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Original Article

Health Education is a Key Pillar in Reducing Prevalence of Typhoid among Febrile Patients in Peri-Urban Western Uganda: A Cross-Sectional Study

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Abstract

Introduction: Typhoid has remained a public health burden leading to several morbidities and despite many attempts. Health education targeted to patients receiving care in health centers may significantly reduce burden of typhoid among febrile patients in Uganda.

Material and Methods: We consecutively sampled 283 participants presenting with febrile symptoms. Consent/assent was administered and after fully understanding the study, blood samples were collected using a 2 ml syringe and transferred into red top vacutainer before laboratory tests. We carried out centrifugation at 1000 rpm for 15 min. We performed slide agglutination test to identify presence of *Salmonella* typhi antibodies followed by tube agglutination for quantification. Titers of <1:160 were considered positive for typhoid. Data were analyzed descriptively as medians and proportions using STATA 14. Robust Poisson regression was carried out to obtain both crude and adjusted prevalence ratios (aPR) for bivariate and multivariate analysis, respectively.

Results: The median age for participants was 25 years. The seroprevalence of typhoid was 26.5% (95%, confidence interval [CI]: 21.7-32.0). Teenagers were 3 times more likely to be tested positive for typhoid compared to those below 13 years; (crude prevalence ratio = 2.76, 95%, CI: 1.11-6.83). Participants who reported to have received health education over past 2 months were 58% less likely to suffer from typhoid compared to those that reported no recent health education (aPR = 0.42; 95%, CI: 0.26-0.69). Having history of typhoid over the past 2 months was positively associated with reoccurrence of typhoid (aPR = 1.75, 95%, CI: 1.12-2.72).

Conclusion: Burden of typhoid still persists in rural communities especially among teenagers. Lack of health education predisposes communities. People who have had typhoid in the past 2 months are mostly likely to have a reoccurrence of the disease.

Key words: Febrile patients, Health education, Seroprevalence, Typhoid

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INTRODUCTION

Typhoid fever is an acute and often life-threatening systemic febrile illness caused by a bacterium *Salmonella* enterica serovar typhi.[1] It is transmitted by fecal–oral route through food and water contaminated with human faces.[2] It is characterized by numerous nonspecific symptoms

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including high fever, headache, malaise, joint pain, abdominal pain, and gastrointestinal symptoms such as nausea, vomiting, constipation, diarrhea, and sometimes gastrointestinal perforations.[3]

Typhoid fever continues to be one of the major public health problems leading to a number of morbidity and mortality cases among patients with acute febrile manifestation in many developing countries.[4] World Health Organization estimated that approximately 21 million cases and 222,000 typhoid related death occur annually worldwide.[5] It is reported that over 80% of Ugandan districts are typhoid endemic with Central and Western District topping the list.[6]

Several studies have pointed leakage in drainage systems, nature of houses eating commercial food in food kiosks as significant factors that are associated with typhoid.[7] No study has pointed out the importance of health education as a predictor of typhoid seroprevalence.

The factors responsible for persistent typhoid in western Uganda are not well understood to demand appropriate preventive strategies for reduction of typhoid burden. We aimed to find the seroprevalence of typhoid and impact of health education among other factors on typhoid among patients with febrile manifestations attending Kampala International Teaching hospital.

MATERIALS AND METHODS

Ethical approval to conduct this study was sought from Kampala International University Research Ethics Committee. Informed consent was sought from study participants for their participation in the study as well as future use of their sample for other studies.

The study was conducted to identify typhoid fever among patients with acute febrile symptoms. The study began from March to May 2017 at Kampala International University in Ishaka-Bushenyi.

General outpatients manifesting acute febrile symptoms provided a blood sample for typhoid testing.

A vein puncture was performed using a 2 ml syringe. A blood sample was drawn into a red top vacutainer and allowed to settle for 30-45 min. Centrifugation was done at 2500 rpm for 5 min.

The serum obtained was tested using, slide agglutination Widal test, for the presence of *Salmonella* typhi antibodies. All the positive tests were further processed by tube agglutination Widal test to determine the titers. Agglutination titers greater or equal to 1:160 were considered to be positive typhoid infection.

Details about the study participants were captured using a semi-structured questionnaire. Demographic and socioeconomic details were collected.

Presence of typhoid was captured as binary, i.e., positive and negative for O antigens. Factors thought to influence typhoid seroprevalence were assessed using Robust Poisson regression. STATA version 14 (Statacorp 4905 Lakeway Drive, College Station Texas, 77845 USA) was used to carry all the analyses. Both crude and adjusted prevalence ratios (aPR) were obtained using bivariate and multivariate regression analysis, respectively.

