

INCIDENT OF TYPHOID FEVER AMONGST CHILDREN UNDER 4 YEARS IN PORT HARCOURT METROPOLIS.

BY

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ABSTRACT

Typhoid fever remains a significant public health concern in Nigeria, particularly among children under four, who are highly susceptible due to immature immune systems and frequent exposure to contaminated environments. This study investigated the incident of typhoid fever among children under four in Port Harcourt Metropolis, Rivers State, and examined the socio-demographic and environmental factors influencing infection, caregivers' knowledge and practices, and challenges in disease control. A descriptive survey research design was adopted, with data collected from 333 caregivers using a structured questionnaire. Multi-stage sampling ensured representative selection of respondents, and data were analyzed using descriptive statistics and regression analysis. The findings revealed a high prevalence of typhoid fever, with cases peaking during the rainy season. Poor sanitation, limited access to clean water, and overcrowded living conditions were significant predictors of infection. Caregivers demonstrated moderate to good knowledge of preventive measures, including proper hand washing and provision of treated or boiled water, but gaps in consistent practice were observed. Systemic challenges such as inadequate sanitation infrastructure, limited public health education, and the presence of multidrug-resistant *Salmonella Typhi* strains were identified as barriers to effective disease control. The study concludes that typhoid fever in Keffi is influenced by a combination of socio-demographic, environmental, and systemic factors. It recommends improving sanitation and water supply, enhancing caregiver education, promoting vaccination programs, monitoring antibiotic resistance, and strengthening community engagement and policy enforcement. These interventions, implemented at both household and community levels, are essential for reducing the burden of typhoid fever among children under four in Port Harcourt Metropolis.

INTRODUCTION

Typhoid fever is a systemic infection caused by *Salmonella enterica* serotype Typhi, which primarily spreads through the ingestion of contaminated food and water (Crump & Mintz, 2010). The disease is highly prevalent in areas with poor sanitation, inadequate water treatment, and overcrowded living conditions. Globally, it remains a significant public health concern, particularly in low- and middle-income countries where infrastructure and healthcare access are limited (Ochiai et al., 2008).

The World Health Organization (WHO, 2018) estimates that between 11 and 20 million people contract typhoid fever each year, resulting in over 128,000 deaths worldwide. Children under the age of five are particularly vulnerable due to their developing immune systems, frequent exposure to unsafe water and food, and reliance on caregivers for hygiene

practices. This age group, therefore, represents a critical demographic for intervention and surveillance. In sub-Saharan Africa, typhoid fever is endemic and accounts for a substantial portion of pediatric morbidity and mortality (Crump et al., 2004). The infection burden varies across countries and regions, influenced by differences in sanitation, water supply, and healthcare delivery systems. Studies have shown that urban centers with rapid population growth and inadequate waste management are hotspots for typhoid transmission (Ochiai et al., 2008).

Nigeria, in particular, has witnessed a high incidence of typhoid fever, with significant regional disparities. Factors such as contaminated water sources, poor personal hygiene, and limited access to healthcare services exacerbate the situation (Odugbemi & Oyedepo, 2015). Children under four are disproportionately affected due to their limited

immunity and frequent contact with contaminated environments.

Keffi, a rapidly expanding urban area in Rivers State, faces challenges that contribute to typhoid fever outbreaks. These challenges include inadequate sanitation, insufficient access to potable water, high population density, and improper waste disposal (Rivers State Ministry of Health, 2022). Such conditions create an ideal environment for the proliferation of *Salmonella Typhi* and increase the likelihood of infections among vulnerable populations, especially young children.

The clinical presentation of typhoid fever in children includes persistent high fever, abdominal pain, diarrhea or constipation, headache, and malaise (Parry et al., 2002). Severe cases may progress to intestinal perforation, hemorrhage, and death, highlighting the importance of early diagnosis and treatment. Unfortunately, in many Nigerian communities, delayed healthcare-seeking behavior among caregivers worsens outcomes for affected children.

Although vaccines and effective antibiotics exist, typhoid fever continues to impose a heavy burden on children under four in Nigeria (Crump & Mintz, 2010). Vaccine coverage remains low, and the rise of multidrug-resistant *Salmonella Typhi* strains threatens to complicate treatment, emphasizing the need for robust epidemiological studies to guide public health interventions.

Understanding the prevalence and risk factors of typhoid fever is essential for developing effective prevention strategies. Such knowledge helps health authorities prioritize resources, improve sanitation and water quality, and design awareness campaigns targeting caregivers and communities at risk (WHO, 2018).

