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Original Research Article

EPIDEMIOLOGICAL STUDY OF TYPHOID FEVER PREVALENCE AMONG SUSPECTED CASES IN RAWALPINDI AND ISLAMABAD: IMPLICATIONS FOR PUBLIC HEALTH INTERVENTION

YASMEEN S[*1], PARVEEN T[2], NAZAR K[3]

[1]College of Nursing Nishtar Medical University Multan, Pakistan
[2]College of Nursing King Edward Medical College Lahore, Pakistan
[3]Nishtar Institute of Dentistry Multan, Pakistan
**Corresponding author's email address: yasmeen66@yahoo.com*

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Abstract: *Typhoid fever remains a significant public health concern in Pakistan, particularly in urban areas such as Rawalpindi and Islamabad. Understanding the prevalence of this disease is crucial for informing public health interventions and resource allocation. This study aims to determine the prevalence of typhoid fever among patients suspected of the disease in District Rawalpindi and Islamabad. A cross-sectional study was conducted over three months, from November 2011 to January 2012. A random sample of 500 patients suspected of typhoid fever was collected from various regional hospitals and clinical laboratories. Samples were tested using the Widal test or Typhi dot, and data on patient demographics and test results were recorded. Descriptive statistics, including frequencies and percentages, were used to summarize the data. Prevalence rates were calculated, and subgroup analyses were conducted to explore variations in prevalence among different age groups. Of the 500 samples collected, 95 tested positive for typhoid fever, yielding an overall prevalence rate of 19%. Subgroup analysis revealed that 31.5% of positive cases were in adults, while 68.5% were in children under the age of 15 years. Among children, the prevalence rates varied across different age groups, with 13.8%, 55.3%, and 30.7% of positive cases reported in 1-4 years, 5-12 years, and 12-15 years, respectively. Further analysis estimated the total prevalence of typhoid fever in Rawalpindi and Islamabad, revealing a prevalence rate of 685 per 10,000 individuals among children. This study highlights the significant burden of typhoid fever in Rawalpindi and Islamabad, particularly among children. The findings underscore the importance of targeted interventions to control the spread of the disease, including vaccination campaigns and improved sanitation measures. Continued surveillance and monitoring are essential for tracking trends in typhoid prevalence and guiding regional public health strategies.*

Keywords: Typhoid Fever, Prevalence, Epidemiology, Infectious Disease, Widal test

Introduction

In 430–424 BC, an outbreak of plaque, which some believe to have been typhoid fever, killed one-third of the population of Athens, including their leader and nobles. This shifted the power from Athens to Sparta, marking the end of the Golden Age of Athens in the ancient world. Typhoid fever is caused by salmonella Typhi, isolated in 1880 by Karl J. Eberth. This gram-negative enteric bacillus belongs to the family of Enterobacteriaceae (O'hara, 2005). The term "enteric fever" is a collective term that refers to typhoid fever. Salmonella Typhi is transmitted via fecal-oral routes from infected individuals to healthy ones. Poor hygiene, contaminated food material, and drinking water contaminated by urine and feces of infected individuals are the leading causes of salmonella Typhi infection (Arvanitakis, 2010; Pal et al., 2018). Salmonella Typhi has a combination of different characteristics, making it an effective pathogen. This species contains an endotoxin typical of gram-negative organisms and the Vi antigen, which is thought to increase virulence. It also produces and excretes a protein known as "invasion" that allows non-phagocytic cells to take up the bacterium, where it is able to live intracellularly (O'hara, 2005). Typhoid fever is an endemic disease present worldwide, mainly in developing countries, and is related to poor economic, health, and hygiene conditions. Annually, 16-20 million cases of typhoid fever occur, revealing the significant impact of typhoid fever on human health (Antillón et al., 2017).