RESULTS

Sociodemographic and Clinical Characteristics of Study Population

A total of 283 patients presenting with a febrile illness who attended general Outpatient Department of Kampala International University Teaching Hospital (GOPD-KIUTH) were diagnosed serologically for typhoid fever between the months of March and May 2017. A greater proportion of the patients who participated in the study were young adults with the median age of 25 with the lower quartile and upper quartile of 19 and 40, respectively. More females 56.9% (161/283) participated in the study compared to males 42.8 (121/283), and among the participants, majority 52.3% were unemployed. Furthermore, a high proportion of the participants 49.82% were single, and most of the participants 107 (37.94%) had attained education up to tertiary level. A few participants 1.1% had their water sources far away from their homes above 1 km distance while majority 61.1% had their water sources nearer to their homes within 100 m reach. Furthermore, most participants 94.0 (266/283) possessed pit latrines as 89.4% (253/283) of the participants found it useful to have a toilet in their homes.

The results also showed that the majority of participants as much as 36.4% (103/283) obtained their treatment from drug shops, while the least proportion of participants 8.8% obtained their treatment from herbal clinics. The data further indicated that most participants 47.0 (133/283) had their health facilities nearer to their homes, within a distance of 0.5 km. However, a larger number of participants 47.3% (129/283) did not receive health education about typhoid fever from their previous health facilities.

Of the 283 participants, data from the laboratory results showed that 75 (26%) of the participants had significant agglutination titers for both O and H *Salmonella* typhi

antigen compared to 208 (73.5%) with insignificant reaction for typhoid fever. Only a few participants 11.3% (32/283) had had a history of typhoid fever in the past 2 months before the study period (Table 1).

Table 1: Sociodemographic and clinical characteristics of study population

Variable	Summary measure
Median age (IQR)	25 (19-40)
Sex *n* (%)	
Male	121 (42.76)
Female	161 (56.89)
Not stated	1 (0.35)
Occupation *n* (%)	
Self employed	93 (32.86)
Un employed	148 (52.30)
Employed	42 (14.84)
Marital status *n* (%)	
Married	124 (43.82)
Single	141 (49.82)
Divorced	07 (2.47)
Separated	11 (3.89)
Education *n* (%)	
None	42 (14.89)
Primary	60 (21.28)
Secondary	73 (25.89)
Tertiary	107 (37.94)
Distance from the water source *n* (%)	
0-100 m	173 (61.13)
Between 100 and 500 m	94 (33.22)
Between 500 and 1 km	13 (4.59)
>1 km	3 (1.06)
Possession of a pit latrine *n* (%)	
No	13 (4.59)
Yes	266 (94.00)
Not stated	4 (1.41)
Find it useful to have a toilet *n* (%)	
No	29 (10.25)
Yes	253 (89.40)
Not stated	1 (0.35)
Laboratory results *n* (%)	
Non-reactive	208 (73.50)
Reactive	75 (26.50)
History of typhoid over past 2 months *n* (%)	
No	249 (87.98)
Yes	32 (11.31)
Not stated	2 (0.71)
Source of treatment *n* (%)	
Drug shop	103 (36.40)
Health center	98 (34.63)
District hospital	55 (19.43)
Herbal clinic	25 (8.83)
Not stated	2 (0.71)
Distance to the health facility *n* (%)	
1-500 m	133 (47.00)
Between 500 and 1 km	61 (21.55)
Between 1 km and 5 km	76 (26.89)
>5 km	10 (3.53)
Not stated	3 (1.06)
Received health education *n* (%)	
No	129 (47.25)
Yes	144 (52.75)

IQR: Interquartile range

The seroprevalence of typhoid fever was 26.5% (75/283); 95%, confidence interval (CI): 21.7-32.0 among the febrile patients who attended GOPD at KIU Teaching Hospital during the study period (Figure 1).

Bivariate Analysis of Factors Associated with Typhoid Fever

Bivariate analysis of factors associated with the occurrence of typhoid fever indicates that patients who were in the age group 13-14 years were 3 times more likely to be tested positive for typhoid fever compared to those below the age of 13 years; (crude prevalence ratio [cPR]=2.76, 95%, CI: 1.11-6.83) this was statistically significant ($P = 0.03$). Participants who had received health education about typhoid were 57% less likely to suffer from typhoid fever compared to those who had not received health education, (cPR = 0.43, 95%, CI: 0.28-0.66), while participants who had history of typhoid fever were 2 times more likely to be reinfected with the disease (cPR = 2.11, 95%, CI: 1.40-3.19). Participants who obtained a high monthly income >1 million per month had 81% chances of not being infected with typhoid fever (cPR = 0.19, 95%, CI: 0.03-1.38), however, the association was not statistically significant ($P > 0.05$).

