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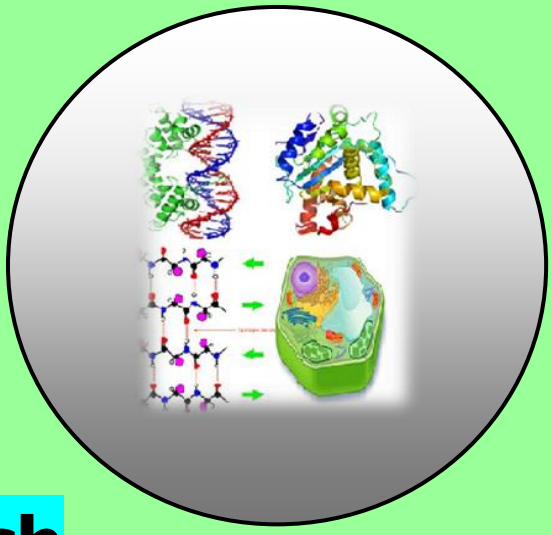
ISSN 2319-3077 Online/Electronic
ISSN 0970-4973 Print

Journal Impact Factor: 4.275
Global Impact factor of Journal: 0.876
Scientific Journals Impact Factor: 3.285
InfoBase Impact Factor: 3.66
Index Copernicus International Value
IC Value of Journal 47.86 Poland, Europe

J. Biol. Chem. Research
Volume 33 (1) 2016 Pages No. 438-444



Journal of Biological and Chemical Research

An International Peer Reviewed / Referred Journal of Life Sciences and Chemistry

Indexed, Abstracted and Cited in various International and National Scientific Databases

Published by Society for Advancement of Sciences®

J. Biol. Chem. Research. Vol. 33, No. 1: 438-444, 2016
(An International Peer Reviewed / Refereed Journal of Life Sciences and Chemistry)
Ms 33/2/16/2016

ISSN 0970-4973 (Print)
ISSN 2319-3077 (Online/Electronic)

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RESEARCH PAPER

Received: 18/04/2016 Revised: 07/05/2016 Accepted: 10/05/2016

Seroprevalence of Enteric Fever among Blood Donors in Khartoum State – Sudan

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ABSTRACT

Typhoid fever is a systemic illness with a significant morbidity and mortality in developing countries. Poor sanitation, overcrowding, low standard of living, lack of medical facilities, and indiscriminate use of antibiotics lead to endemicity of typhoid fever and multi-resistant strains of Salmonella typhi in developing countries.

The aim of this study is to determine seroprevalence of typhoid fever among blood donors attending Central Blood Bank in Khartoum State in Sudan.

The total of one hundred samples was collected from healthy blood donors in the period from September to December, 2014.

The diagnosis of typhoid fever in this study was based on Standard Agglutination Test (SAT) to determine the titer of Salmonella typhi [O] Ag and Salmonella paratyphi B [O] Ag and Typhidot Immuno-chromatography test (ICT) to screen the presence of anti-Salmonella antibodies.

Out of the collected samples, 33% were reactive sera, and non-reactive sera were 67%.

The agglutination results of typhoid fever among blood donors for salmonella typhi O Ag were significant, doubtful, insignificant and negative as 19%, 11%, 3% and 67%, respectively. Whereas for Salmonella paratyphi B Ag were significant, doubtful, insignificant and negative as 11%, 12%, 4% and 73%, respectively.

The Typhidot test showed 46 was positive sera, and all the positive sera were IgM antibody. The prevalence of disease among blood donors is a potential and dangerous source to who directly received the blood transfusions.
Key words: Enteric fever, blood donors, Typhidot, Agglutination Test and Sudan.

INTRODUCTION

Typhoid fever is an acute systemic infectious disease seen only in humans, is a classical example of enteric fever caused by *Salmonella enteric serovar typhi*. The classic presentation includes fever, malaise, diffuse abdominal pain, and diarrhea. Untreated, typhoid fever is a grueling illness that may progress to delirium, obtundation, intestinal hemorrhage, bowel perforation, and death within one month of onset (Evans and Brachman, 1989).

Blood transfusion is generally the process of receiving blood products into one's circulation intravenously (Evans and Brachman, 1989).

Two key issues have dominated discussion and research among blood transfusion scientists to date. One is the preservation of the viability of blood constituents in order to benefit patients receiving a transfusion. The other is the safety of blood and blood products for transfusion. Having succeeded in isolating the various immunological factors likely to cause adverse transfusion reactions, attention has shifted in recent years to excluding pathogens that are either blood-borne or transmitted via the donor or that are introduced during the process of preparing the blood and its products (Bove, 1990).

