The Prevalence of Symptomatic Typhoid in Obanliku Local Government Area of Cross River State, Nigeria

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Abstract

This study was designed to investigate the prevalence of symptomatic typhoid in Obanliku Local Government Area of Cross River State, Nigeria. The study also investigated the influence of gender and ABO blood group on the prevalence of symptomatic typhoid. The cross-sectional survey design was employed. Four hundred and two (402) people of both sexes and all ages were randomly selected by the multistage sampling technique. To determine whether one was suffering from typhoid, the subjects were observed for signs and symptoms of typhoid fever. Stool samples of the subjects were obtained and cultured on Salmonella Shigella (SS) Agar and observed after 12 and 24 hours. Subjects whose stool samples developed colourless colonies with black centers on the SS agar were taken as positive for Salmonella while those that did not grow colourless colonies with black centers were taken as negative. The combined result of the observations for signs and symptoms as well as the stool culture result were used to determine whether one was sick of typhoid or not. The ABO blood groups of the subjects were determined using the ABO anti-sera. The prevalence of typhoid fever was determined using percentages while the influence of gender and blood group was determined using chi-square. Results obtained indicated that: 43.5% of the people of Obanliku are suffering from typhoid fever; gender does not influence the prevalence of typhoid fever ($P>0.05$); blood group significantly influences the prevalence of typhoid fever with group O being the highest (66.3%) and group AB the least (4.4%). Among the recommendations made is that Mass and aggressive campaigns should be carried out among the communities on personal and environmental hygiene in order to reduce the spread of typhoid. Government should mobilize for the identification and treatment of both symptomatic and asymptomatic typhoid cases to reduce the burden of typhoid.

Key Words: Prevalence, symptomatic, typhoid, Salmonella

1 INTRODUCTION

"Typhoid fever is an acute illness characterized by fever caused by infection with the bacterium Salmonella typhi". "It has an insidious onset with fever, headache, constipation, malaise, chills, and muscle pain. Diarrhea is uncommon and vomiting is not usually severe [1]. The symptoms of typhoid fever include sustained fever; malaise; loss of appetite; constipation; (which is more common than diarrhea in adults); and rose spots on trunk. In severe cases, confusion, delirium and intestinal perforation as well as death may occur in delayed treatment. Other symptoms include headache, abdominal pain and anorexia. Etta [2, includes digestive problems, high fever all day, and vomiting as symptoms. There are however, no specific symptoms and signs, which makes it difficult to clinically diagnose typhoid fever [3].

According to Agarwal et al. [3], statistics show an average of more than 300,000 cases each year in India. For instance, there were 329,499 cases in 1995 with 672 deaths. According to the best global estimates, there are at least 16 million new cases of typhoid fever each year, with 600,000 deaths" [3]. Typhoid is one of the most wide spread of all bacterial diseases in the world and remains a public health problem, causing about 16 million cases of disease and about 600,000 deaths annually [4]. Consequently, the Maryland Department of Health and Mental Hygiene (MDHMH) [5] reports that WHO has identified "typhoid as a serious public health problem.

Typhoid fever is transmitted usually, by the ingestion of food or water contaminated with the faeces of an infected person, which contain the bacterium Salmonella enterica enterica Serovar Typhi [6]. Flying insects feeding on faeces may occasionally transfer the bacteria through poor hygiene habits and public sanitation conditions.

In 2012, Ighoro, Osazuwa, Ajayi, Ebueku and Igbinigie [7] found from their study on the"Dual Infection with Typhoid and malaria in Febrile patients in Ikare-Akoko in Western Nigeria" that 173 out of 234 patients (73.9%) were suffering from typhoid fever. In south-Sulawesi, Valli et al. [4] report that typhoid is the most common cause of community-acquired septicemia with incidence rate exceeding 2500/100000 in many districts.

