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Research Paper

PREVALENCE OF TYPHOID AND PARATYPHOID, IN RELATION TO THEIR GENOTYPE AMONG STUDENT OF NOVENA UNIVERSITY, OGUME

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Blood samples and records of patients were sourced from health centre and hospitals around Ukwani local government area as well as Novena University health clinic to assess the susceptibility to typhoid/ paratyphoid fever according to blood group system. Commercially available anti-A and anti-B blood grouping reagent as well as antigen 'O' and 'H' antigen for *Salmonellae paratyphi* A, the 'O' and 'H' antigen for *S. paratyphi* B and *Salmonellae* group antigen phase 211 for *S. typhimurium* were employed in this study. Result of the study reveals 60(60%) of the hundred (100) blood samples were infected with typhoid/ paratyphoid fevers and that 20(20%) and 50(50%) of the 100 blood samples belonged to blood group A, B, AB, and O respectively. Bacteremia was higher among females (38%) than males (22%). The highest typhoid/paratyphoid attack was observed among blood group O 46(46%) whereas the least was noticed among blood group AB individual 2 (2%). Results have revealed a possible association between ABO blood group system and susceptibility to typhoid/paratyphoid infections.

Keywords: Typhoid, Paratyphoid, Genotype, O and H antigen

INTRODUCTION

Typhoid also known as typhoid fever is a common worldwide illness, transmitted by the in ingestion of food and water contaminated with the faeces of an infected person, which contain the bacterium *Salmonella enteric enteric*, *S typhi*. The bacteria then perforate through the intestinal wall and are phagocytosed through the intestinal and are phagocytosed by macrophages. The organism is a gram negative short bacilli that is motile due to its petritrichous flagella. The bacterium grows best at 37°C / 98.6°F human body temperature. The term enteric fever is frequently used in Britain to describe typhoid and typhus (from Greek Tu□oC "stupors"). Typhoid fever was confused with typhus until the mid _ nineteenth century, when Sir William Jenner undertook the first successful definition of typhoid, clearly delineating it from typhus which is spread by lice and has differing symptoms, Karl, J. Elisabeth isolate the first causal organism for typhoid fever in 1880 thus providing the basis for

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a definitive diagnosis. It was difficult to establish a historical diagnosis prior to that time but scholars working on the history of James town Virginia (USA) believed a typhoid outbreak was responsible for the death of over 600 settlers between 1607 and 1624. In the war against South Africa in the late 19th century, Britain troops lost 13,000 men to typhoid as compare to 8000 battle deaths. The best knows earlier was (Typhoid Mary) Mary malton was a cook in oyster bay, new York in 1906 who is known to have infected 53 people of whom 5 died. After been identified as a carrier, she promise that she would never handle food again five years later after her release, she was found to have been the source 25 cases of typhoid at the women's hospital in Manhattan, until 1948 little other than support measure could be offered the typhoid patients, but with the discovery of the antibiotics chloramphenicol, mortality was markedly reduced. Drug resistance began to emerge in the early 1970's in Mexico and Vietnam, and within a few 75% of all cases, in Vietnam were resistance. In industrial countries the resistances rates are around 5% of all cases paratyphoid are a group of enteric illness caused by strain of the *bacterium Salmonellae* that caused *Paratyphi Salmonella paratyphi* A, *S. paratyphi* C (*S. hirschfeldii*). They are transmitted by means of contaminated water or food. The paratyphoid bears similarities with typhoid fever but it course is more bening, it can be caused by any of the three variations or bb serotypes of *Salmonella enteritidis paratyphi* A, B, and C it is similar in its symptom to typhoid fever but tends to be milder with a much lower case fatality rate.

Typhoid fever affects 17 million people worldwide every year, with approximately 600,000 deaths. The numbers of sporadic cases of typhoid fever remained relatively constant in the industrialized world and with the advent of prosper sanitary facilities. It has virtually been eliminated in many areas. Most cases in developed countries are imported from endemic countries. Strains resistance to chloramphenicol and other recommended antibiotics have been prevalent in severe area of the world. Multi drug resistance strains have been reported from Asian, the Middle East and Latin America. Incidence of infection varies during different period of the year. But generating high where clean suppliers are short and where there is over crowding. Infection spread through fecal_oral route from patient. There is no animal reservoir of the organism *S. typhi* carriers may either be convalescent pr chronic carriers who excrete *S. typhi* for more than a year, factors outside the house hold like clean food from vendor and flooding help distribute the disease from person to person. Because of poverty and poor hygiene and sanitary condition, the disease is more common in less industrialized principally, owing to the problem of unsafe drinking water inadequate sewage disposal and flooding occasionally causing epidemics, paratyphoid fever is found in large parts of Asian, Africa, central and south America, many of those infected get the disease in Asian countries. There are about 16 million cases a year which result in about 25,000 deaths worldwide.