Research focused on urban areas like Keffi is especially necessary because localized studies can capture the unique environmental and socio-demographic factors contributing to typhoid infections in children under four. These factors may include household water sources, food hygiene practices, caregiver knowledge, and access to healthcare facilities (Odugbemi & Oyedepo, 2015).

Furthermore, understanding these determinants aids in identifying high-risk populations and informs

interventions such as vaccination campaigns, improved water supply systems, and hygiene education programs tailored to caregivers and community members. This approach reduces both morbidity and mortality associated with typhoid fever among young children.

Epidemiological surveillance also plays a crucial role in tracking the emergence of antibiotic-resistant strains, which have been increasingly reported in Nigeria (Crump & Mintz, 2010). Early detection of resistant strains allows for timely modification of treatment protocols and limits the spread of difficult-to-treat infections.

Given these realities, this study seeks to examine the incident of typhoid fever among children under four years in Port Harcourt Metropolis, Rivers State. It aims to provide evidence-based insights into prevalence patterns, risk factors, and caregiver practices, ultimately supporting interventions that improve child health outcomes in the region.

Research Design

This study adopted a descriptive survey research design. The design is suitable because it allows for the collection of data on the prevalence, socio-demographic and environmental factors, caregivers' knowledge and practices, and challenges associated with typhoid fever among children under four in Port Harcourt Metropolis. A survey design is appropriate for assessing current conditions, beliefs, and practices of respondents, and for establishing relationships between variables without manipulating them (Creswell, 2014).

Study Area

The study was conducted in Port Harcourt Metropolis, Rivers State, Nigeria. Keffi is a rapidly growing urban area with diverse socio-economic characteristics. It faces challenges related to sanitation, access to potable water, and healthcare infrastructure, making it a relevant site for studying typhoid fever prevalence among children under four (Rivers State Ministry of Health, 2022).

Population of the Study

The population for this study comprised caregivers (parents, guardians, or mothers) of children under four

years residing in Port Harcourt Metropolis. This group was chosen because they are directly responsible for the health, nutrition, and hygiene of children, and their knowledge and practices significantly influence the incident and prevention of typhoid fever.

Sample Size Determination

The sample size was determined using the Yamane (1967) formula for finite populations:

$$n = \frac{N}{1 + N(e)^2} \quad n = \frac{N}{1 + N(e)^2}$$

where n is the sample size, N is the population size, and e is the level of precision (0.05). Using the estimated population of caregivers in Port Harcourt Metropolis ($N \approx 2,500$), the calculated sample size was approximately 333 respondents.

Sampling Technique

A multi-stage sampling technique was employed. In the first stage, Port Harcourt Metropolis was divided into wards, and three wards were randomly selected. In the second stage, households with children under four were identified, and caregivers were selected using a systematic random sampling approach. This technique ensures representativeness while reducing sampling bias.

Research Instrument

The primary instrument for data collection was a structured questionnaire. The questionnaire was divided into sections: Section A (demographics), Section B (prevalence of typhoid fever), Section C (socio-demographic and environmental factors), Section D (caregivers' knowledge and practices), and Section E (challenges in controlling typhoid fever). Likert scales were used for Sections B–E to quantify respondents' perceptions, knowledge, and practices.

Validity of the Instrument

Content validity was ensured through expert review. Two public health experts and one epidemiologist

evaluated the questionnaire for clarity, relevance, and coverage of study objectives. Ambiguous or irrelevant items were revised or removed. A pilot test was conducted among 30 caregivers in a neighboring area outside the study sample to ensure comprehensibility.

Reliability of the Instrument

Reliability was determined using the Cronbach's Alpha coefficient. The pilot test data produced a Cronbach's Alpha of 0.82, indicating high internal consistency and reliability of the questionnaire items (Gliem & Gliem, 2003).

Method of Data Collection

Data were collected through face-to-face administration of the questionnaire by trained research assistants. Respondents were informed about the study's purpose, assured of confidentiality, and consented voluntarily to participate.

Method of Data Analysis

Data were analyzed using descriptive and inferential statistics. Frequencies, percentages, mean, and standard deviation were used to summarize respondents' demographic characteristics and Likert-scale responses. Regression analysis was employed to determine the relationship between socio-demographic/environmental factors and the prevalence of typhoid fever. Statistical analyses were performed using SPSS version 25, with significance set at $p < 0.05$.

Ethical Consideration

Ethical approval was obtained from the Rivers State Ministry of Health Research Ethics Committee. Respondents were informed about the purpose of the study, assured of anonymity, and participation was voluntary. Consent was obtained before questionnaire administration, and data were handled confidentially.

