

CARRIER RATE OF TYPHOID ORGAISMS IN ENUGU, NIGERIA

Abstract

Objective: To determine the carrier rate of typhoid and paratyphoid organisms in Enugu community.

Design: The Study was planned to investigate the carrier rate over a one year period.

Setting: All the specimens (blood, urine and stool) came from students, traders and civil servants in Enugu and were cultured in Medical Microbiology Laboratory of University of Nigeria Teaching Hospital, Enugu.

Subjects: Ninety-six apparently healthy adults (48 males and 48 females without any complaints were selected for the study.

Outcome Measures: All the stool and urine specimens were subjected to standard bacteriological culture for enteric organisms.

Results: *Salmonella typhi* was isolated from the stool of two (2.08%) of the candidates while *S. paratyphi* was recovered from the stool of another individual (1.04%) of the study group. No candidate gave Widal titre greater than 40 to 'O' agglutinin which is statistically significant (Anova F value 597.7, P value <0.0001). Only Two Candidates positive for *S typhi* culture gave titre of 160 to 'H' antigen, also Statistically significant (Anova F value 1195, P value <0.0001).

Keywords: Typhoid carrier, Bacteriology, Widal test

Introduction

Infection with Salmonella organisms remain a world-wide problem. *Salmonella typhi* is a serious source of illness primarily in the developing world, with over 12.5 million cases estimated outside China in 1980¹. Salmonellosis is generally acquired through contaminated food and water, although cross contamination occur in hospitals and institutions². Nearly 50% of determined outbreaks are caused by poultry and poultry

products. Typhoid fever remains an important public health problem with more than half million deaths occurring throughout the developing world³. In Nigeria, up to 30 percent of the patients admitted may die from the infection³. A factor of epidemiologic importance is the asymptomatic human carrier state (chronic carrier and temporary excreter), which exist for the agents of typhoidal and non-typhoidal salmonellosis.⁴ Approximately, 3 % of persons infected with *S.typhi* and 0.1% of those infected with non-typhoidal salmonellae become chronic carriers which can last from many weeks to years. In chronic typhoid carriers, persistent carriage of very large numbers of organisms is usual- 10^6 - 10^8 organisms/g of faeces.⁵ Children rarely become chronic typhoid carriers⁴. The chronic carrier state is defined as documented excretion of *S.typhi* in stool or urine for a year or more⁵. About one third of the chronic carriers give no history consistent with typhoid fever and the incidence is higher in older patients and more in women.⁶ Underlying biliary or urinary tract diseases, especially with stone formation, increase the probability of the chronic enteric or urinary carrier states in patients with typhoid fever⁵. In Nigeria typhoid fever patients are diagnosed on the basis of clinical symptoms and a single Widal test⁷. Bacteriologic culture is seldom done. Vi agglutinins are found in the serum of some 85% of chronic carriers at a titre of 5 or more.⁸ The measurement of antibodies to Vi antigen by haemagglutination test and by EIA can detect chronic *S.typhi* carriers if bacteriologic culture cannot be done⁸. Vaccines against typhoid are available the parenteral vi capsular polysaccharide and the oral live whole-cell *Salmonella typhi* 21a vaccine that provide similar levels of protection.⁹ The response to Ty21a vaccine was found to imitate that in natural infection.¹⁰ Worldwide, non-typhoid salmonella (NTS) create a huge public health concern with 155000 deaths and over 90 million cases annually.¹¹ They are known for their emerging antimicrobial resistance and there are no vaccines against them. The 21a vaccine elicits a higher immune response cross-reactive with several NTS strains and is at the forefront as a surrogate vaccine.¹¹ There is little report of typhoid carrier rate in Enugu Nigeria. This study aims to determine the carrier rate in this community.

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65 **Materials and Methods**

66 Ninety-six apparently healthy adults (48 males and 48 females) without any
67 complaints during the period of study, were selected for the study. In the group were
68 traders, students and civil servants in Enugu. Blood, urine and stool samples were
69 collected from the candidates. Stool and urine specimens were inoculated onto
70 appropriate bacteriologic agars (MacConkey and Deoxycholate agars) before and after
71 enrichment in selenit-F broth (1gm or 1ml of stool). Subcultures of stool and urine were
72 plated onto MacConkey and Deoxycholate agars. Urine samples were additionally
73 inoculated on Cystein Lactose Electrolyte Deficient (CLED) agar. The resulting suspect
74 colony growths were examined for salmonella by standard methods¹². Widal
75 agglutination tests were done on the sera resulting from the blood samples. The
76 procedure used was the standard tube dilution method of Freter¹³ with salmonella
77 antigens prepared by Gama Biological.