While efforts have been made to identify the curtail pathogens that pose a risk to the safety of the blood supply in developed countries (Hill, 2005). It appears that there is little enthusiasm among stake holders for ensuring the safety of the blood supply from infectious agents in Sudan (Brown *et al.,* 2005).

On rare occasion, blood products are contaminated with bacteria, this can result in life-threatening infection, also known as transfusion-transmitted bacterial infection. Blood product contamination, while rare, is still more common than actual infection (Evans and Brachman, 1989).

Blood contamination is more common with longer duration of storage, especially when exceeding 5 days and the sources of contaminants include the donor's blood and skin, phlebotomist's skin, and from containers (Blajchman, 2002).

Apart from some concern about HIV and HBV, which are blood-borne and can compromise the safety of the blood supply, policy-makers do not seem to be interested in screening for other blood-borne pathogens. Yet, no blood or blood product is safe until it is free from all agents that can create an untoward consequence after transfusion (Barr and Muir, 1990).

This is the reason why no effort should be spared in ensuring that all types of pathogens - viral or bacterial - are eliminated from the blood supply. Given that salmonellosis is endemic in our region, there is a potential risk of *Salmonella* spp. being transmitted via blood transfusion. Indeed, unscreened units of blood which harbor live *Salmonella* organisms or endotoxin could cause severe, possibly fatal, post-transfusion reactions (Corales and Schmitt, 2002).

Bacterial contamination of blood components is an infrequent complication of transfusion.

However, if it does occur, the potential for fulminant sepsis in the recipient is associated with high mortality. It can result from contamination during venepuncture or if an asymptomatic donor is bacteraemic at the time of donation. Symptoms occur during or shortly after transfusion of the contaminated unit and include high fever, rigors, erythema and cardiovascular collapse (Kopko and Holland, 2001).

RBCs are stored at 4℃. This makes contamination with Gram-negative bacteria such as *Yersinia enterocolitica* and *Pseudomonas* species more likely as they proliferate rapidly at this temperature. Gram-positive bacteria such as *Staphylococcus epidermidis*, *Staphylococcus aureus* and *Bacillus* species proliferate more readily at room temperature and so are more commonly seen as platelet contaminants (Kopko and Holland, 2001).

MATERIALS AND METHODS

Study design

Cross-sectional descriptive study was carried out in the period from September to December, 2014 in Central Blood Bank at Khartoum state, Sudan.

The consent was taken from healthy blood donors after been informed by the nature of the study.

Data collection

After explaining the purpose of the study, data were collected from volunteers by records; the data include age, sex and history of previous blood donation. Blood sample was collected in sterile plain container.

Laboratory work

Sample collection

Aliquots of five ml of whole venous blood were collected using sterile disposable syringes. And left to clot for one hour .The collected specimens were transported to the laboratory, centrifuged for 3000 r.p.m for five minutes and serum was separated and stored at -20°C until tested.

Widal test (Standard Agglutination Test (SAT)

All the samples were subjected to the tube agglutination test to find out exact titer of antibodies, the Widal test was done as following:

Series of serum dilutions were made for each antigen to be tested, including tubes with 0.5 ml saline for control of each antigen to be used.

Perfectly clean and dry test tubes were made and prepared dilutions beginning with 1:10 and doubling through 1:320.

0.1 ml of serum were added to 0.9 ml of physiological saline and then diluted serially by mixing 0.5 ml diluted serum with 0.5 ml saline and discarding 0.5 ml from the last tube. From specimen submitted to detect possible rise in titer, series of 10 dilutions were prepared, ending with 1:320. The prepared tubes were incubated at 37℃ for 24 hours, after incubation period observe the agglutination reaction within the tubes (Cheesbrough, 2006). Each serial dilution had been interpreted as the follow:1/20,1/40/1/80,1/160 and 1/320; negative, insignificant, doutful, significant and significant ,respectively. Positive and negative control sera were run in parallel with each performed batch. Duplicates of each tested serum were used to assure that the antigens used in the test were sensitive as well as specific (Cheesbrough, 2000).

Immunochromatography test (ICT)

This test was proceeded to confirm presences of *Salmonella* among blood donors. Commercial Typhidot ICT was used as the flowing:

After determination of titer of the Widal test, serum was added to square well, up to area A (control line), 3 drops of buffer were added to oval wells then pulled the clear plastic tab and one drop of buffer was added to square well .Finally waited for 15 minutes and read the result which were shown by color bands when there is IgM in serum against coated antigen. Pink purplish coloured lines confirm a positive test result. It was compared with positive control lines.

Data analysis

The Statistical Package for Social Sciences (SPSS 11.5) was used for statistical analysis.