Umeh and Agbulu [8] aver, "the distribution pattern of the infections seems uncertain in Nigeria and appears to show geographical variation". For instance, "Some studies found that enteric fevers are more prevalent in males than

in females". Dewan et al. [9] reported that in Bangladesh, the male to female ratio of incidence of typhoid fever was 1:36. In other words, "typhoid incidence was high in female population than male ($X2 = 5.88$, $P<0.05$)". Otoikhian and Okoror [10] also report their own study where they found out that typhoid fever was higher among females (38%) than males (22%)". However, Umeh and Agbulu [8], in their own study in Benue state, found out that "The percentage occurrence in both sexes did not differ significantly". All reports were based on the titre of salmonella antibodies to the H and O antigens. D'Adamo [11] however avers that blood group B antigens tend to protect women against typhoid, while increasing the susceptibility of men.

In 2012, Otoikhian and Okoror [10] studied the prevalence of typhoid and parayphoid in relation to blood group among students of Novena University, Ogume, using the Widal test. They found out that of the 100 students observed, 60 (60%) were positive against 40 (40%) that were negative. Of the 60 that were positive, 46(76%) were of blood group O, while 7 (11.6%) were of group A. Blood group B that were positive were 5 (8.3%) while group AB students that were positive were only 2 (3.3%). They concluded that individuals with group O were most susceptible to typhoid and paratyphoid while group AB was the least susceptible. Adias et al. [12] also reported their own findings which indicated that 64.2% of the O Rh-positive individuals and 58.7% A Rh-positive individuals were Widal-positive. The lowest proportion of Widal-positive cases was observed in the B Rh-positive group (26.7%). The observed p-value ($p<0.05$) shows that blood group had a significant impact on Widal reaction in the donors. In his study in various districts of Uzbekistan with typhoid fever cases, D'Adamo [11] found out that people with A group were more infected than group O ($P<0.05$). He therefore suggests the possibility of correlative mechanisms between the blood type and typhoid infection.

This study was designed to investigate the prevalence of symptomatic typhoid in Obanliku Local Government Area of Cross River State, Nigeria. The prevalence was compared between gender as well as ABO blood group.

2. Materials and Methods:

2.1 Study Area: This study was carried out in Obanliku Local Government Area of Cross River State, bounded in the North by Kwande L.G.A of Benue state, in the east by the Republic of Cameroon, in the west by Obudu and in the south by Boki L.G.A all of Cross River state. Obanliku L.G.A comprises 10 council wards, each ward made of a number of villages.

The weather condition in the area is generally divided into 2 seasons: the rainy season, which typically begins to set in around April/May, becomes intense around July through September, and fades out in October/November. The dry season begins in November, and spans through March.

The people are mostly peasant farmers of crops such as cassava and yam. They live mostly in houses that resemble huts. A single house may house a family of 10 or above (man, wife, children, and other relations). Toilet facilities are hardly provided. Refuse disposal is not usually a problem as there are enough bushes around every home to dump the refuse.

Water supply is a major problem in most settlements, especially around January to May when most small streams and springs would have dried up. There is no pipe-borne water supply, no government agency for treatment and distribution of portable water. There are few bore holes scattered here and there, but some also dry up in the heart of dry season while some are non-functional.

2.2 Study Design: The research design employed for this study was the quantitative cross-sectional descriptive survey. A single examination of a cross-section of the people of Obanliku was carried out. This design was preferred since there was no control group. The design, according to Cloe [13], best suits the study on prevalence as this one.

2.3 Study Population: The population for the study comprised all the people of Obanliku, estimated to be about 103,000 (about 57,750 of which are females and 45250 males) (NPC, 2006). All categories of the people (children, adults, men, and women) formed the population for this study.

2.4 Study Sample: Due to the impossibility of dealing with the entire population, a sample (or subset) of the population was used. Four hundred and two (402) people were selected from the population using the multistage sampling technique.

2.5 Materials: The materials used for this study included:

Typhoid Status by Symptoms and Stool Culture Results Pro-forma;

Materials for isolation of Salmonella from stool;

Anti-sera for determination of ABO blood group.

Methods:

Data on signs and symptoms were obtained by interview and observation of the selected subjects. The subjects were asked questions, and observed for presence (or absence) of signs and symptoms such as loss of appetite, constipation, headache, cough, abdominal pain, malaise, lethargy (tiredness, physical slowness, mental dullness, and lack of energy); diarrhea, coated tongue etc.