Salmonella typhi can specifically only attack humans so the infection nearly always comes from contact another human either ill person, a healthy carrier of the bacterium. The bacterium is passed on with water and refrigeration but by keeping food refrigerated correctly, this maximized the production of the bacterium significantly, hence this geared toward evaluations of the prevalence of damaged that typhoid and paratyphoid have caused amonged

student of Novena University and its environment due to their mortality rate in relation to their blood groups.

OBJECTIVE OF STUDY

- To evaluate the blood groups and genotype distributed of sampled individuals.
- Source information within the research zone on typhoid and paratyphoid occurance.
- Correlate occurrence and blood group as well as genotype.

MATERIALS AND METHODS

One hundred samples of blood were collected from patient who reported for typhoid cases by veinal puncture at the health center of Novena University Ogume. The sample was put in a sterile test tubes and a drop of ethylenediamine tetra-acetate (EDTA) was added into each tube to prevent clotting before being transported to the microbiology laboratory for analysis. The samples were treated in two phases: Blood grouping and Widal test.

BLOOD GROUPING

Three drops of blood from each samples was dropped on a clean grease free white ceramic tile and to these, a drop each of the blood grouping anti sera, Anti –A, Anti – B, and Anti_D(laboratory diagnostic product limited(LDP) UK were added and mixed thoroughly by rocking to and fro 60seconds and observed for agglutination.

Agglutination of the blood with Anti [p- A indicated blood group B while agglutination with both Anti – A and Anti – B indicated blood group AB. Absence of agglutination with neither Anti –A nor Anti –B indicates blood group O. the blood group were classified further according to their reaction with Anti – D antisera for rhesus blood group which could either be positive or negative. Agglutination with Anti –D shows rhesus positivity while non agglutination shows rhesus negative.

Table 1: ABO Blood Grouping

Anti –A	Anti -B	Anti-D	Remarks
	_	+	A positive
+	_	_	A negative
+	+	_	AB negative
+	+	+	AB positive
_	+	+	B positive
_	+	_	B negative
_	_	_	O negative
_	_	+	O positive

WIDAL TEST/REACTION

Tile Method

Blood samples were centrifuged at the rate of 1000rpm for 5 minutes, after this time, the blood samples were separated into two layers in each of the test tubes with the serum on top while the red cells remain below. Using a micropipette, a drop each of the serum was placed on a clean free white tile and each drop of the specific commercially available antigen (i.e. the 'O' and 'H' for *S. typhi, the 'H'* antigens of *S. paratyphoid* A, the 'O' and 'H' antigens for *S. typhi* B and Salmonella group antigen phase 211 for *S. typhimurium* manufactured by Biosystem reagents equipments Ltd was added and mixed thoroughly by rocking for 60 seconds and observed for agglutination. Any samples which agglutinated with the *Salmonella* antigen within the time limit was said to be positive to the specific antigen. Agglutination outsides the stipulated times was regarded as false positivity.

Tube Dilution Method

This method was used to determine the patients. Eight (8) small plastic or glass test tubes were labeled and arranged on a rack and 9ml of phosphate buffered saline was dispersed into the first test tube using a calibrated pipette while 1ml of saline was dispensed each of the remaining 7 tubes. Using a micropipette 1ml of the patients undiluted serum was dispensed into the test tube containing 9ml of saline, resulting in a 10ml solution in the ratio 1:10, serial dilution of the serum in phosphate buffered saline was made. The test tube containing 1:10 dilution was mixed properly and 1ml dispensed from it into the second test – tube containing 1ml saline. This was further mixed and 1ml was subsequent taken and dispersed into third test tube. And this process is continued up to the 7^{th} test tubes resulting in 1:2, 1:40, 1:80, 1:160, 1:320, 1:640 respectively to after which 1ml was discarded from the last tube.