Unlike most other gastrointestinal infections, which predominantly affect children aged six months and three years, typhoid fever peaks between 5 and 12 years. This age range indicates that the hygiene conditions of children are poor, and they do not care for their health and hygiene, which shows that typhoid fever is mainly related to the hygiene conditions of individuals (Farooqui et al., 2009). Typhoid infection occurs in every age group of people, with no discrimination based on sex. However, the rate of infection differs in individuals of different ages. Typhoid fever is infrequent under three years, and detection is difficult in children of this age (Parry, 2006; Sinha et al., 1999). Typhoid fever in school-age children and older people is assessed by typhoid vaccine, and the optimum age for immunization as part of public health programs remains unclear. Several factors show the low rates of detection of typhoid fever in preschool year's children (Bhutta, 2006). Typhoid fever may be milder or atypical at this age. The diagnosis of typhoid fever in preschool children is complex, and it may be due to an underdeveloped reticuloendothelial system, which is the index for multiplication of Salmonella Typhi, or due to difficulties in collecting the recommended

5mL blood sample from preschool children for conventional blood culture methods used in endemic areas (Dickson, 2016). The incidence of typhoid fever, particularly in infants and young children, is detected using active surveillance. There are two vaccines recommended by the World Health Organization: the live oral (Ty21a) and the injectable (Typhimvi, Typherix) (Pakkanen et al., 2015). Both are 50% to 80% protective. Boosters are recommended every five years and two years, respectively. An older killed whole-cell vaccine exists, which is still used in countries where they are unavailable. The vaccines are no longer recommended due to their higher side effects (Wahdan et al., 1980).

Methodology

This study was conducted using a cross-sectional design between November 2011 and January 2012. The purpose of the study was to determine the prevalence of typhoid fever within the populations of Rawalpindi and Islamabad. The study collected data over three months, during which a random sampling method was employed to select patients suspected of having typhoid fever from various hospitals and clinical laboratories in District Rawalpindi and Islamabad. Random sampling ensured that each member of the population had an equal chance of being included in the study, thereby minimizing selection bias. The study collected data from 500 patients suspected of having typhoid fever during the specified time frame. The Widal test or typhi dot tested the samples for the disease. Information regarding the age of patients (both adults and children) and the test results (positive or negative) was recorded.

The collected data was summarized using descriptive statistics such as frequencies and percentages. This included the total number of samples collected, the number of positive and negative examples, and the distribution of positive cases among different age groups. The prevalence of typhoid fever was calculated by dividing the number of positive cases by the total number of samples collected. This provided an estimate of the proportion of individuals in the population with the disease.

Subgroup analysis was conducted to investigate variations in prevalence rates among different demographic groups. This analysis examined the prevalence of typhoid fever among other age groups (e.g., adults and children) and within specific age ranges (e.g., 1-4 years, 5-12 years, 12-15 years). The estimated population of Rawalpindi and Islamabad in 2012 was used to calculate the total number of typhoid cases in the region based on the prevalence rate determined from the study data.

The total prevalence rate of typhoid fever was calculated by dividing the total number of cases by the estimated population size and multiplying by 10000 to express the rate per 10,000 individuals. Similarly, the prevalence rate among children was calculated using the number of cases reported in children and the corresponding population size of children in the region. The study findings, including prevalence rates and subgroup analyses, were presented in tables and figures for straightforward interpretation. Additionally, confidence intervals were calculated to assess the precision of prevalence estimates.

Results

According to the data collected from various hospitals and clinical laboratories in District Rawalpindi and Islamabad, typhoid fever is a common disease in Pakistan. The data was gathered from 500 random patients suspected of having typhoid fever over three months from November 2011 to January 2012. The Widal test or typhi dot tested the samples for the disease. The collected data is presented in Table 1

Of the 500 samples, 95 were positive for typhoid, which makes up about 19% of the total, and 405 were negative, which makes 81% (Figure 1).

Of the 95 positive models, 30 were positive in adults (about 31.5%). The remaining 65 (68.5%) were positive in children under the age of 15 years (Figure 2).