In addition, participants who had suffered from typhoid fever in the previous 2 months were 2 times more likely to be reinfected with the disease than those without a history of typhoid fever in the previous 2 months (cPR = 2.11, 95%, CI: 1.40-3.19) and this was a statistically significant factor ($P < 0.001$). Furthermore, participants who obtained their health-care facilities from the district hospital were 38% less likely to suffer from typhoid fever compared to those that obtained health facilities from the drug shops (cPR = 0.62, 95%, CI: 0.32-1.23) but the association was not statistically significant as shown in Table 2.

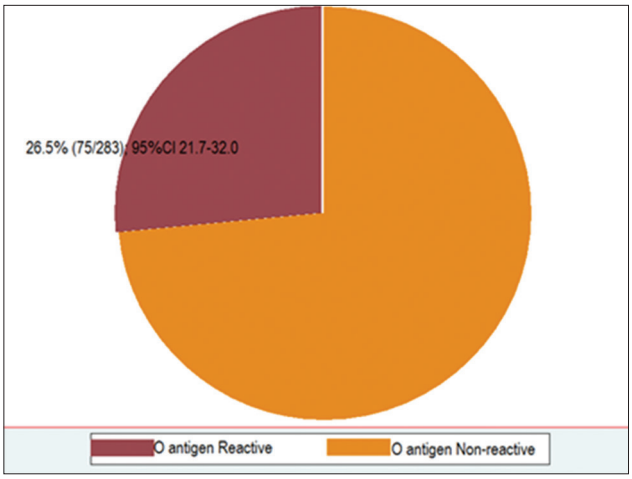

Figure 1: Seroprevalence of typhoid fever in Ishaka-Bushenyi district

Table 2: Bivariate and multivariate analysis of factors associated with typhoid fever among patients attending General Outpatient Department at Kampala International University in Ishaka-Bushenyi Western Uganda

Variable	Typhoid		cPR	95% CI	*P*-value	aPR	95% CI	*P*-value
	Negative *n*=208 (%)	Positive *n*=75 (%)						
Age (years)								
0-12	26 (83.87)	5 (16.13)	1.00					
13-18	15 (55.55)	12 (44.45)	2.76	1.11-6.83	0.03			
19-25	67 (73.62)	24 (26.38)	1.64	0.68-3.93	0.27			
26-39	61 (72.62)	23 (27.38)	1.70	0.71-4.08	0.24			
≥40	39 (78)	11 (22)	1.36	0.52-3.56	0.53			
Health education								
No	81 (62.79)	48 (37.21)	1.00			1.00		
Yes	121 (84.02)	23 (15.98)	0.43	0.28-0.66	<0.001	0.42	0.26-0.69	0.001
History of typhoid over the past 2 months								
No	190 (76.30)	59 (23.70)	1.00			1.00		
Yes	16 (50)	16 (50)	2.11	1.40-3.19	<0.001	1.75	1.12-2.72	0.013
Distance of health facility								
1-500 m	100 (75.19)	33 (24.81)	1.00					
Between 500-1 km	46 (75.41)	15 (24.59)	0.99	0.58-1.68	0.97			
Between 1 km-5 km	50 (65.79)	26 (34.21)	1.38	0.90-2.12	0.14			
>5 km	10 (100)	(0)						
Source of treatment								
Drug shop	76 (73.78)	27 (26.22)	1.00					
Health center	68 (69.39)	30 (30.61)	1.17	0.75-1.82	0.49			
District hospital	46 (83.64)	9 (16.36)	0.62	0.32-1.23	0.18			
Herbal clinic	17 (68.00)	8 (32.00)	1.22	0.63-2.36	0.55			
Useful to have a toilet								
No	18 (62.07)	11 (37.93)	1.00					
Yes	189 (74.70)	64 (25.30)	1.67	0.40-1.11	0.12			
Possess a pit latrine								
No	9 (69.23)	4 (30.77)	1.00					
Yes	195 (73.31)	71 (26.69)	0.87	0.37-2.01	0.74			
Monthly salary								
<50,000	19 (70.37)	8 (29.63)	1.00					
5000-100,000	41 (66.13)	21 (33.87)	1.14	0.58-2.25	0.70			
Between 100,000 and 500,000	71 (68.27)	33 (31.73)	1.07	0.56-2.05	0.84			
Between 500,000 and 1,000,000	59 (83.10)	12 (16.90)	0.57	0.26-1.24	0.57			
>1,000,000	17 (94.44)	1 (5.56)	0.19	0.03-1.38	0.10			
Education								
Non	31 (70.45)	11 (29.55)	1.00					
Primary	42 (70)	18 (30)	1.15	0.60-2.17	0.68			
Secondary	57 (78.08)	16 (21.92)	0.84	0.43-1.63	0.60			
Tertiary	77 (71.96)	30 (28.04)	1.07	0.59-1.94	0.82			
Marital status								
Married	93 (75)	31 (25)	1.00					
Single	101 (71.63)	40 (28.37)	1.13	0.76-1.70	0.54			
Divorced	6 (85.71)	1 (14.29)	0.57	0.09-3.61	0.55			
Separated	8 (72.73)	3 (27.27)	1.09	0.40-3.01	0.87			
Occupation								
Self employed	71 (76.34)	22 (23.66)	1.00					
Unemployed	105 (70.95)	43 (29.05)	1.23	0.79-1.92	0.37			
Employed	32 (76.19)	10 (23.81)	1.00	0.52-1.94	0.99			
Sex								
Male	87 (71.90)	34 (28.10)	1.11					
Female	120 (74.53)	41 (25.47)	0.91	0.61-1.34	0.62			

