2. Community based studies:

2.1 Epidemiology of Typhoid fever in a rural and urban slum community of West Bengal

Investigator: S. Ghosh

The study was undertaken at Kalikapur Gram Panchayet in Sonarpur block of South 24 parganas with approx. population of 29,000 living in 5967 families in 11 villages under Kalikapur PHC. Resident female village surveillance workers were selected and trained for detection of fever cases with at least 3 days duration through daily surveillance activities. The surveillance workers were also instructed to send the detected cases to government health facility for blood examination and subsequent treatment.

Baseline demographic and epidemiological information revealed that majority were Hindu (81%) & rest were Muslim (19%). Only 30.4% families lived in Pucca houses. Drinking water source was mainly tube wells, whereas 30% used tap water. About 50% of people used open field for defecation. Majority of the families fell within the income group of ≤ Rs. 2000/- p.m. Overall literacy rate was 72.9%. 56.8% of male and 43.2% of female were literate.

Since April 2003 up to March 2006, a total of 556 blood samples were collected of which 19 (3.4%) were positive for *Salmonella* typhi. Isolation rates were 4.6% in January to March, 4.5% in April to June, 2.5% in July to September and 2.7% in October to December. Out of 556 blood samples collected from fever cases 63 samples were from below 5 years age group, 101 samples from 5-9age group, 89 from 10-14 years age group and remaining 303 from age groups ≥15 years. Isolation rates from the respective age groups were 3.17%, 1.98%, 8.99% and 2.31%. However incidence of typhoid fever per 1000 persons-year was found to be the highest in the age group of < 5 yrs (11.81) compared to that of 5-9 yr (2.03), 10-15 (4.06) & ≥15 yr (0.87).

Duration of fever at the time of collection of blood samples from 19 positive fever cases: 15 were of ≤ 7days duration, rest 4 were 8 to 15 days. Headache, pain abdomen, anorexia were main associated complain along with ≥ 3 days duration fever.

Salmonella typhi strains isolated were found to be resistant to Chloramphenicol, Trimethoprim, Co-trimoxazole, and Ampicillin but sensitive to Gentamycin, Norfloxacin, Ciprofloxacin, Pefloxacin, Cefotaxime and Amikacin.

2.2 Identifying environmental risk factors for endemic diarrhoeal diseases in West Bengal, India: a remote sensing – geographic information system (GIS) approach

Investigator: A. Palit

This ongoing study is principally focused on generating Geo-environmental database (land use, land cover, water bodies, proximity of settlements to water bodies etc.) of selected foci using remote sensing and GIS technology, macro-stratify the "geo-environmental factors" by retrospective RS-GIS analysis in relation to incidences in those foci and assess the "feasibility" of identifying diarrheogenic factors with reference to water bodies, water supply

structure, human habitations etc. and develop a RS-GIS model to visualize the dynamics of transmission defining macro-ecosystem of pathogens in relation to incidences and seasonal variability.

Data of acute diarrhoeal disease incidences in Kolkata and its adjoining areas for two years (2002 -2003) has been analyzed to identify particular foci of epidemic outbreaks as well as of endemic ones in Kolkata. The type of human habitations in relation to water resources, water bodies, drinking water supply structures etc. are in the process of identification for ground truth evaluation.

Data have been recorded in designed formats for drinking water epidemiology along with its microbiological characteristics (water quality testing, monitoring etc.) at different sample locations in pre-selected foci in relation to environmental and land cover variables.

Retrospective satellite data of IRS ID LISS III and LISS IV are in the process of classification for mapping out the images of Kolkata as well as some of its worst diarrhea affected foci based on the disease surveillance data.

Results of water samples' analysis at various sources have been depicted Tables 2.2.1 – 2.2.4.

We used ordinary least squares (OLS) and spatial autoregressive (SAR) lag model implemented in GeoDA version 0.9.5.i to measure the relationships between the disease (diarrhea, cholera, and typhoid) incidence rate in 2005/2006 and several water environment and socio-ecological variables obtained at an areal unit defined by Thiessan polygon of the water sample points from three sources: tap, tube well, and storage. There were 85 points of those sources; therefore 85 polygons (areas) were created. The individual level socioeconomic data were aggregated for the 85 polygons. Initially, we fit the data in an OLS regression model. The results shows considerable non-normality (Jarque-Bera=109.22; $p<.001$) in the data suggesting a spatial lag model may be suitable for this data. The spatial lag model is a maximum likelihood estimate that uses a spatially lagged dependent variable. The spatial weights were constructed based on three nearest nearby polygons.