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80 **Results**

81 All the 96 candidates were screened for typhoid and other enteric fever
82 organisms. *Salmonella typhi* was isolated from the stool of two (2.08%) of the
83 candidates, while *Salmonella paratyphi C* was recovered from the stool of another
84 individual (1.04%) of the study group(table 1). With regards to Widal test, none of them
85 gave a titre greater than 40 for 'O' agglutinin which is statistically significant (Anova test
86 F value 597.7, P value <0.0001). The two from whom *S. typhi* was recovered, gave titre
87 of 160 against 'H' antigen also statistically significant (Anova F value 1195, P value
88 <0.0001) see (table 2). The two typhoid isolates came from females while the paratyphi
89 organism came from a male. Repeat stool cultures from the three culture positive
90 individuals gave similar results after a period of six and twelve months, confirming that
91 they are carriers.

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96 **Discussion**

97 From the results typhoid organisms were recovered from three apparently healthy
98 individuals, even on repeat cultures. The study group were considered healthy since they
99 gave no complaints. The rate of 2.1 percent should be considered the typhoid carrier rate
100 in Enugu. Also 1.0 percent should be taken as the paratyphi salmonella carrier rate.

101 Typhoid, an illness caused by Salmonella enteric serovar typhi is common
102 worldwide; it is transmitted by the ingestion of food or water contaminated with faeces
103 from an infected person⁴. When untreated (Azithromycin and fluoroquinolone are drugs
104 suggested for treatment), typhoid fever persists for three weeks to a month¹⁴. Death
105 occurs in between 10% and 47% of untreated cases¹⁵. A person may become an
106 asymptomatic carrier of typhoid fever, suffering no symptoms, but capable of infecting
107 others. Approximately 5% of people who contract typhoid continue to carry the
108 causative organism after they recover (like Mary Mallon-typhod Mary)¹⁶. With an
109 estimated 16-33 million cases annually resulting in half a million deaths, typhoid is
110 identified as a serious public health problem. Some patients come to the clinic with
111 typhoid “certificates” as evidenced by their previous positive laboratory Widal results.⁷
112 This can contribute to over diagnosis of typhoid.⁷ Due to improved surgery and
113 supportive care in some countries, median case fatality rate (CFR) for typhoid perforation
114 (TP) declined from over 50% in 1960 to single digits in the last decade but West Africa
115 lags behind at 16%.¹⁷ There is mounting evidence of the association between
116 hepatobilliary cancer and typhoid carrier state.^{18,19} Though some regard Kathmandu,
117 Nepal as the enteric fever capital of the world²⁰, the global burden of typhoid fever is not
118 in doubt.²¹ Public health education campaigns encouraging people to wash their hands
119 after defecating and before handling food are an important component in controlling
120 spread of the disease. Control of carriers can be further done through encouraging them
121 to submit to chemotherapy or be considered for cholecystectomy.¹⁹ It is recommended
122 that health authorities should keep a register of typhoid and paratyphoid carriers. The
123 carriers themselves should be kept under “surveillance” by local health officers who
124 should ensure that the sewage from their dwellings is safely disposed of, give them
125 appropriate instructions in personal hygiene and encourage them not to take employment

in food or water industry. However workers in the food or water industry should be individually examined bacteriologically or culture of sewage effluent of large food factories can be done as an alternative to the examination of individual faecal specimen.²¹ Chlorination of drinking water, adequate treatment and vaccination against the disease has led to dramatic decreases in the transmission of typhoid fever in the U.S²². Both paratyphi A and B have no vaccine in clinical use though contentiously Ty 21a-vaccine have been suggested and there is a growing problem of antibiotic resistance among the strains.²³ Strains of *Salmonella enteric* sub sp enteric are amongst the most commonly identified invasive bacterial pathogens in resource-poor settings, and cause significant mortality, particularly in children. But neither of the two available vaccines can be used in infants. Interestingly, Vi conjugate vaccines should offer children excellent protection from typhoid.²⁴ There is evidence that Ty21a vaccine may have cross-protective efficacy against numerous non typhoidal *Salmonella enteritidis* and typhimurium.⁹ Greater effort must be placed on the development of next generation vaccines to address the disease burden resulting from typhi, paratyphi A and non typhoidal *Salmonella* NTS infectious.²⁵ Policy-makers therefore should introduce preventive interventions against typhoid, including vaccination.²⁶

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TABLE 1 Isolation rate, age range and sex distribution of the individuals culture
positive for enteric fever organisms(%)

Sex	<i>S. typhi</i>	<i>S. paratyhi C</i>	<i>Age</i>
Male	0(0)	1 (1.04)	27
Female	2(2.08)	O (0)	30 – 32

277 **TABLE 2**

278 **Widal Test for (96) Healthy Normal Individuals**

ANTIGENS		Titre						
		< 20	20	40	80	160	320	640
‘O’ Antigen	{DO (<i>S. Typhi</i>)	96	0	0	0	0	0	0
	{aO <i>S. paratyphi</i> A	96	0	0	0	0	0	0
	{bO <i>S. Paratyphi</i> B	86	2	8	0	0	0	0
	{cO <i>S. paratyphi</i> C	86	3	7	0	0	0	0
H’ Antigen	{DH	87	7	0	0	2	0	0
	{aH	96	0	0	0	0	0	0
	{bH	95	1	0	0	0	0	0
	{cH	95	1	0	0	0	0	0

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