A drop of the antigen which the patient's serum agglutinated with was added to each test tube and then all tubes were incubated at 50°C for 2-4 hrs after which they were read and checked for agglutination. The last dilution showing visible agglutination was recorded as titer the eight tube without showing visible agglutination was recorded as titer the eight tube without serum served as control.

RESULTS

Out of the one hundred blood samples collected for typhoid and paratyphoid fever analysis. 50(50%) were blood group O and out of which 4(40%) were negative and the remaining 46(46%) were positive. Blood group AB which accounted for 20(20%) were all positive. Blood group A which was also positive all positive accounted for 20(20%). Blood group B has the lowest number of 10(10%) with 3(3%) negative and the remaining 7(7%) were positive.

In blood group A, 12(60%) were males while the remaining 8(40%) accounted for females. Out of the 20 blood group AB individuals, 14(70%) were males while 6(30%) were females. Blood group B which had 3 B^- patients turn out to be all male while the B^+ patients had 2(2%) males and 5(5%) females. Blood group O^+ which accounted for the highest number of patients had 26 females and 20males. The O^- which were 4 had 2 males and 2 females.

Due to the fact that typhoid paratyphoid fever is endemic in Novena and its environment, individual are expected to have quite a high level of its antibodies in their immune system. For this study, any titer below 1:160 was regarded as insignificant or negative while those fro above

Table 2: ABO Blood Groups Distribution Between Sexes of Adults

Blood Groups	Males (%)	Female (%)	Total (%)	Rhesus Factor
A	12(60)	8(40)	20(20)	A^+ 12 Males 8 Females
B	14(70)	6(30)	20(20)	Ab^+14 Males 6 Females
O	22(44)	28(56)	50(50)	4 O^- 2 Males 2 Females 46 O^+ 26 Males 26 Females
B	5(50)	5(50)	10(10)	3 B^- (Males) 7 B^+ 2 Males 5 Females
Total	53	47	100(100)	100

1:160 were regarded as positive or significant. Out of the one hundred (1000 blood samples tested, 60(60%) tested positive while 40(40%) tested negative according to the stipulated titer. Of the 60 positive samples, 46(76%) were blood group O, 7(11.6%) were blood group A, blood group B accounted for 5(8.3%) while blood group AB accounted for the least number of 2(3.3%). Out of the 40 negative Widal reactions, 4(10%) was blood group O, 13(28.5%) belonged to blood group A, 5(12.5) were blood group while 18(45%) were blood group AB.

Of the 46 widal positive blood group O persons, 28 were females while 18 were males. Out of the 7 positive A blood group 5, were females while AB blood group had 2 positive which were both males, for the negative widal test, blood group O had 4 which were all males, A had 13 with 3 females and 10 males, B had 5 which were all males while AB had 18 with 6 females and 12 males.

DISCUSSION

This result was in agreement with the report of Mourant (1983) which says that in the tissues, both normal and neoplastic of all persons, there are blood groups ABO like antigen which are usually inaccessible to the immune system. However, in the cause of an immune process or of the immune response to a growing or developing disease, Infections of the antigen become accessible. Then an O blood group person who do not have antigen, Then an O blood group person who do not have antigens A or B in its red cell will be more likely than any other blood group person to tolerate the typhoid /paratyphoid

Table 3: Widal Reactions and Corresponding Blood Groups (Baseline Titer > 1:160)

Blood Groups	Positive Widal Reaction According To Sex (%)	Negative Widal Reaction According To Sex (%)	Total (%)
A	7(5 Feales 2 Males) (11.6)	13 (3 Females 10 Males) (32.5)	20(20)
B	5(females) (8.3)	5 Males) (12.5)	10(10)
Ab	2(males) (3.3)	18 (6 Females 12 Males) (45)	20(20)
O	46(28 Females 18 Males) (76.6)	4 (Males) (10)	50(50)
Total	60(60)	40(40)	100(100)

