www.jmscr.igmpublication.org
Impact Factor (SJIF): 6.379
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v6i2.65

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Repeated Outbreaks of Paratyphoid Fever– An Ongoing Threat in North Kerala

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Abstract
Two major episodes of Salmonella Paratyphi A outbreaks had occurred in different localities of a same Muncipality panchayath following wedding feasts- the first episode in April 2016 and the second one in January 2017. Patients presented with fever and abdominal discomfort, 10-14 days after the suspected exposure.
Objective: *To identify the magnitude and source of two different food borne outbreaks of Salmonella Pparatyphi A.*
Methods: *A team from the local tertiary care centre which included personnel from Departments of Microbiology, Community Medicine and Paediatrics had visited the places, conducted medical camps and field visits. Blood samples were collected from symptomatic patients for culture and serological tests. Stool samples were subjected to culture. Drinking water sources and food samples were collected for microbiological analysis.*
Results: *Blood cultures yielded Salmonella Paratyphi A in 5 out of 34 patients during the first episode and 7 out of 59 patients in the second episode. The isolates were sensitive to Ampicillin, Ceftriaxone, Ciprofloxacin and Chloramphenicol. Significant levels of Salmonella Paratyphi A antibody were demonstrated in 53% (18/34) and 27% (18/59) of patients during first and second episodes respectively. Stool cultures and environment samples were negative for Salmonella species.*
Conclusion: *All identified patients were treated with Ceftriaxone or Ciprofloxacin for 2 weeks and no relapse was noted. Intensive health awareness programs were conducted all over the panchayath, along with chlorination of drinking water sources and health education. Salmonella Paratyphi A infection, which was once thought to be rare compared to Salmonella Typhi enteric fever, is being reported more frequently associated with outbreaks.*
Keywords: *Paratyphoid fever, Widal test.*

Introduction

Food borne outbreaks by Salmonella species is reported from all over the world. Outbreak with *Salmonella Paratyphi A*, once thought to be a rare occurrence, is being reported from many parts of the world.(1). Studies from Indian states report that the outbreaks are mainly due to contamination of drinking water rather than food borne (2),(3) and shows dual seasonal peaks, one during April – June (dry seasons) when there is scarcity of

water[3] and the other during July-September (rainy season) when the drinking water sources get contaminated with surface water. Lack of access to safe drinking water is found to be the major cause of epidemics and outbreaks of *Salmonella Paratyphi A.* Clinically, *Salmonella Paratyphi A* is found to have caused milder disease than typhoid fever and an age bias – higher rate of occurrence in adults than in children- has also been observed [4].Here we report repeated episodes of paratyphoid fever outbreaks caused by *Salmonella Paratyphi A* in a specific locality in Kerala following mass feast.

Two major episodes of *Salmonella paratyphi A* outbreaks had occurred in different localities of a same Muncipality panchayath over a time gap of 9 months. The first episode was during the first week of April 2016 and the other at the end of January 2017. Both episodes were first noticed by the General practitioners of the area when unusually high number of patients with similar clinical features -fever and abdominal discomfort- attended outpatient clinics within a week time, all having history of participating wedding feasts a week prior to the onset of illness. Many members in families and neighborhood were affected. When the index cases were noticed with high titre for AH antibody with Widal test, the clinicians suspected the outbreaks and had notified the same to the Public Health Department and the nearby tertiary care centre.

Materials and methods

An investigation team was constituted which included consultants from the departments of Microbiology, Community Medicine and Paediatrics of Tertiary care centre, Physicians from Public health Service, Lab. technicians and health worker staff. The team conducted Medical Camps and field visits for 2 weeks - 5th May 2016 to 18th May 2016- during the first episode and for 11 days - from 28th January 17 to 7th February 17- during the second. Cases were identified, data and samples were collected.

Inclusion criteria

Patients with febrile illness which was started within 1-2 weeks after consuming food and drinks from the suspected feasts.

Methods

Using sterile syringe and needle, 10 ml of blood samples were collected from those patients who were in the first week of febrile illness and 5 ml of blood from patients who had passed 1 week of fever. 5 ml blood collected from the first group were dispensed in 50 ml of Brain Heart Infusion Broth (BHIB) and incubated at 37°C. After 24 hours incubation sub-culturing was performed from the BHIB onto Mac Conkey's agar and Blood agar plate culture medium. After overnight incubation positive cultures were proceed further while Negative broth cultures were incubated for seven days and sub cultured before reported negative. Suspected colonies obtained on the above media were screened by routine biochemical identification tests which include IMViC, Triple Sugar Iron agar (TSI), urease test (Himedia ltd. India) and lysine decarboxylation (LDC). Final species confirmation was done by agglutination with species specific antisera for Salmonella serotypes A-G Non differential, O9,O2,O4, hd, ha, hb and hi. The 5 ml blood sample collected from both first and second groups of patients were transferred to sterile dry bottles, serum was separated and transferred to serum collecting vials. The clot was transferred to 10 ml Bile Broth medium and incubated for 7 days with alternate day sub culturing and processing of isolates as with the blood culture samples. With the serum samples semi quantitative tube agglutination (Widal test) was performed using febrile antigen kits of Enteric fever (Beacon Diagnostics). The serum samples were serially diluted by using fresh 0.95% saline preparation from 1:50 to 1:400 for anti TO and anti TH separately in 12 test tubes. O antigens and H antigens were added in the test tubes, equal amounts in all. Based on the manufacturer manual, an antibody titer of 1:100 and higher for

anti TO and 1:200 and higher for anti TH antibodies were taken as a cut of value to indicate infection of typhoid fever.

