

Prevalence of typhoid infections in adult patients attending Kajjansi Health Centre IV in Wakiso district. A cross-sectional study.

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Abstract.

Background:

The disease, caused by *Salmonella Typhi* and *Salmonella Paratyphi*, is transmitted mainly through the fecal–oral route and contributes significantly to morbidity and mortality worldwide. This study aimed to determine the prevalence of typhoid infections and associated risk factors among adult patients attending Kajjansi Health Centre IV in Wakiso District.

Methodology:

A cross-sectional study was conducted among 72 adult patients aged 18 years and above presenting with signs and symptoms suggestive of typhoid infection between March and April 2025. Participants were selected using simple random sampling. Data on socio-demographic characteristics and risk factors were collected using structured questionnaires, while venous blood samples were tested using typhoid rapid diagnostic strips based on immunochromatographic principles. Data were analyzed using Microsoft Excel and presented in tables and figures.

Results:

The Overall prevalence of typhoid infection was 63.9% (46/72). Infection was highest among participants aged 18–26 years (29.2%), followed by 26–35 years (19.4%), and lowest among those above 46 years (4.2%). Of the 72 participants, 37 (51.4%) were female, and 35 (48.6%) were male, 55.6% had secondary education, and 48.6% were employed. Participants who did not wash their hands with soap had higher infection rates (30/36), and those consuming untreated water accounted for 26.4% of infections. Risk was also higher among individuals eating unwashed fruits (55.6%) and those leaving food uncovered (23.6%).

Conclusion:

The study revealed a high prevalence of typhoid infection among adults attending Kajjansi Health Centre IV, with young adults being the most affected. Poor sanitation, unsafe food handling, and inadequate water treatment practices were major associated factors.

Recommendations:

Community health education should be strengthened to promote proper hygiene, safe food handling, and household water treatment. Local authorities should enforce sanitation standards, including the provision of latrines and waste disposal facilities.

Keywords: Typhoid fever, Risk factors, Hygiene practices, Water and sanitation, Kajjansi Health Centre IV, Wakiso District.

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Background.

Salmonella is a gram-negative bacterial genus (*Salmonella enterica* and *Salmonella bongori*) with over 2700 serovars. *Salmonella typhi* and *Salmonella Paratyphi* cause life-threatening typhoid fever and *Paratyphi*, respectively, with annual mortalities of over 150,000 worldwide (Sang *et*

al.,2024). Typhoid fever causes global morbidity and mortality and is a significant health burden, particularly in low- and middle-income countries. The direct fecal oral route is the main transmission mode, but indirect environmental transmission could occur, particularly in urban settings (Muhammad *et al.*, 2024). Typhoid infection is responsible for an estimated 9million cases and 110000

deaths globally per year. Typhoid infection is endemic in areas where sanitation, water, and hygiene are poor. Serious complications develop in approximately 10-15% of patients if left untreated (Khanam *et al.*, 2022).

In sub-Saharan Africa, 7.2million cases of typhoid infection occur annually at an incidence rate of 762 per 100000 persons-years when compared to North Africa with a reported incidence rate of 557 per 100000 (Adesigun, O.A *et al.*, 2020). In Ghana, typhoid infection has ranked among the top 20 cases of outpatient morbidity and constituted 1.2%, 1.7%and 1.3% of hospital admissions in 2017, 2016, and 2015, respectively. Typhoid infection remains and continues to be a major public health challenge in the Hohoe municipality (Fusheini *et al.*, 2020).

In East Africa, typhoid infection prevalence is 58% among which 43% are from rural areas without access to improved water supply, and 15% are from urban areas (Mogasale *et al.*, 2014). In Kenya, typhoid infection and invasive non-typhoidal salmonellosis present a huge burden of disease, especially in poor resource settings where clean water supply and sanitation conditions are inadequate. A total of 16236 children were recruited into the study, and the prevalence of non-typhoidal salmonella (NTS), consisting of styhimurium was 1.3%, and *S.typhi* was 1.4%, and was highest among<16years of age. Use of pit latrines and open defecation were significant risk factors for *S.typhi* (Mbae *et al.*, 2020)

In Uganda, typhoid infection cases were reported, which gave an incidence rate of approximately 160 cases per 100000 persons in a year. In Kasese district, typhoid infection cases were reported, giving an incidence rate of 60 cases per 100000 persons yearly. In Kasese, Bwera Sub County registered the highest incidence, distantly followed by Kissinga, Kitholhu, and Nyakiumba sub counties (Mirembe *et al.*, 2019). From 17th February to 12th June 2015, typhoid infection suspected cases were 10230, probable cases were 1038, and 51 confirmed cases. Approximately 2.56% of respondents drank water sold in plastic bags, and 19.23% of respondents consumed locally made drinks. This study aimed to determine the prevalence of typhoid infections and associated risk factors among adult patients attending Kajjansi Health Centre IV in Wakiso District.