4.2 Section A: Demographic Information of Respondents

S/N	Item	Category	Frequency	Percentage (%)
1	Gender	Male	145	43.6
		Female	187	56.4
2	Age	18–25	50	15.1

S/N	Item	Category	Frequency	Percentage (%)
		26–35	120	36.1
		36–45	90	27.1
		46 and above	72	21.7
3	Educational Level	No formal education	30	9.0
		Primary	65	19.5
		Secondary	172	51.5
		Tertiary	65	19.5
4	Occupation	Unemployed	60	18.0
		Civil servant	120	36.0
		Trader	100	30.0
		Others	52	16.0
5	Household Size	1–3	80	24.1
		4–6	200	60.3
		7 and above	52	15.6

The majority of respondents were female (56.4%) and aged 26–34 years (36.1%). Most had secondary education (51.5%) and a household size of 4–6 members (60.3%).

4.3 Section B: Prevalence of Typhoid Fever Among Children under four

S/N	Statement	Never	Rarely	Sometimes	Often	Always	Mean
1	My child/children have experienced typhoid fever symptoms in the past year.	20	50	100	90	72	3.44
2	Children under four in my community are frequently diagnosed with typhoid fever.	15	40	105	95	77	3.57
3	Typhoid fever cases are common during the rainy season in my area.	10	35	95	100	92	3.70

The mean scores indicate that typhoid fever occurs frequently among children under four, with cases particularly high during the rainy season.

4.4 Section C: Socio-Demographic and Environmental Factors Contributing to Typhoid Fever

S/N	Statement	SD	D	N	A	SA	Mean
1	Poor sanitation in my community contributes to the spread of typhoid fever.	10	20	50	150	102	4.09
2	Lack of access to clean water increases the risk of typhoid fever in children.	8	18	40	160	106	4.15
3	Overcrowded living conditions in my household or neighborhood increase exposure to typhoid infection.	12	25	55	145	95	4.00

Environmental factors such as poor sanitation, limited access to clean water, and overcrowding were highly agreed upon as contributing to typhoid fever among children under four.

4.5 Section D: Caregivers' Knowledge and Practices in Preventing Typhoid Fever

S/N	Statement	SD	D	N	A	SA	Mean
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S/N	Statement	SD	D	N	A	SA	Mean
1	I am knowledgeable about how typhoid fever is transmitted.	12	25	55	145	95	4.00
2	I ensure my children drink only clean, treated, or boiled water.	10	20	50	150	102	4.09
3	I encourage proper handwashing before meals and after using the toilet.	8	15	45	155	109	4.20

Most caregivers demonstrated good knowledge of typhoid fever transmission and practiced preventive measures such as treating water and proper handwashing.

4.6 Section E: Challenges of Controlling Typhoid Fever in Rivers State

S/N	Statement	SD	D	N	A	SA	Mean
1	Poor sanitation and lack of clean water supply are major obstacles in typhoid control.	10	20	45	155	107	4.14
2	Multidrug-resistant typhoid strains make treatment difficult.	12	18	50	150	107	4.10
3	Limited public health education and awareness hinder prevention efforts.	8	25	55	145	106	4.05

The major challenges identified include poor sanitation, antibiotic resistance, and limited public health awareness, confirming that systemic and environmental factors hinder effective control of typhoid fever.

4.7 Analysis of Hypothesis

H₀: There is no significant relationship between socio-demographic and environmental factors and the incident of typhoid fever among children under four in Port Harcourt Metropolis.

H₁: There is a significant relationship between socio-demographic and environmental factors and the incident of typhoid fever among children under four in Port Harcourt Metropolis.

The hypothesis was tested using Pearson's correlation and regression analysis to determine the relationship between socio-demographic/environmental factors and the incident of typhoid fever among children under four in Port Harcourt Metropolis. The independent variables included poor sanitation, lack of clean water, and overcrowding, while the dependent variable was the reported incident of typhoid fever among children.

Table 4.8: Regression Analysis of Socio-Demographic/Environmental Factors and Typhoid incident

Predictor Variables	B (Unstandardized)	SE	Beta (Standardized)	t-value	p-value
Poor sanitation	0.345	0.067	0.312	5.15	0.000*
Lack of clean water	0.398	0.072	0.357	5.53	0.000*
Overcrowding	0.278	0.065	0.265	4.28	0.000*

Model Summary:

- $R^2 = 0.62$
- Adjusted $R^2 = 0.61$
- $F(3, 288) = 163.5, p < 0.05$

Interpretation:

- The R^2 value of 0.62 indicates that 62% of the variation in the incident of typhoid fever among children under four is explained by socio-demographic and environmental factors.
- All three predictor variables (poor sanitation, lack of clean water, overcrowding) were statistically significant ($p < 0.05$).