cPR: Crude prevalence ratio; aPR: Adjusted prevalence ratio; CI: Confidence interval

Multivariate Analysis of Factors Associated with Typhoid Fever

A multivariate analysis was performed on some of the independent variables that possessed a $P < 0.2$ at bivariate analysis to establish the association between the risk factors and typhoid fever occurrence at 95% CI.

Participants who had suffered from typhoid fever in the previous 2 months were 1.75 times more likely to be reinfected with the disease than those without a history of typhoid fever in the previous 2 months, and this was statically significant ($P = 0.013$, CI: 1.12-2.72). However, those who had received health education about

typhoid were 58% less likely to suffer from typhoid fever compared to those who had not received health education, (aPR = 0.42, 95%, CI: 0.28-0.66), and this was also statistically significant ($P = 0.001$).

Furthermore, participants who had suffered from typhoid fever in the previous 2 months and received health education were 1.5 times more likely to be reinfected with typhoid fever ($P = 0.34$, CI; 0.62-3.95) though this was not clinically significant. Receiving health education reduced the chances of being reinfected from 1.7 to 1.5.

Furthermore, participants who obtained a high monthly income >500,000 Ugandan shillings per month had 45% chances of not being infected with typhoid fever (aPR =0.55, 95%, CI: 0.24-1.27) however, this was not statistically significant ($P = 0.16$). On the other hand, those who received a monthly income of <500,000 Ugandan shillings were 1.39 times more likely to be infected with the disease. Although this was not statistically significant ($P = 0.33$, CI: 0.72-2.66) (Table 2).

DISCUSSION

In developing countries, typhoid diagnostic methods using bacteriological culture are unlikely due to limited resources. Consequently, rapid diagnostic techniques for typhoid become likely. There is need to study possible factors that may influence seroprevalence of typhoid. No study has looked at the relation between typhoid seroprevalence and health education among other factors.

In this study, the seroprevalence of typhoid was found to be 26.5% (75/283; 95% CI 21.7-32.0). A study conducted in Bushenyi District, Uganda showed a significant titer of higher seroprevalence.[6] However, our seroprevalence findings were far higher in comparison to study conducted in Addis Ababa Ethiopia.[8] The persistent burden of typhoid fever in Bushenyi District could be due to lack of adequate health education of the communities about the disease burden and its prevention.

Furthermore, this study found out that teenage age was significantly associated with burden of typhoid fever. These findings agree with what Agwu, (2012) found out in Bushenyi District. This implies that typhoid is still persistent in Bushenyi District. This may pose a huge health and economic burden to the entire community and other neighboring communities. A similar report shows the higher burden of typhoid fever among infant, children, and adolescent categories in South Central and Southeastern Asia.[4] Reasons could be due to hyperactivity of children within this age group, where they try to explore the natural environment and would touch and eat anything that comes their way.

Participants who reported to have received health education over past 2 months were 58% less likely to suffer from typhoid compared to those that reported no recent health education (aPR = 0.42; 95%, CI: 0.26-0.69), and this is statistically significant at $P < 0.05$. There is no published work addressing the relation between health education and typhoid. This therefore emphasizes the need to plan and implement health education for all the communities as an effective preventive measure of typhoid fever.

This study found out that having a history of typhoid over the past 2 months was significantly associated with a reoccurrence of typhoid (aPR = 1.75, 95%, CI: 1.12-2.72). This could be due to poor adherence to drugs such as failing to complete the dosage resulting into drug resistance.

CONCLUSION

Data from this study have showed that the burden of typhoid fever still persists in rural areas of Ishaka-Bushenyi. Pre-teenage age and Lack of Health Education in these communities were significantly associated with increased typhoid fever. People who have previously suffered from typhoid fever are mostly likely to have a reoccurrence of the disease.

RECOMMENDATIONS

Proper planning for health services and personnel is warranted to counteract the persistent burden of typhoid in rural communities. Further studies are necessary to be carried out over a wide geographical area and using culture methods to correctly identify those with the disease.

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