RESULTS

One hundred blood donors were enrolled in this study, males were 81(81%) and females were 19 (19%).

As shown in fig.1 the reactive sera for Widal test of total sample were 33 (33%) samples and non-reactive sera for Widal test were 67 (67%) of total sample.

The titration result of Typhoid fever among blood donors for *Salmonella typhi* [O] Ag were (significant, doubtful, insignificant and negative) as 19(19%), 11(11%), 3(3%), 67(67%) respectively. The titration result of Typhoid fever among blood donors for *Salmonella* Para typhi B Ag were (significant, doubtful, insignificant and negative) as 11(11%), 12 (12%), 4 (4%) 73 (73%) respectively as shown in table 1.

This study was conducted Immunochromatography test (ICT) and the result is shows in fig.1 as: positive sera were 46(46%) and negative sera were 54 (54%). All positive reactions in Immunochromatography test (ICT) were positive for IgM antibody and there is no reaction for IgG antibody. The prevalence of recent infection of sallmonellosis among blood donors according to their age groups based on immunochromatography test (ICT) which is as following: less than 20, 20-40 and more than 40 years; 3, 27 and 16, respectively.

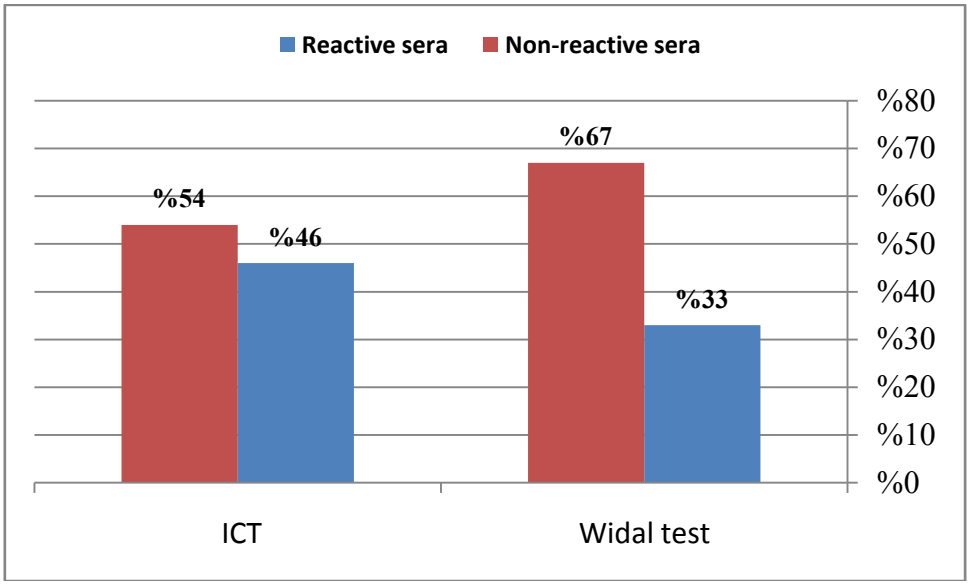

Fig 1. Reactive and non-reactive sera of Widal test and ICT for Enteric fever among blood donors.

Table 1. The Standard Agglutination Test results for *Salmonella typhi* [O]Ag and *Salmonella Paratyphi B* [O]Ag.

Result	*Salmonella typhi* [O]Ag		*Salmonella Paratyphi B* [O]Ag	
	Frequency	Percentage	Frequency	Percentage
Significant	19	19%	11	11%
Doubtful	11	11%	12	12%
Insignificant	3	3%	4	4%
Negative	67	67%	73	73%
Total	100			

DISCUSSION

This study was aimed at assessing the prevalence of *Salmonella* among blood donors in Central Blood Bank in Khartoum state in Sudan. 33% of the total donor population found to be Widal-positive in this study which is higher than that reported by Nsutebu *et al*., 2002 in Yaounde, Cameroon, who found that 10% of blood donors were showed positive result. Whereas our finding was lower than that reported by Teddy *et al*., 2010, in Nigeria, it was 53%. This variation in prevalence rate of typhoid fever may attribute to the level of hygiene in these countries.

Typhidot is a new, inexpensive, and reliable serodiagnostic test recently available commercially and studied in many endemic areas with reports of higher sensitivity and specificity in the present study, 46% of cases were positive by typhidot test (ICT). Other studies have shown higher percentage of positivity 79% (Sherwal, 2004), 78% (Narayanappa, 2008), 70% (Bhutta and Mansurali, 1999), 56% (Membrebe and Chua, 1999), otherwise, previous study that reported low percentage of typhidot 9% (Jesudason and Sivakumar, 2006).