Environment samples

- Water sample from the wells of households, which were used as the water sources for preparing the drinking water supplied in the meal.
- Samples of the brands of curd that were used for the feast were tested for any bacterial pathogens.
- Food left over was not tested due to the time lapse.

All samples were processed in laboratory according to standard procedure.

The bacterial isolates obtained from samples were identified by routine standard identification tests and were confirmed by slide agglutination test with specific antiserum.

All serum samples were subjected to Widal tube agglutination test, Lepto IgM (ELISA), Dengue IgM (ELISA) and Weil- Felix agglutination test

Results

Thirty four and fifty nine fever cases were detected during the first and second episodes respectively. Adults in the age group 21-30 were found to be affected more in both incidents

.

Table 1 Age distribution of cases

Age group	First outbreak (34 cases)		Second outbreak (59 cases)	
	Number affected	%	Number affected	%
1 to 10 yrs	6	17.5	3	5
11 to 20 yrs	6	17.5	9	15
21 t0 30 yrs	8	23.5	31	53
31 t0 40yrs	6	17.5	7	12
41 to 50yrs	7	21	5	8
> 50yrs	1	3	4	7
Total	**34**	**100**	**59**	**100**

Salmonella Paratyphi A was isolated from blood samples of 5/34 (14.7%) patients during the first outbreak and 7/59 (11.8%) patients during the second. Culture of stool samples from the consented food handlers and few of the patients and household members were negative for any pathogen.

Table II

	Period of investigation	Number of cases identified	Blood culture samples (1st week of fever)		Clot culture (illness > 1 week)		Stool culture		Total No: of *S.paratyphi A* isolated
			No: of samples tested	*S.paratyphi A* isolated	No: of samples tested	*No: of S.paratyphi A* isolated	No: of samples tested	*No: of S.paratyphi A* isolated	
Outbreak 1	5.5.2016 to 18.5.2016	**34**	8	**2**	34	**3**	12	0	**5 (14.7%)**
Outbreak 2	28.1.2017 to 7.2. 2017	**59**	32	**3**	59	**4**	8	0	**7 (11.8%)**

Table III

Serum samples obtained from all patients were subjected to Widal test. During the first outbreak 53% of patients showed AH antibody titre >200 and during the second outbreak, 27% of patients had AH antibody titre >200.

	Number of cases identified	Widal test positive (STH antibody >200)		
		Culture negative	Culture positive for S.paratyphi A	Total
Outbreak 1	34	15	3	18 (53%)
Outbreak 2	59	14	4	18 (27%)

All samples were tested negative for IgM Lepto, IgM Dengue and Weil- Felix test. Water samples from private wells which were used as drinking water sources were found to be heavily contaminated with fecal coliforms.

Table IV

	Lepto IgM(ELISA),	Dengue IgM(ELISA)	Weil- Felix test	Presumptive coliform count of water samples		Results of curd samples tested	
				No: of samples tested	Report	No: of samples tested	Report
Outbreak 1	Tested : 34 Positive : 0	Tested : 34 Positive : 0	Tested : 34 Positive : 0	2 well water samples	>180 Coliforms /100 ml water (with both samples)	3 brands	Negative for Salmonella spp.
Outbreak 2	Tested : 59 Positive : 0	Tested : 59 Positive : 0	Tested : 59 Positive : 0	4 well water samples	>180 Coliforms /100 ml water (with all 4 samples)	3 brands	Negative for Salmonella spp.

Discussion and Conclusion

Enteric fever is a disease prevalent worldwide and the leading cause of febrile illness in endemic areas. Salmonella serotype Paratyphi A has shown rising trends over *Salmonella* Typhi since 1990. Food borne outbreak due to Salmonella Paratyphi A following consumption of contaminated vegetarian food was reported from other parts of country[6&7]. The signs and symptoms of uncomplicated paratyphoid fever are often nonspecific and therefore either isolation of *Salmonella Paratyphi A* from patient's samples or demonstration of AH antibody by Widal test has become necessary for diagnosis of the disease. The Widal test has been in use for more than a century as an aid in the diagnosis of typhoid fevers. [10] In areas with known endemicity for Salmonella infections, early administration of antibiotics for short febrile illness often result in negative blood culture results[11] , where a positive Widal test may be highly useful to excite suspicion of occurrence of the disease. This study reports outbreaks with *Salmonella Patatyphi A* that had occurred in an endemic area, repeatedly following mass feast events. As sporadic cases occur not infrequently in this area, the local physicians are vigilant towards the outbreaks and Widal test is included in the routine fever investigation. On identifying the first warning case by positive Widal test, mass screening, case identification and medication were implemented along with campaigning and awareness programs to control the spread of the disease. Salmonella Paratyphi A was isolated from 16% and 22% of Widal positive patients. The possibility for cross reactive Widal reaction with Scrub typhus, Leptospirosis & Dengue was ruled out by negative Weil- Felix test, IgM Lepto and IgM Dengue tests [9]. The sources of outbreaks were traced epidemiologically to domestic wells which were

the sources of drinking water used in the feasts; but the source of contamination could not be found out. Frequent health education programs were conducted in schools and PHCs by the Health care staff; distributed pamphlets and notices regarding the importance of use of boiling water only for drinking as we had observed high Coliform count in the water samples tested at random from different localities of the panchayath, which make the water unsafe if used as such. The area was kept in surveillance for next six months and no more outbreaks were observed.

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