunoassay. The test cassette consists of:

- Burgundy colored conjugate pad containing recombinant S. Typhoid H antigen and O antigen conjugated with colloid gold (typhoid conjugates) and rabbit IgG gold conjugates.

- Nitrocellulose membrane strip containing two test bands (M and G bands) and control bands (C band).

The M band is pre-coated with monoclonal anti-human IgM for detection of IgM anti-*S. typhi*, and C band is pre-coated with goat anti rabbit IgG. When an adequate volume of test specimen is dispensed into the sample well of the test cassette, the specimen migrates by capillary action across the cassette. Anti-*S. typhi* IgM if present in the specimen will binds to the typhoid conjugates.

The immune complex is then captured on the membrane by the pre-coated anti-human IgM antibody forming burgundy colored M band, indicating a *S. typhi* IgM positive result. Anti *S. typhi* IgG if present in the specimen will bind to the typhoid conjugates. The immune complex is then captured by pre-coated reagents on the membrane, forming burgundy colored G band, indicating *S. typhi* IgG positive test result. Absent of any test bands (M and G bands) suggests a negative result. The test contains an internal control (C band) which should exhibit a burgundy colored band of immune complex of goat anti rabbit IgG /rabbit IgG -gold conjugate regardless of the color development on any of the test bands. Otherwise, the test results are invalid and the specimen must be retested with another device.

2. Test method

Instructions for use must be read entirely before taking the test. Allow the test device controls to equilibrate to room temperature for 30 minutes (20C to 30 C) prior to testing.

****Don't open the inner packaging until ready.it must be used in one hour if opened.**

3.Test procedure

- remove the test cassette from the sealed pouch, place it on the clean and level surface with the sample well up.
- using the dropper, vertically transfer (1drop) 25microliter of serum/plasma/whole blood into the sample well (S) of the cassette, avoiding the formation of bubbles. Add two drop 80-100 microliter of sample buffer into the diluents well (D) of the cassette. C) Observe the test results immediately within 15-20 minutes, the result is invalid over 20 minutes.

****Don't read result after 20 minutes . To avoid confusion, discard the test device after interpreting the result.**

Results and Discussion

Distribution of typhoid fever depending on the gender.

Regarding the gender distribution the results revealed that high prevalence of disease in males 17(56.66%), but revealed low prevalence of disease in females 13(43.33). As in table (1-1).

The results of present study agreement with the results (5) recorded males had greater frequency than females, whereas disagreement with the results (8), recorded no significant difference was found in frequency of typhoid fever in males and females. And disagreement with the results (9) reported high incidence in females than males in Iraq.

Distribution of typhoid fever depending on the age groups.

According to age groups the results revealed that high incidence of disease in age group (10-20) (40%), while revealed low incidence of disease in age group (40-50) (10%). As in the table (1-1). The results in this study disagreement with the results (10) and (8) discovered that high rate of infection appears between ages (21 and 30) years.

Table (1-1)
Distribution of *Salmonella typhi* Depending on The gender and age groups.

Age (years) group	Males N.	Females N.	Total number(%)
10-20	6	6	12(40%)
20-30	5	4	9(30%)
30-40	4	2	6(20%)
40-50	2	1	3(10%)
Total	17(56.66%)	13(43.33%)	30(100%)

Result of Rapid test

10 serum samples out of 30 samples to detect *Salmonella typhi* in rapid test, the result revealed 6(60%) positive samples for IgM, whereas revealed 4(40%) positive samples for IgG.

The result in this study disagree with the result (11) estimated the diagnostic accuracy of 2 rapid antibody tests, On Site Typhoid IgG/IgM Combo and TUBEX-TF, during outbreak of typhoid fever in Harare in Zimbabwe. And disagree with the result (12) recorded the diagnostic accuracy of 3 RDTs for typhoid fever in febrile hospitalized patients in Chittagong, Bangladesh, was only moderate, the concerned results of the 3 tests ranged from (24% - 59%) with specificities of (61–96%).

Conclusions

The rapid test may be use for detection of *Salmonella typhi* during typhoid fever outbreak in Al-Diwaniyah province. As well as control on house flies (*Musca domestica*) to reduce severity of disease.

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