Table 4: Widal Reactions and Corresponding Blood Groups and Sexes

Blood Group	Positive Widal Reaction (%)		Negative Widal Reaction (%)		Total (%)
	Females (%)	Males (%)	Females (%)	Males (%)	
A	5(5)	2(2)	3(3)	10(10)	20(20)
B	5(5)	_	_	5(5)	10(10)
Ab	_	2(2)	6(6)	12(12)	20(20)
O	28(28)	18(18)	_	4(4)	50(50)
Total	**38(38)**	**22(22)**	**9(9)**	**31(31)**	**100(100)**

infections since Salmonella paratyphoid A, B, C and typhi D are antigens which contain the antibodies A and B like blood group O individuals. Other blood groups are more likely to attack to attack their own tissues than blood group O persons. (Mourant,1983). The study also revealed higher susceptibility of female 38(38%) to typhoid/ paratyphoid infections than males 22(22%) with respect to the different blood groups. Although there are no known explanation factors presently to this observation, it has been suggested by Agbonlahor *et al*., 1993. That genetic factor could be on display by endowing males with immune regulatory potential to cope better with some disease state.

SUMMARY AND CONCLUSION

The data obtained from this research serves as a preliminary guide to the association of human ABO blood groups with typhoid/paratyphoid cases distributed within Novena and its environment. Among the 100 patients examined 53 were males while 47 were females, blood group AB predictably had the least occurrence of 2. Findings have revealed the highest and least susceptibility of blood group O (46%) and AB (2%) to typhoid / paratyphoid infection among individual in novena. Consequently, results obtained were expected to serve as background information for future studies on ABO status and susceptibility to typhoid/ paratyphoid bacteremia in this part of the world.

RECOMMENDATION

Based on the finding of this study, I will advice the following recommendations;

- Proper cooking of food to avoid contamination.
- Proper personal hygiene.
- Milk and other dairy product should be well pasteurized, and properly.
- Make sure that can food are well packed to avoid contaminations.
- Educate people on how to avoid typhoid and paratyphoid.

REFERENCES

1. Agbonlahor D E, Aghahona M O, Idukpaye O, Agbonlahor F E, Ekundayor A O, Emole F E, Osunde M C, Omoregie R, Onyemelukwu N F, and Okara G C (1997), "Baseline Typhoid Antibody Levels in Apparently Healthy Nigerians", *Nig. Quart Hosp. Med,* No. 3, pp. 242-245.
2. Alheya B H and Corniell L L (1967), "Relations of Blood Groups to Infection"*, A M Epidemiol,* Vol. 86, No. 2, pp. 525-45.
3. Alstead S and Girwood R H (1984), *Infectious Diseases: Textbook of Medical Treatment,* 14th Edition, Longmans Singapore Publication, pp. 7-9, Singapore.
4. Anderson J R (1985), *Alimentary Tract Muri's Textbook of Pathology,* 12th Edition, Edward Arnold Education Academic and Medical Publication Co. Bedford Square, pp. 1944-1945, London.
5. Anyiwo C E (1994), "Immunology of Typhoid: Facts and Farce. A Seminar Paper presented on the Occasion of the Annual lecture Dinner to the Nigerian Society for Immunology"*,* pp. 2-4.
6. Berkolo R, Fletcher A J and Chir M B B (1992), *Bacterial Dieases, The Merck Manual of Diagnosis and Therapy,* 16th Editio9n, Merck Research Laboraories, pp. 102-105, Rahway New Jersey.

7. Boomsma L J (1988), "Clinical Aspect of Typhoid Fever in Two Rural Nigeria's Hospitals, Prospective Studies", *Trop Geograph Med*., Vol. 40, pp. 97-102.

8. Boyed W C (1982), "New Concepts of Human Race Suggested by Blood Group Studied", *J. Nat Med. Association*, Vol. 44: pp. 1-6.

9. Cheese Brough M (1994), *Salmonella in Medical Laboratory Manual for Tropical Countries 2: Microbiology Butter Root,* Heinemann Ltd., pp. 257-260, Oxford.

10. Chikwe I O, Gashua W and Mohammed T (1993), "Determination by Widal Agglutination of the Baselline Titre for the Daignosis of Typhoid Fever in Two Nigerian States", *Scandon J Immuno*, Vol. 36, No. 11, pp. 153-156.

11. Cleggs A G and Cleggs P C (1982), "Typhoid and Paratyphoid Fever in Man Against Diseases", *Heinemann Educational Book Ltd. Bedford Square*, pp. 140-142, London.

