

Dynamics and resistance patterns of recurrent typhoid outbreaks: descriptive epidemiology study, Harare, Zimbabwe



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BACKGROUND

- Typhoid fever has become a public health problem in Harare City, with large number of cases reported annually since 2010.
- There is a paucity of data reported regarding the association between rainfall patterns as dynamic supporting factors for typhoid outbreaks, and antimicrobial resistance.

OBJECTIVES

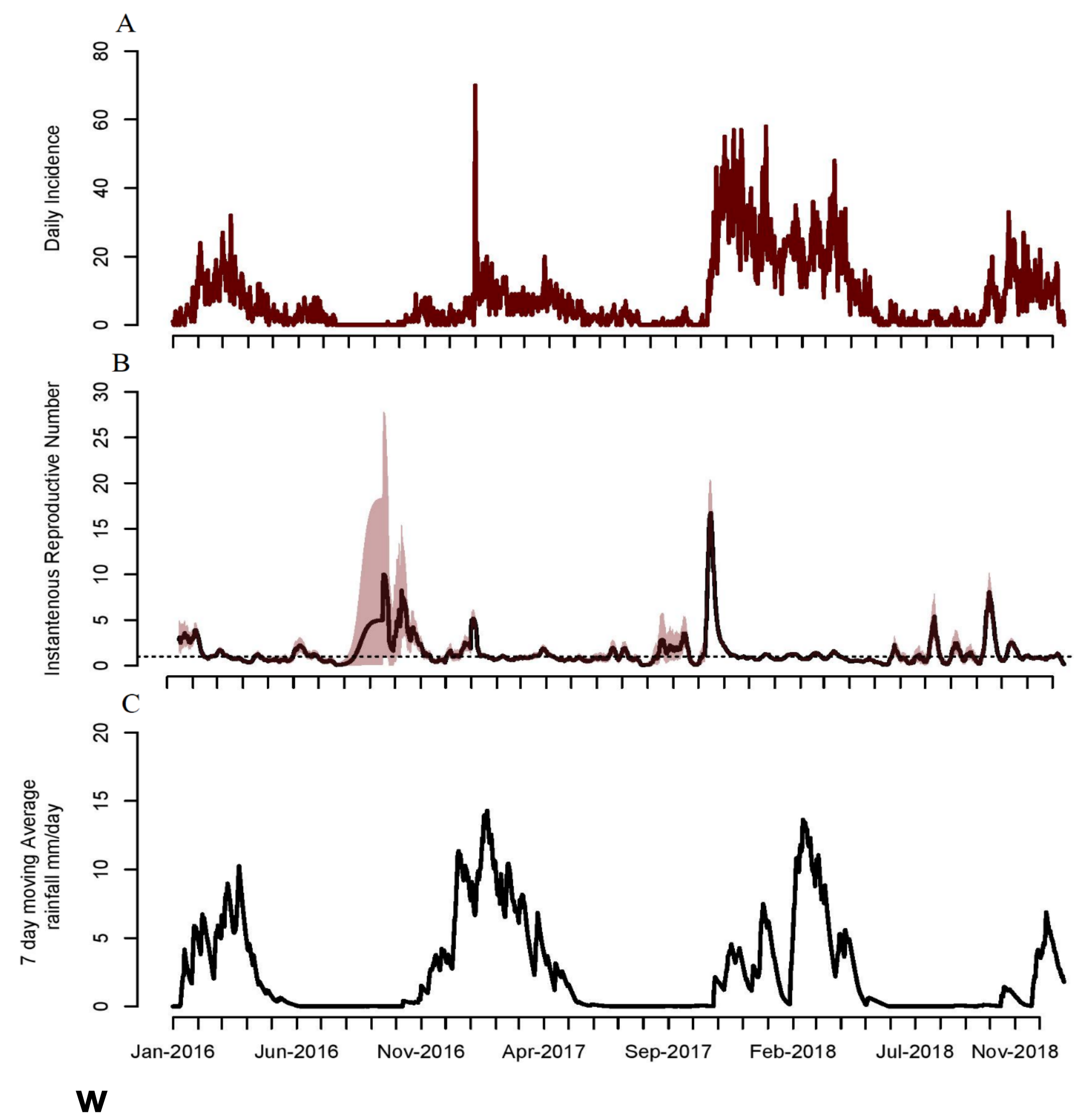
- We describe the dynamic features of the typhoid epidemic in Harare City, including the associations between typhoid transmission factors and emergence of antibiotic resistance between 2016 and 2018.