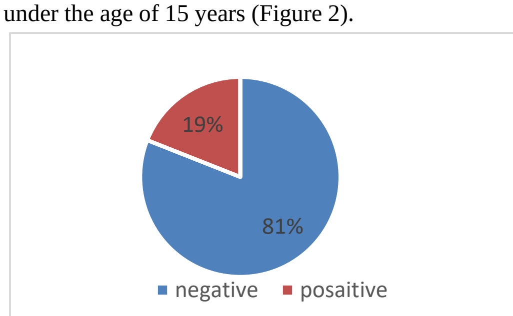

Fig No 1:Ratio between positive and negative sample

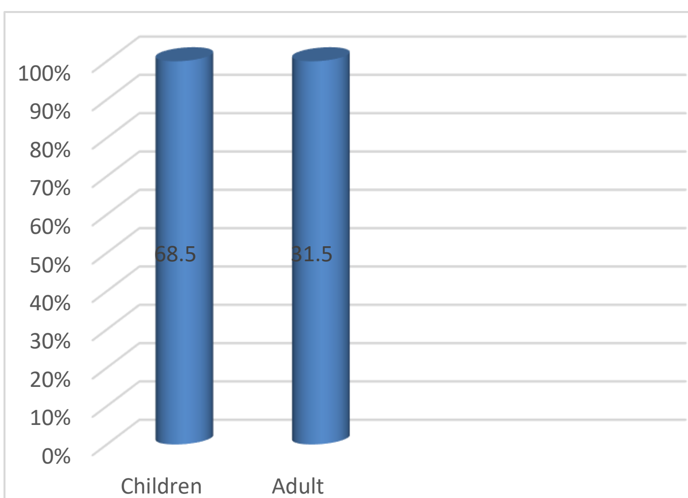

Figure 2:Typhoid ratio in adults and children

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Table 1: Data Collected from Different Hospitals and Clinical Laboratories.

Institutes /Locations	Total samples collected	Positive	Negative	Adults	Children		
					1-4 Yrs	5-12 Yrs	12-15 Yrs
PIMS/ISD	40	6	34	1	1	2	2
Polyclinic/ISD	40	7	33	2	0	3	2
Shifa International/ISD	40	8	32	3	2	2	1
IDC/ISD	20	6	14	2	0	3	1
Ali Medical Centre/ISD	20	7	13	3	1	2	1
NIH/ISD	30	8	22	3	0	3	2
Bio care Lab. /ISD	20	2	8	2	0	0	0
DHQ/RWD	50	6	44	2	1	2	2
Hearts International/RWD	30	5	25	1	0	2	2
Railway Hospital/RWD	30	4	16	2	0	2	0
BBH/RWD	50	8	42	2	1	4	1
BILAL Hospital/RWD	30	4	16	1	0	1	2
CMH/RWD	50	8	42	2	1	4	0
CITI Lab./RWD	50	10	40	3	1	4	2
	500	95	405	30	9	36	20

The results of 65 samples taken from children were classified into three different age groups. Of these, nine models were positive in children aged 1-4 years, accounting for 13.8% of the total positive samples. Thirty-six samples were positive in children aged between 5-12 years, making up 55.3% of the actual positive samples in children. Lastly, 20 models were positive in children aged 12-15, accounting for 30.7% of the total positive samples. This information is also available in Table 2 and Figure 3.

Table 2: Ratio among different children of age group

Serial No	No. Positive Sample	%age
Age 1-4 years	09	13.8
Age 5-12years	36	55.5
Age 12-15years	20	30.7