In present study all positive results of typhidot test (ICT) were positive for IgM antibody that indicates for suffering of these patients from recent *Salmonella* infection, so blood transfusion of those patients will be very dangerous especially for immunocompromised patients.

In this study typhidot positive results were exhibited higher percentage in age group 20-40 years (27%), followed by more than 40 year (16%), and less than 20 years (3%) which is quite comparable with the study of (Balakrishna, 2010); It showed 33% of patients belong to the age group 11-20 years. 24%were in the age group of 21-30 years. 15.5% were in the age group of 31-40 year.

Actually this research is the first one was conducted in the central blood bank in Khartoum state in Sudan.

CONCLUSION AND RECOMMENDATIONS

Prevalence of disease among blood donors is a potential and dangerous source to who directly received the blood transfusions.

1- Screening of the blood of donors to detect the presence of *Salmonella* before donation is very crucial.

2- It is more gainful and easy to do screening test by Typhidot test which gives reliable, sensitive, specific and rapid results.
3- *Salmonella´s* blood bags must be avoided from donation especially immunocompromised patients or patients whose receiving immunosuppressive treatment.
4- Need attention of health institutions of the importance of *Salmonella* transfusion through blood and take the necessary actions to curb its prevalence through the blood.
5- Imperative need of specific researches on the prevalence of *Salmonella* in blood banks in Sudan.

ACKNOWLEDGEMENTS

Authors are thankful to **Dr. Yousif F. H. Elnil** for unlimited guidance and provision of grant for this research work.

REFERENCES

Balakrishna, T. (2010). A comparative study of typhidot and widal test in the diagnosis of typhoid fever. Department of microbiology. Mysore Medical College, Mysore. PP. 32.

Barr, A. and Muir W. (1990). Quality monitoring of blood and its components. *J Med User Review*; **40**: 253–6.

Bhutta, Z. and Mansurali, N. (1999). Rapid serologic diagnosis of pediatric typhoid fever in an endemic area: A prospective comparative evaluation of two DOT-enzyme immuno assays and the Widal test. *Am J Trop Med Hyg*; **61**(4): 654-7.

Blajchman, M. (2002). Incidence and significance of the bacterial contamination of blood components. *Dev Biol*; **108** (2): 59–67.

Bove, J. R. (1990). Testing in the years ahead: new pressures and new concerns. *Transfusion*; **30**: 63–7.

Brown, M.R., Fristma, M.G. and Margues, M.B. (2005). Transfusion safety: what has been done, what is still needed. *Med Lab Observ*; **37**: 20–6.

Cheesbrough, M. (2006), Medical laboratory manual for tropical countries; Cambridge university press, 2nd Ed. part 1, pp. 260-261.

Corales, R. and Schmitt, S. K. (2002). Distribution of antibodies to *Salmonella* in the sera of blood donors in the south-western region of Nigeria. *Blood transfus*; **8** (3): 163-169.

Evans, A. and Brachman, P. (1998). Bacterial Infections of Humans. *Epidemiology and Infection journal*; **121** (3): 569-577.

Hill, B. (2005). Current controversies in blood transfusion. *The Biomed Sc*.; **49**: 30.

Jesudason, M. V. and Sivakumar, S. (2006). Prospective evaluation of a rapid diagnostic test Typhidot for typhoid fever. *Ind J Med Res*; **123**: 513-6.

Kopko, P. M. and Holland, P. V. (2001). Mechanisms of severe transfusion reactions. *Transfus Clin Biol*; **8**: 278–81.

Membrebe, F. A. and Chua, J. A. (1999). The clinical utility of Typhidot in the diagnosis of Typhoid fever. *Phil J Microbiol Infect Dis*; **28** (1): 1-4.

Narayanappa, R. (2008). Comparative Study of Dot Enzyme Immunoassay (Typhidot-M) and Widal Test in the Diagnosis of Typhoid Fever. *Indian Peditric*; **47** (4): 331-333.

Nsutebu, E. F., Ndumbe, P. M. and Adiogo D. (2002). The distribution of anti-*Salmonella* antibodies in the sera of blood donors in Yaounde, Cameroon. *Trans R Soc Trop Med Hyg*; **96**: 68–9.

Sherwal, A. (2004). Comparative Study of Typhi dot and Widal test in Patients of Typhoid Fever. *JIACM*; **5** (3): 244-6.

Teddy, C. Adias, Zaccheaus, A. Jeremiah and Ayo, O. Ilesanmi (2010). Distribution of antibodies to *Salmonella* in the sera of blood donors in the south-western region of Nigeria; **8** (3): 163-169.

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