METHODS

Line-listed typhoid cases were obtained from the City of Harare Department of Health for the period from January 2016 to December 2018. Daily precipitation estimates were obtained from Climate Hazards Group Infrared Precipitation. Cases were culture confirmed and analysed for antimicrobial resistance. We conducted descriptive analyses for city and suburbs. We divided the epidemic into rainy season (January to March), winter season (April to August), and the pre-onset rainy (September to December).

RESULTS

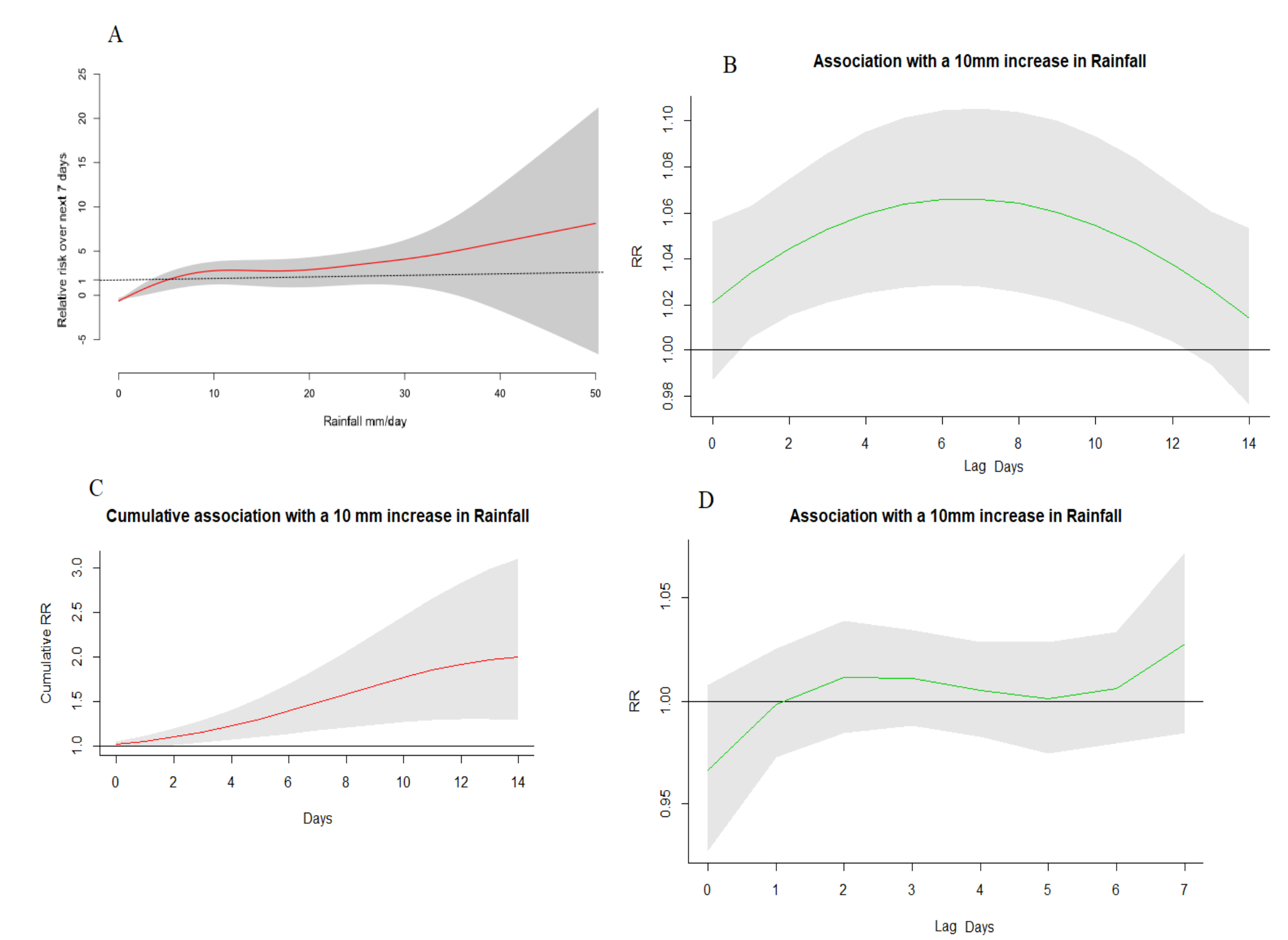
Figure 2: Monthly trend of incidence cases reported, instantaneous reproductive number and average rainfall pattern from Jan2016 - Dec 2018