Methodology.

Study design

Across sectional study was carried out to assess the prevalence of typhoid infections in adult patients attending Kajjansi H/CIV in Wakiso district.

Study area.

The study was conducted at Kajjansi Health Center IV in adult patients receiving laboratory services. It is located in Kajjansi town, Busiir South, Wakiso district, Uganda. This facility receives an average number of 200 patients on a daily basis, especially the low- and middle-income persons, and this seems to be a core factor of typhoid infections.

Study population.

The population for this study targeted all patients aged 18 years and above attending the laboratory services with clear signs and symptoms of typhoid infections at Kajjansi Health Center IV during the months of March and April 2025. This enabled the researcher to obtain the minimum sample size of samples as there were no restrictions on the type of respondents to participate in the study.

Sample size determination.

This sample size was obtained using (Kish and Leslie 2000) formula as shown below; $n = Z^2pq/d^2$

Where n = the desired sample size

Z = standard normal deviation (1.96) at the 95% confidence level, p = estimated prevalence of typhoid in Uganda as 25 % (0.25)

$q = (1-p), 1-0.25=0.75$

d= permissible error (0.1) Therefore, $n = (1.96)^2 \times 0.25 \times 0.75 / (0.1)^2$

The minimum sample size required =72

Therefore, a total of 72 samples was selected and included in the study.

Sampling technique

A simple random sampling technique was used in this study, where the sample had an equal probability of being chosen. The technique was used to select the respondents, which will enable the researcher to choose a desirable number of participants in the study without bias.

Sampling procedure

Therefore, study objectives were systematically enrolled into the study according to purpose. This was done until the required number of participants was obtained.

Inclusion criteria

Patients of 18 years and above, with clear signs and symptoms, were included in the study regardless of their gender, area of residence, and educational status.

Exclusion criteria

Patients without clear signs and symptoms were not included in the study.

Data collection method

Pre-tested self-administered questionnaires written in English were given out to respondents after obtaining informed consent from them. Collection of blood samples was done, and the test results were obtained after sample analysis.

Data collection tools.

Typhoid strips were used to collect qualitative data that work under the principle of the immune chromatography, the antigen-antibody complex formed a colored band in both the test and control area for a valid test, data collection tool included, provision for number of participants to be involved in the study, date of sample collection, participant's ID, gender, age, ID number and test results after sample analysis.

Data collection procedure

On receiving the consent from the respondents, those who participated in the study were given a questionnaire to which they responded, and later, samples were collected.

Sample collection

Venous blood samples were collected in a red top vacutainer tube, and the blood specimens were labeled and identified as research samples.

Dependent variables

Prevalence of typhoid infections was the dependent variable.

Independent variables

Gender, age, and predisposing factors of typhoid infections were the independent variables.

Quality control

Standard operating procedures were followed during sample collection and during testing. The sample containers were also well labeled with the patient's laboratory number, such that the results correlate accurately to the right patient from whom the samples were obtained. The study used a parallel check by different technicians to control the results obtained.

Data analysis and presentation.

Data was analyzed manually using tally sheets and entered in the computer using Microsoft Word and Microsoft Excel computer programs, and it was quantified in the form of frequency tables, pie charts, and bar graphs for easy interpretation.

Ethical considerations.

Permission and clearance were got from the respective authorities, and the study purpose was thoroughly explained to the respondents. Their consent was obtained (they were issued the consent forms) and their rights respected.

Results.

Social demographic data.

Table 1: A table showing demographic characteristics

Characteristics	Frequency	Percentage (%)
<u>Gender</u>		
Female	37	51.4
Male	35	48.6
<u>Age group</u>		
18-26	27	37.5
26-35	23	31.94
36-46	10	13.89
>46	12	16.67

Education level: Primary, Secondary	28	38.8
Tertiary	40	55.6
	04	5.6
Employment status	08	11.1
Student Employed Self-employed	35	48.6
Unemployed	12	16.7
	17	23.6

From Table 1, the females were the most affected with typhoid infections, with a prevalence of (51.4%), the age group of 18-26 years had the highest prevalence 37.5%, 37.5%. Those of secondary school level were the most affected, with a prevalence of 55.6%, and the patients who were employed had a high frequency of 48.6%.

Prevalence of typhoid infections in adult patients

Table 2: A table showing the prevalence of typhoid infections in adults.