The results obtained from both OLS and SAR suggest water environment variable has association with the higher incidence rate for diarrhea, cholera or typhoid, which can only be clearly understood subject to selection of higher numbers of points of sources in future. The OLS model shows higher percent of Hindu population in the area had lower typhoid incidence rate. The SAR model shows higher percent of Hindu population in the area or the higher percent of people using boil/filter water in the area had lower diarrhea incidence rate. Like the OLS, the SAR model also shows higher percent of Hindu population in the area had lower typhoid incidence rate.

Table 2.2.1 Drinking water analysis from different sources of samples from endemic wards of Kolkata Municipal Corporation.

AREA	Ward no.	Sources of water	No. of samples tested	No. positive for colliform bacteria	Organism Present/Absent	Organisms Identified
Kolkata	Ward-28	1.Tap	9	2	Present	*E.coli, Pseudomonas*
		2.Tubewell	4	2	Present	*E.coli, Salmonella*
		3.Stored	7	3	Present	*E.coli, Pseudomonas*
Kolkata	Ward-29	1.Tap	14	2	Present	*E.coli, Salmonella*
		2.Tubewell	7	3	Present	*E.coli, Pseudomonas*
		3.Stored	18	7	Present	*E.coli, Vibrio, Citrobacter, Pseudomonas, Salmonella*
Kolkata	Ward-30	1.Tap	16	2	Present	*E.coli, Proteus, Pseudomonas*
		2.Tubewell	7	3	Present	*E.coli, Salmonella*
		3.Stored	26	9	Present	*Pseudomonas, E.coli*
	Ward-33	1.Tap	17	6	Present	*E.coli, Vibrio, Citrobacter, Salmonella*
		2.Tubewell	5	1	Present	*E.coli*
		3.Stored	28	17	Present	*Ctrobacter, Proteus, E.coli, Pseudomonas, Salmonella, Vibrio*
	Ward-34	1.Tap	3	0	Absent	
		2.Tubewell	3	0	Absent	
		3.Stored	3	0	Absent	
		4.Pond	3	3	Present	*E.coli, Proteus Pseudomonas Klebsiella*
		Total No. of sample	**170**	**60**		

Table 2.2.2 Identified microorganisms from water samples

Organism	Kolkata-Ward /total no. of positiveve cases
E. coli	38/ 60 (63.3%)
Salmonella sp.	17/60 (28.33%)
Vibrio sp.	14/60 (23.33%)
Proteu sp.	13/60 (21.6%)
Pseudomonas sp.	15/60 (25%)
Citrobacter sp.	9/60 (15%)