12. Daid B D, Dulbecco R, Eisen H N and Ginsberg S H (1990), *Enterobacteriacece in Microbiology*, 4th Edition, J B Uppincott Company, Blood Groups, *J. Path Bact.,* Vol. 54, pp. 514-516.

13. Descatello A U and Sturch A (1992), "Frequency of Isoagglutinnin in Serum of Blood Groups", *J. Path Bact*., Vol. 54, pp. 514-516.

14. Frobisher M, Hinsdill R D, Gabtree K T and Good Heart G R (1974), *Enterobacterraceae and Regulated Organisms*, 9th Edition, S B Saunders Company, pp. 509-510, Philadelphia.

15. Govan A D T, Macfarlane P S and Calander R (1986), *Typhoid Fever in Pathology Illustrated,* 2nd Edition, pp. 411-413, Churchill Livingston, Edinburgh.

16. Jawetz E D, Melnick J, Adelberg A *et al*., (1995), *Enteric Gram-Negative Rods (Enterobacteriace) in Medical Microbiology* 20th Edition, Brooks G F Butel. J S and Omoton N I, Appleton and Lange, Standford, Connecticut, pp. 274-217.

17. Olubuyide J O (1992), *Typhoid Fever in the Tropics Postgrad Doc Afri.,* Vol. 14, No. 2, pp. 37-41.

18. Jawertz E, Melnick J, Adelberg A et al. (1998), "Enteria Gram-negative Rods (Enterobacterraeae)", in *Medical Microbiology,* 21st Edition, Brooks G F., Furel J S and Morse A S, Appleton and Lange, Stanford, Connecticut, pp. 7-13.

19. Koneman E W, Allen S O, Janda M W and Shrekenberger P C and Winn C W (1992), *The Enterobacteriacease in: Colour Atlas and Textbook of Diagnostic Microbiology,* 4th Edition, J B Lippineoff Company, pp. 7-13, Philadelphia.

20. Laurence D R and Bennet P N (1993), *Typhoid Fever in: Clinical Pharmacology,* 7th Edition, Longman, Singapore Publishers, pp. 49-50.

21. Loveday J (1991), "Infectious Diseases in Davie's Medical Terminology", *A Guide Current Usage,* 5th Edition, Butferroot – Heineman, Oxford, p. 43.

22. Mourant A E (1983), *Blood Relations, Blood Group and Anthropology,* Oxford Scientific Publication, pp. 10-20, London.

23. Murray P R, Bacon E J O, Pataller M A, Tenovier F C and Tolken R H (1995), *Escheridnia, Salmonella and Yersinia in Manual of Microbiology* 6th Edition, ASM Press, Washington DC.

24. Pang T (1990), "The Laboratory Diagnosis of Typhoid Fever, Current Statutes and Future Trends", *Postgrad Doc Afri.*, Vol. 12, No. 1, pp. 3-6.

25. Parker M T and Collier L H (1984), *Enterrc Infections Typhoid and Paratyphoid Fever. In Topley and Wilson's Principles of Bacteriology Vinology and Immunity,* 8th Edtion, Vol. 3, pp. 424-442

26. Race R R and Sanger R (1975), *The ABO Blood Groups in: Blood Groups in Man,* 6th Edition, Black Well Scientific Publication, pp. 3-17, Oxford.

27. Sack B and Sack D A (1992), *Immunologic method for the Diagnosis of Infection by Enteriobacteraceae and Vibronaceae. In: Manual of Clinical Laboratory and Immunology,* 4th Edition, Rose N R, Conway De Maccand E, Fashe H, Friedman H and Penn G M, American Society of Microbiology, pp. 482-484.

28. Saxena S N and Sen R (1996), "Salmonella Paratyphi an Infection in India – Incidence and Phage Types", *Tans R. Soc. Trop Med Hyg*., Vol. 603, pp. 409-411.

29. Smith G R (1982), *Enteric Infection: Typhoid and paratyphoid Fever*, in Wilson G, Miles A, Parker M I (Eds.), *Principles of Bacteriology. Vonology and Immunity,* 7th Edition, Vol. 3, Edward Arnold Ltd., pp. 407-33, London.

30. Smith A L (1980), *Enteric Bacilli., in Microbiology and Pathology,* 12th Edition, C V Mosby Company, pp. 224-227, London.