Result	Frequency	Prevalence (%)
Positive	46	63.89
Negative	26	36.11
Total	72	100

From Table 2, out of 72 samples that were examined, a prevalence of 63.89% (46) was discovered to be suffering from TF due to the gram-negative bacterium *Salmonella* genus (*Salmonella enterica* and *Salmonella bongori*); however, 36.11% (26) were negative.

The age group that was most affected by typhoid infections.

Table 3: A table showing the age group that was most affected by typhoid infections.

Age group(years)	Frequency	Positives	Negatives	Prevalence (%)
18-26	27	21	06	29.16
26-35	23	14	9	19.4
36-46	10	04	06	5.55
>46	12	03	09	4.16

From Table 3, Typhoid infections were most prevalent among patients aged 18-26, with a prevalence of 29.16 % (21/72), and least among patients aged >46, with a prevalence of 4.16 % (3/72).

The predisposing factors of typhoid infections in adult patients.

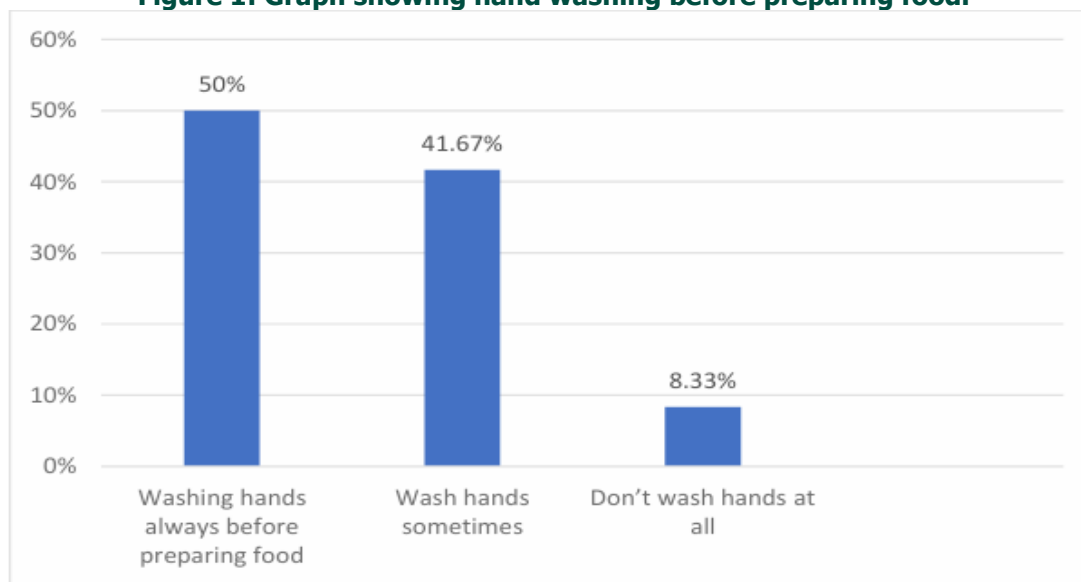
Table 4: Table showing the factors contributing to typhoid infections.

Predisposing factors	Category	Number(n=72)	Positives	Negatives	Prevalence (%)
Having a latrine	Yes	64	28	36	38.9
	No	8	6	2	
Washing hands with soap	Yes	36	10	26	13.9
	No	36	30	6	
Having a rubbish pit	Yes	26	7	19	9.7
	No	46	34	12	
Covering pit latrines to prevent flies	Yes	40	7	33	9.7
	No	32	19	13	

From Table 4, the prevalence of TF was highest, 38.9% (n=28/72), among participants having a latrine. The participants who washed their hands with soap, the prevalence of 13.9% (n=10/72) was for those who had a rubbish pit had a prevalence of 9.7% (n=7/72), and finally, the prevalence of 9.7% (n=7/72) was for those participants who had left their pit latrines uncovered

Food and personal hygiene-related factors.