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Drugs	Total Antimicrobial susceptibility test	Susceptible	Intermediate	Resistance	Percentage Resistance
Chloramphenicol	195	63	0	132	67
Ampicillin	76	4	0	72	95
Tetracycline	135	57	2	76	56
Gentamicin	4	0	0	4	100
Co-trimoxazole	157	67	0	90	57
Ceftriazone	212	210	0	2	0.9
Cefuroxime	111	85	2	24	22
Nalidixic acid	117	64	8	45	39
Ciprofloxacin	215	124	22	69	32
Ceftazidime	24	14	1	9	38
Cefotaxime	146	128	1	17	12
Meropenem	86	78	2	6	7.0
Azithromycin	37	23	3	11	30

Figure 3: Temporal relationship between relative risk of typhoid exposure over 7 days accumulated rainfall

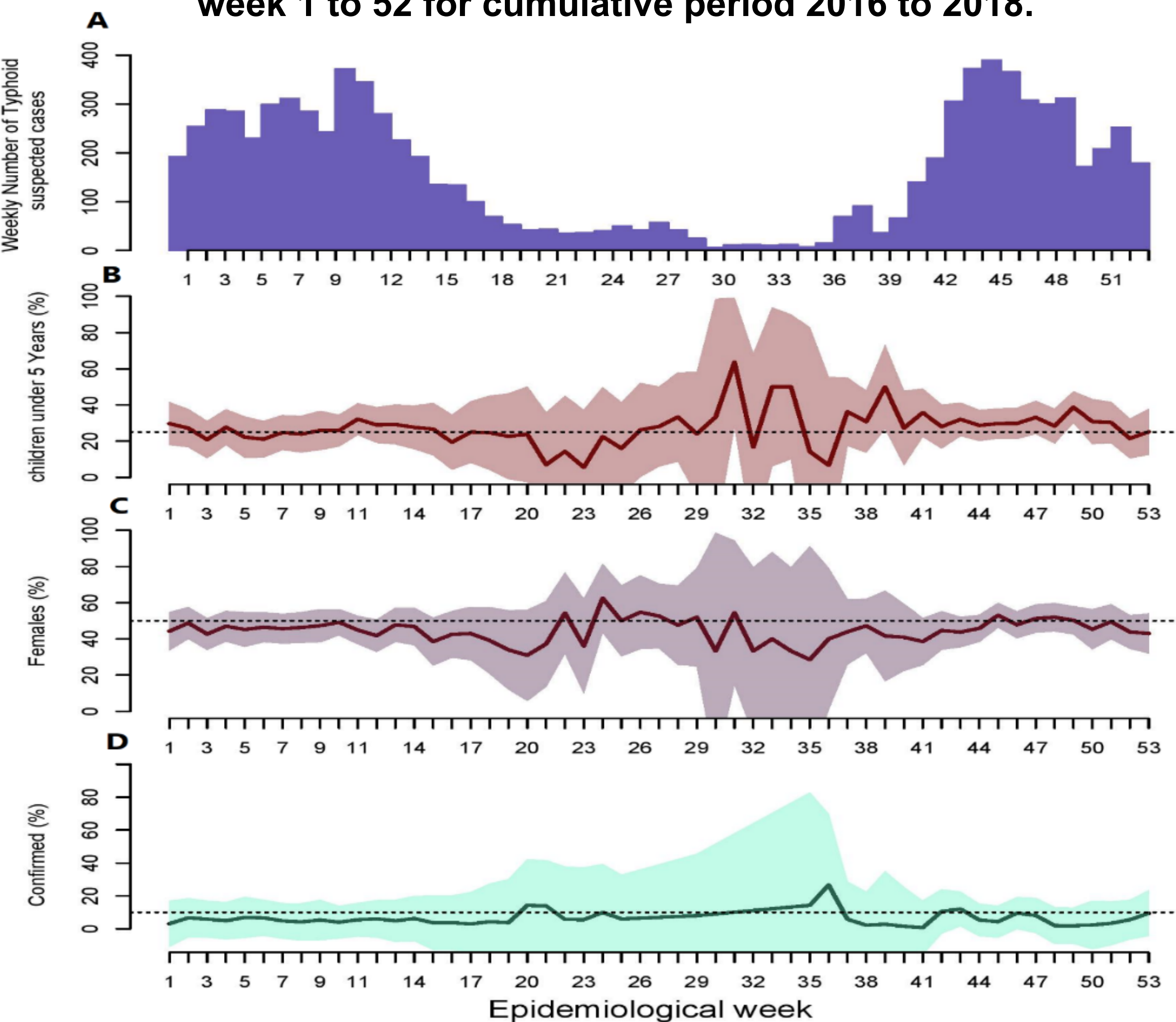


The centre line in each graph shows the estimated spline curve, and the upper and lower lines represent the 95% confidence limits. Red line represent Relative risk, and grey polygon with 95% exact binomial confidence Interval. Rainfall over lags of 0–7 days and 0–14 days. RR represents the relative risk of typhoid (scaled against the mean weekly number of cases).

DISCUSSIONS

- This study provides a unique opportunity to understand the typhoid epidemic in density suburbs with challenges associated with control of typhoid fever.
- We found that the under-fives had highest incidence of typhoid cases. The highest incidence close to 50 percent of cases to adults occurred during dry seasons a pointer of household transmission.
- The epidemic was characterised by four peaks predominantly occurring onset of rains with increase number of cases with increase precipitations.
- We illustrated that typhoid in suburbs of Harare is seasonal, with the risk of reporting cases increasing at the beginning of rainy season. This phenomenon provides a window opportunity for outbreak preparedness, including enhance surveillance system, strategic supplies and training of health workers on case definition.
- Our observation that over 90% of isolate showed decrease susceptibility to common antibiotics use for management especially on nalidixic acid and ciprofloxacin were common during the outbreak suggest that options for antimicrobial therapy becoming limited.

Figure 1: Weekly epidemiological series of typhoid cases from Epi week 1 to 52 for cumulative period 2016 to 2018.



Conclusion

These dynamics might be explained by factors related to sources and modes of transmission, including contamination of boreholes and shallow well, inadequate access to clean water and sanitation. Reduce susceptibility to commonly used antibiotics justify needs to address rising problem of antibiotic resistance and inefficient prescription of antibiotics, antimicrobial surveillance is required to monitor dynamic antibiotic resistance profiles of S. Typhi and MDR strains.

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Ethical statement

The MSF Ethics Review Board granted approval for this study.

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