The data on stool culture involved the culturing of stool samples collected from the selected subjects in SS

(Salmonella Shigella) Agar plates. This medium was preferred because of the assertion of conda [14] that it is a selective and differential medium widely used in sanitary bacteriology to isolate Salmonella and Shigella from feces, urine and fresh and canned foods. The culture medium (SS Agar) was prepared according to the manufacturer's instructions as follows:

Sixty grams (60g) of the medium were suspended in one liter of purified water. The suspension was heated with frequent agitation and boiled for one minute to completely dissolve the medium. According to the manufacturer, no autoclaving was done [14]. The medium was allowed to cool to 45-500C and then dispensed into sterile Petri dishes and allowed to set. The medium was prepared and used the same day. After solidification, the plates were packed carefully and transported to the areas where stool samples were to be collected.

Each plate was divided into four quarters and a specimen from an individual streaked using a wire loop on one quarter of the plate. The plates were transported to the Sacred Heart Hospital the same day, and incubated at 350c. They were observed after 12 hours and 24 hours.

Colonies that were colourless with black centers were identified as Salmonella. These were confirmed by slide agglutination with Salmonella antisera. Colonies that showed agglutination were confirmed as Salmonella.

The result was entered in the Column for "stool culture result" of the "Typhoid Status by Symptoms and Stool Culture Results Pro-forma".

The data on ABO blood group was collected by mixing a drop of the respective anti-serum (A, B, and C) with a drop of the subject's blood on a white tile and steered gently. Coagulation of the blood with anti-A or B was taken as blood group A or B respectively, while coagulation with both was taken as group AB. Non-coagulation with neither of A nor B was taken as group O. Coagulation with anti-D was taken as Rh positive and vice-versa.

This test was conducted in order to find out if incidence of symptomatic and asymptomatic typhoid is influenced by blood group.

2.6 Method of Data Analysis: The data collected were analyzed using percentages to determine prevalence while Chi square was used to determine influence of gender and blood group on symptomatic typhoid. All subjects whose stools were positive for Salmonella colonies but showed no corresponding signs and symptoms were regarded as not symptomatic (not sick). Those who tested positive and have corresponding signs/symptoms were grouped as symptomatic.

3. Results:

3.1 Prevalence of symptomatic typhoid in Obanliku

To determine the prevalence of symptomatic typhoid, percentages were used and the result is as shown below.

Table 1: **The prevalence of Symptomatic Typhoid in Obanliku Local Government Area.**

Number Observed	**Sick**		**Not Sick**		**Total**	
	N	percentage	N	Percentage	N	Percentage
402	175	43.5	227	56.5	402	100

From the results obtained, 175 people out of the 402 observed (43.5%) were sick of typhoid fever (representing 435 in every 1000 people). These were those who had clinical manifestations of typhoid fever and also tested positive by the stool culture on SS agar. The remaining 227 (56.5%) were not sick of typhoid. They might have manifested some signs of typhoid but if they tested negative by the stool culture, they were regarded as not sick of typhoid.

This result seems far lower than the report of Ighoro et al.[7] obtained from Ikare-Akoko where they found that 73.9% of the people observed were sick of typhoid fever. This is likely due to two reasons:

This study employed the culturing of stool samples to determine whether one was sick of typhoid or not, which, according to Agarwal et al. [3], is the definitive diagnosis of typhoid fever. On the other hand, Ighoro et al. [7] used the widal test, a technique commonly employed in hospitals for the diagnosis of typhoid though believed to be prone to giving false positives due to cross reaction of the antigen with other antibodies, especially in areas where typhoid is endemic [15].

While this study was a cross-sectional survey on the population of Obanliku, the study in Ikare-Akoko was on people that were already sick and had visited the hospital. In other words, the people observed did not quite represent the population.

3.2 Influence of Gender on the Prevalence of Symptomatic typhoid: To find out whether gender significantly

influences symptomatic typhoid, chi-square was used to analyse the data and the result is as shown in table 2.

Table 2: Prevalence of symptomatic typhoid by gender.