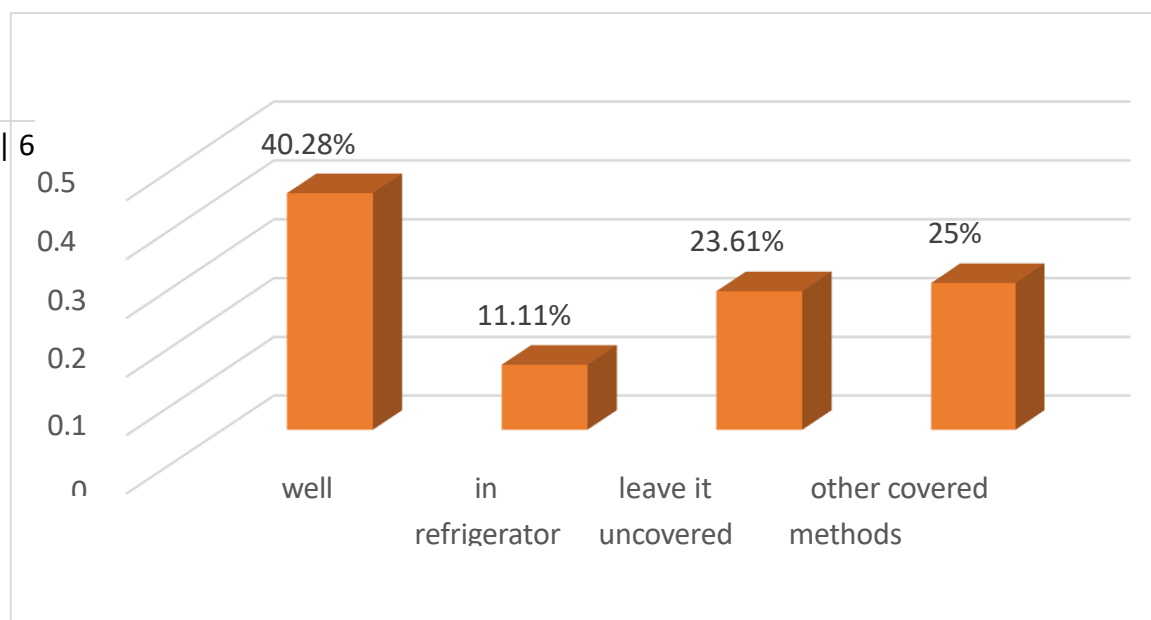
Figure 1: Graph showing hand washing before preparing food.



From Graph 1, most of the respondents always wash their hands before preparing food (50%), followed by 41.67% of them who wash their hands sometimes, and only 8.33% don't wash their hands at all before preparing food.

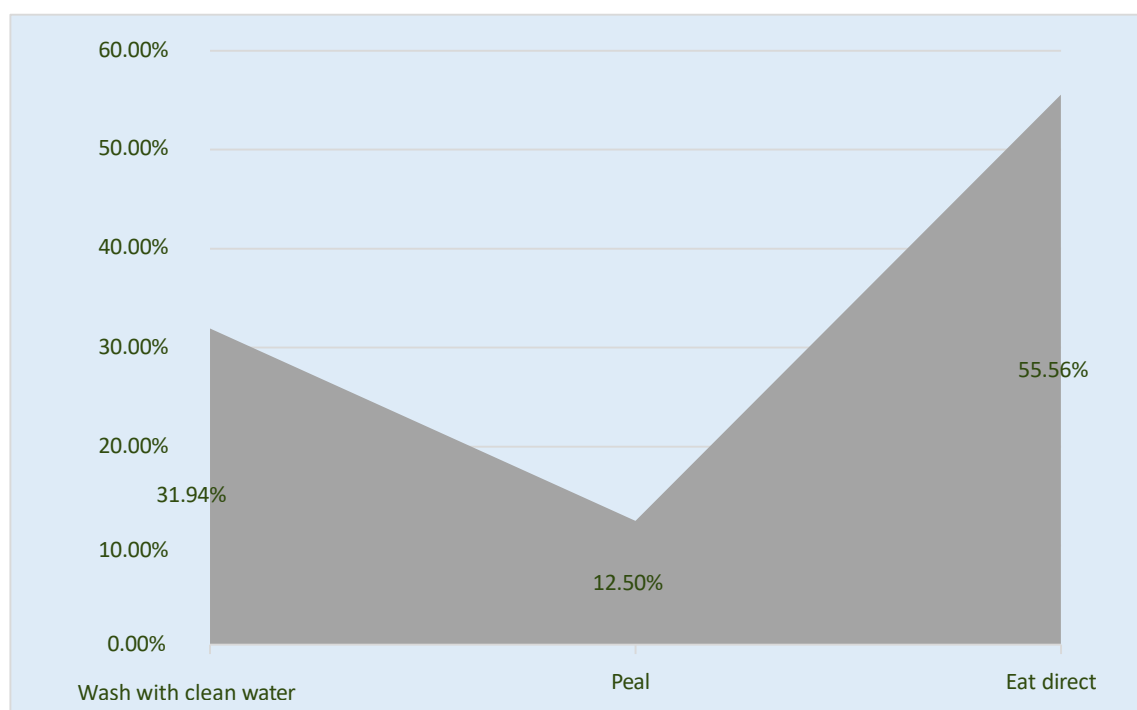
Figure 2: Showing different methods of keeping food for future use.