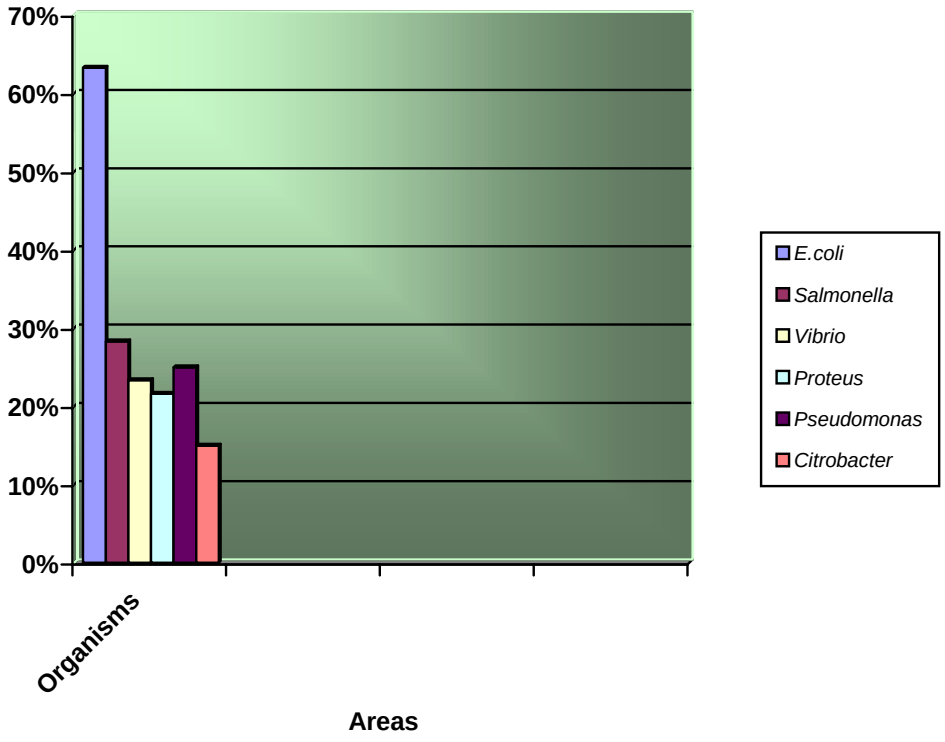
Table 2.2.3 Seasonal disposition of enteric pathogens in water samples

Organism	Summer	Pre-monsoon	Monsoon
Salmonella sp.	2/8 (25%)	8/29 (27.5%)	7/23 (30.4%)
Vibrio sp.	1/8 (12.5%)	6/29 (20.6%)	7/23 (30.4%)
E.coli sp.	3/8 (37.5%)	19/29 (65.5%)	16/23 (69.5%)

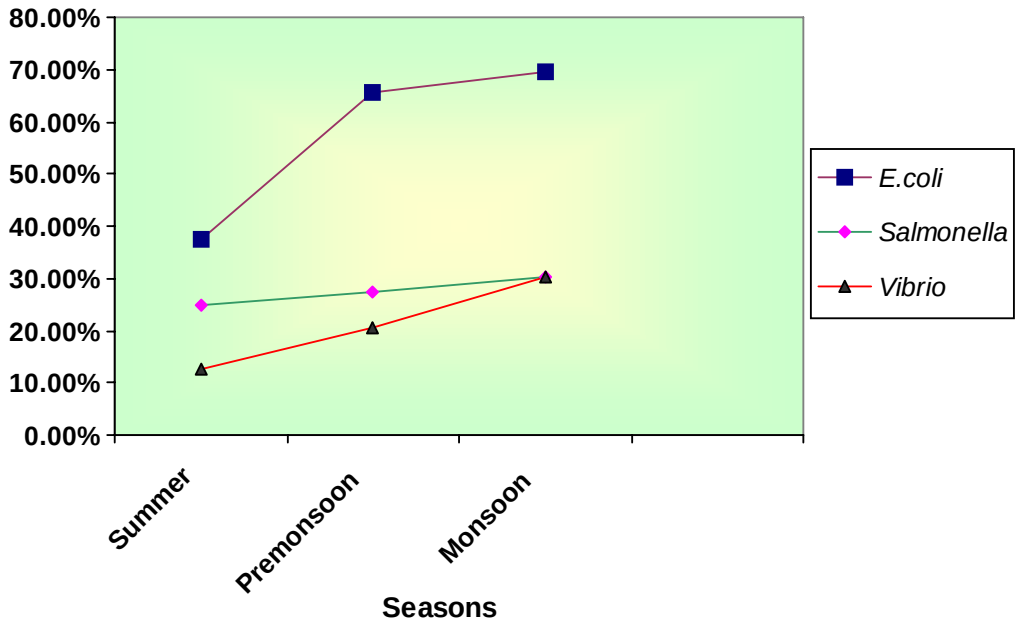
Table 2.2.4 Disposition of enteric pathogens in different seasons

Name of the zone	Summer	Pre-monsoon	Monsoon
Kolkata	8/40 (20%)	29/90 (32%)	23/40 (58%)

2.2.I. Presence of Micro-organisms



2.2.2 Frequency of Enteric Pathogen in Various Seasons



2.2.3.Frequency of the Organisms (Seasonwise)