	Status	Male	Female	Total	X^2
Symptomatic typhoid	Sick	83 (77.9)	92 (97.1)	175	
	Not sick	96 (101.1)	131 (125.9)	227	
					1.056
	Total	179	223	402	

The results from the table indicate that out of the 175 subjects that were sick of typhoid, 83 were males and 92 were females. This distribution, when compared with the expected, the difference was not significant at 0.05 alpha level. This means that gender does not influence the prevalence of typhoid fever (P>0.05).

The result of this study indicated that gender does not influence the prevalence of symptomatic typhoid (typhoid fever) (P>0.05). This is at variance with the reports of Dewan *et al.* [9] as well as Otoikhian and Okoror [10]. Both studies reported a significantly higher incidence of typhoid fever in female than in male populations. It also differs from the report of Ighoro *et al.* [7] that typhoid was more common in males than in female. The result however agrees with that reported by Umeh and Agbulu [8] in their work carried out in Okpokwu L. G. A. of Benue state where they found out that "the percentage occurrence of typhoid in both sexes did not differ significantly.

3.3 Influence of ABO blood group on the prevalence of symptomatic typhoid. To determine the influence of ABO blood group on the prevalence of symptomatic typhoid, the data collected were analysed using chi-square. The result is as shown in table 4 below.

Table 3: Prevalence of Symptomatic Typhoid by Blood Group.

	Status	A	B	AB	O	Total	X^2
Symptomatic typhoid	Sick	22(36.6)	31(31.8)	6(7.4)	116(99.3)	175	(p<0.05)
	Not sick	62(47.4)	42(41.2)	11(9.6)	112(128.7)	227	
	Total	84	73	17	228	402	15.79*

The result from the table above shows that out of the 175 subjects that were sick of typhoid, 22 (12.6%) were of blood group A, 31 (17.7%) group B, 6 (4.4%) group AB and 116 (66.3%) group O. These differences, when tested using chi- square were found to be significant at 0.05 alpha level. This implies that blood group significantly influences the prevalence of typhoid fever. To determine the strength of the relationship between blood group and symptomatic typhoid, the Cramer' "V" was used. The value was 0.198 (P<0.05), implying that there is a strong relationship between the two variables, with group "O" being the highest (66.3%) and group "AB" the least (4.4%). This agrees with the result of Otoikhia and Okoror [10] that blood group significantly influences the prevalence of typhoid fever with individuals of group "O" being most susceptible to typhoid and paratyphoid (76%), and group AB being the least 3.3%). It also agrees with the work of Adias et al. [12] that blood group O is the most susceptible to typhoid fever, though differs in terms of the least susceptible. They reported that group B is the least, instead of AB. This result also varies with the report of D'Adamo [11] from his study in Uzbekistan that people with A group were more infected than group O (P<0.05), and suggests the possibility of correlative mechanisms between the blood type and typhoid infection. This influence of blood group may be explained from the point of view of www.yourbtdiet.com/health/blood-group-and-susceptibility-to-disease/ [16] that there are some antigens of certain pathogens that are similar to the human blood antigens. This makes it difficult for such individuals to immediately recognize the "foreign antigen" and respond to it. Thus, they are likely to come down with the signs and symptoms

than other blood types.

4 Conclusion:

Based on the findings of this study, it can be concluded that:

There is high prevalence of typhoid fever (symptomatic typhoid) in Obanliku Local Government Area of Cross River State (43.5% of the people, representing 435 in every 1000).

The prevalence of typhoid fever is not influenced by gender.

The ABO blood group significantly influences the prevalence of typhoid fever, with group O being most susceptible.

5. Recommendations:

Mass and aggressive campaigns should be carried out among the communities (by government and non-governmental agencies) on personal and environmental hygiene in order to reduce the spread of typhoid.

Government should mobilize for the identification and treatment of both symptomatic and asymptomatic typhoid cases (cases of typhoid fever and typhoid carriers) to reduce the burden of typhoid.

Scientists should carry out more studies on the real factor(s) that interplay in making individuals of certain blood groups more susceptible to typhoid fever than others and see how this can be used to confer resistance in individuals.

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