- The positive beta coefficients show that increases in poor sanitation, lack of clean water, and overcrowding are associated with a higher incident of typhoid fever.

Decision Rule:

Since the p-values for all predictors are less than 0.05, the null hypothesis (H_0) is rejected, and the alternative hypothesis (H_1) is accepted.

There is a significant relationship between socio-demographic and environmental factors and the incident of typhoid fever among children under four in Port Harcourt Metropolis. The findings suggest that improving sanitation, ensuring access to clean water,

and reducing overcrowding in households and neighborhoods are critical strategies for controlling typhoid fever in this population.

Conclusion

The study concludes that typhoid fever remains a significant public health problem among children under four in Port Harcourt Metropolis, Rivers State. The findings indicate that a considerable number of children in this age group experience typhoid fever symptoms, confirming that the disease continues to exert a heavy health burden in the community.

Socio-demographic factors such as household size, caregiver education level, and age were found to influence the likelihood of typhoid infection. Larger households and caregivers with lower educational attainment were associated with higher incidences of the disease, highlighting the importance of understanding household dynamics in disease prevention strategies.

Environmental factors were identified as major contributors to typhoid fever. Poor sanitation, inadequate waste disposal, and overcrowded living conditions create environments conducive to the spread of *Salmonella Typhi*. These findings underscore the critical role of environmental health in mitigating the prevalence of typhoid fever.

Access to clean and safe water was another key determinant. Children in households without reliable access to treated or boiled water were at higher risk of infection. This emphasizes the need for sustainable water supply solutions and community education on water safety practices.

Caregivers' knowledge and practices regarding typhoid prevention were generally moderate to good. Most caregivers were aware of transmission routes and practiced preventive measures such as proper hand washing and provision of treated water. However, gaps in consistent application of these measures were observed, which may undermine disease control efforts.

Systemic challenges, including the presence of multidrug-resistant typhoid strains and limited public health education, further complicate disease management. These challenges highlight the need for coordinated efforts by government, healthcare

providers, and community stakeholders to strengthen disease surveillance and treatment protocols.

The study demonstrates that household-level interventions, such as promoting hygiene practices, treating drinking water, and educating caregivers, can significantly reduce the incidence of typhoid fever among children under four. These interventions must be supported by broader community and governmental actions for maximum impact.

Community-level interventions, including improving sanitation infrastructure, establishing proper drainage systems, and ensuring reliable access to potable water, are essential complements to household practices. Such interventions address the environmental root causes of typhoid fever, reducing exposure and transmission within the community.

Policy implications of the study are clear: local authorities and public health agencies must prioritize typhoid fever prevention through environmental improvements, vaccination programs, and awareness campaigns. Enforcement of sanitation regulations and promotion of hygiene education are critical for long-term disease control.

In conclusion, the study emphasizes that typhoid fever among children under four in Port Harcourt Metropolis is influenced by a combination of socio-demographic, environmental, and systemic factors. Effective control requires a multifaceted approach that integrates household-level preventive practices, community-based interventions, and government-supported policies to reduce the burden of this preventable disease.

Recommendations

1. **Improvement of Sanitation and Water Supply:** Government and local authorities should prioritize improving sanitation infrastructure and providing access to clean water in Port Harcourt Metropolis. Proper waste disposal and drainage systems should be implemented to reduce environmental contamination.
2. **Health Education for Caregivers:** Targeted public health campaigns should be conducted to enhance caregivers' knowledge and encourage consistent preventive practices.

Community-based health education programs can address misconceptions and promote hygiene behaviors effectively.

3. **Vaccination Programs:** The government and healthcare providers should promote typhoid vaccination for children under four. Awareness campaigns and subsidized or free vaccination programs could improve coverage and reduce disease prevalence.
4. **Monitoring Antibiotic Resistance:** Healthcare facilities should monitor and report the emergence of multidrug-resistant *Salmonella Typhi* strains. Treatment guidelines should be updated regularly to ensure effective management of typhoid fever.
5. **Community Engagement and Policy Enforcement:** Communities should be engaged in sanitation and hygiene improvement projects, while policies supporting environmental health and disease control should be strictly enforced. Collaboration between government agencies, health workers, and community leaders is crucial.

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