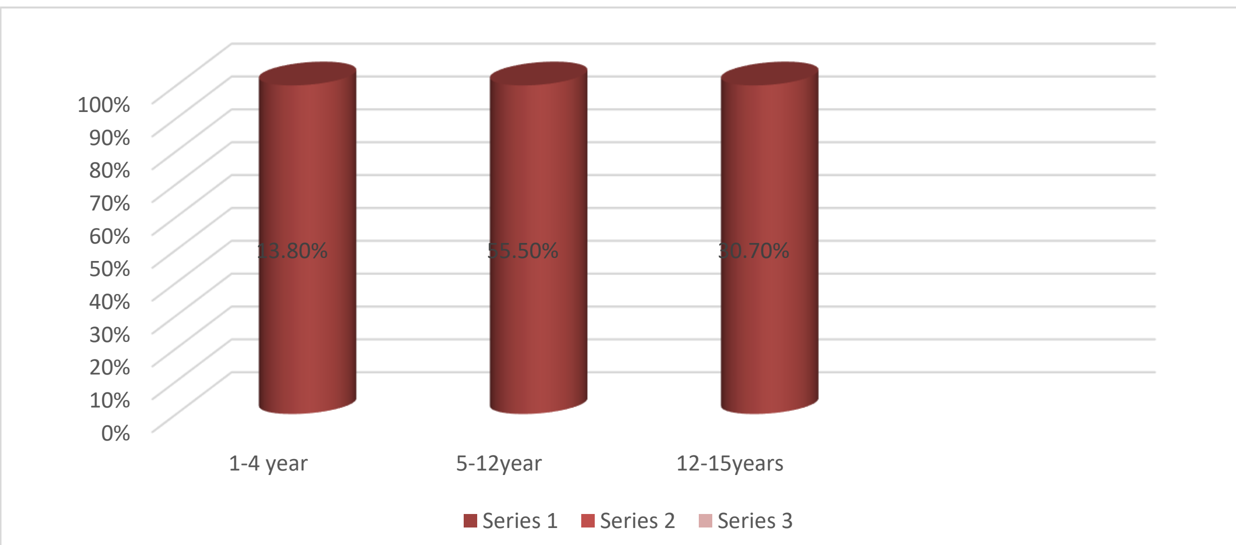

Figure 3: Typhoid ratio among different age children

In 2012, the estimated population of Rawalpindi and Islamabad was around 3 million. Based on our collected data, I have calculated the total prevalence rate of typhoid fever. The total prevalence was 570000, of which 39045 cases were reported in children. Further analysis revealed that the prevalence rate of typhoid fever in children of Rawalpindi and Islamabad is 685/10000.

Discussion

As indicated by our study, the prevalence of typhoid fever observed among suspected cases in Rawalpindi and Islamabad warrants careful consideration. With a rate of 19%, the burden of this infectious disease in the region is significant. Moreover, the disproportionate impact on children, who comprised the majority of positive cases, signals a concerning trend that necessitates targeted intervention strategies. These findings are consistent with previous studies highlighting the persistent prevalence of typhoid fever in Pakistan. However, direct comparisons with historical data may be limited due to variations in study methodologies and population demographics. Nonetheless, our results underscore the ongoing challenge posed by the disease, aligning with international literature emphasizing

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the global burden of typhoid fever, particularly in regions with poor sanitation and limited access to healthcare.

Several factors may contribute to the sustained prevalence of typhoid fever in Rawalpindi and Islamabad. Poor sanitation infrastructure, contaminated water sources, and overcrowded living conditions create conducive environments for transmitting Salmonella typhi (Abara et al., 2012; Khasnis and Nettleman, 2005). Also, low vaccination coverage and inadequate healthcare access may impede effective control of the disease (Ozawa et al., 2019). Understanding these underlying determinants is crucial for designing targeted interventions to reduce typhoid fever's burden (Antillón et al., 2017).

Our findings have significant implications for public health policy and practice in Pakistan. Effective control measures, including vaccination campaigns, improvements in water and sanitation infrastructure, and health education initiatives, are essential for reducing the burden of typhoid fever. Collaborative efforts involving government agencies, healthcare providers, and community stakeholders are necessary to implement these interventions comprehensively. Furthermore, while our study provides valuable insights into the prevalence of typhoid fever in Rawalpindi and Islamabad, further research is warranted to address the remaining gaps in knowledge. Longitudinal studies with larger sample sizes and more robust diagnostic methods like blood culture confirmation would enhance our understanding of disease dynamics. Additionally, investigations into the socioeconomic determinants of typhoid prevalence and the impact of vaccination programs are critical for guiding future public health strategies.

Conclusion

The study found a prevalence rate of 19% for typhoid fever among patients suspected of having the disease in District Rawalpindi and Islamabad, with a higher prevalence rate among children under 15 years old. The findings highlight the significant burden of the disease in the region and underscore the importance of targeted interventions to control its spread, including vaccination campaigns and improved sanitation measures. Continued surveillance and monitoring are essential for tracking trends in typhoid prevalence and guiding regional public health strategies.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.

Ethics approval and consent to participate
Approved by the department Concerned.

Consent for publication
Approved

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Not applicable

Conflict of interest

The authors declared absence of conflict of interest.

Author Contribution

SHAZIA YASMEEN (MSN)
Coordination of collaborative efforts.
Study Design, Review of Literature.
Conception of Study, Development of Research Methodology Design, Study Design,, Review of manuscript, final approval of manuscript.
Conception of
TAHIRA PARVEEN (Principal)
Study, Final approval of manuscript
Manuscript revisions, critical input.
Data acquisition, analysis.
KALSOOM NAZAR (Nursing Superintendent)
Manuscript drafting.
Data entry and Data analysis, drafting article.
Data acquisition, analysis.

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