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From figure 2, most of the respondents keep their food for future use well covered (40.28%), followed by those who use other methods of keeping food safe (25%), a very few keep it in a refrigerator (11.11%), and the rest leave it uncovered (23.61%).

Figure 3: Showing methods of preparing fresh fruits before eating.



From Graph 4, 55.56% of the respondents eat fresh fruits directly from the source, 31.94% wash the fresh fruits with clean water, and the rest (12.50%) peel before eating.

Water-related factors.

Table 5: Table showing sources of water for use at home.

Sources of water	Frequency	Percentage (%)
Get water from the tap	29	40.28
Get water from the borehole	24	33.33
Get water from the well	12	16.67
Get water from the spring	00	00
Get water from other sources	7	9.72
Total	72	100

From table 5, most of the respondents get their water from the tap (40.28%), followed by borehole (33.33%), and then wells (16.67%), and lastly water from other sources like rainwater and swamps (9.72%).

Table 6: Methods of making water safe for drinking.

Methods used	Frequency	Percentage (%)
Boil water	48	66.67
Treat with chemicals	5	6.94
Just drink	19	26.39

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The majority of respondents boil drinking water (66.67%), those who just drink water were (26.39%), and lastly those who treat water with chemicals were (6.94%).

Table 7: Distance of water sources from Latrines.

Distance of water sources	Frequency	Percentage (%)
Nearest is <30m	25	34.72
The nearest is about 30m	15	20.83
Nearest is >30m	28	38.89
Do not know	4	5.56
TOTAL	72	100

Table 7 shows most of the respondents fetch water from sources more than 30 meters away from any nearby latrines (38.89%), followed by those who estimated the distance of their water sources to be less than 30 meters away from the latrines (34.72%), (20.83%) estimated their distance of their water sources to be about 30 meters and finally (5.56%) did not know the distance of their water sources from the nearby latrines.

Discussion.

The Prevalence of Typhoid infections among the participants.

From this study, over 60% of the respondents were infected with the gram-negative bacterium of genus (*Salmonella enterica* and *Salmonella bongori*), and a few of them were negative.

This study also revealed that the respondents aged 18-26 years were the most prevalent to Typhoid infections. And the findings agree with Abioye's findings 2017, the infection was highest in the age group 21-25 years, which had 86.36% prevalence (Abioye *et al.* 2017).

Predisposing factors of Typhoid infections/ Sanitation factors.

According to this study, over 60% of the respondents had latrines at home, while the remaining few had no latrines at home. This study also revealed 50% of the participants wash their hands either with or without soap after visiting latrines, and 50% respondents do not wash their hands with soap.

Furthermore, up to 55.6% of the respondents cover their pit latrines, and a few don't cover their pit latrines.

Despite the majority of the households having latrines and a modest number having rubbish pits, there is still a significant risk of getting into contact with fecal matter and exposure to Typhoid fever among the respondents in this study.

Food and personal hygiene-related factors.

The study indicated that most of the respondents always washed their hands, and others didn't wash their hands sometimes before preparing food (50% and 41.67%, respectively). And 8.33% didn't wash their hands at all, while a further 55.56% eat fruits without washing. It also showed that 23.61% of the respondents leave food uncovered for future use, where flies and other household creatures like rats and cockroaches can easily get access to and contaminate it.

Water-related factors associated with Typhoid infection.

From this study, a majority of respondents get water from taps (40.28%), followed by those who get water from boreholes 33.33% and a few get water from wells 16.67%, and rain or swamps 9.72%. The study also showed that most respondents 66.67% boil water for drinking, 6.94% treat water with chemicals, and the rest just drink untreated water directly from the source. Furthermore, the respondents collect water from water sources more than 30 meters away

from nearby latrine (38.89%), while 34.72% collect water less than 30 meters from the nearby latrine and 20.83% estimated the distance of water source to be about 30 meters away from the nearby latrine and the rest do not know the distance of their water sources from the nearby latrine.

This study also showed similar findings to (Bhutta et al., 2019 and Gamal et al., 2014), whereby Prior studies documented the risk factors for typhoid infection, like poor living conditions with unsafe water, lack of adequate sanitation (Bhutta *et al.*, 2019). The major complications are intestinal hemorrhage and perforation, whereby if the disease is not treated, it causes morbidity and mortality (Gamal *et al.*, 2014).

It can be deduced that the risk factor of contracting Typhoid infections in this area is high, as some of the respondents drink untreated water collected from boreholes and swamps. The respondents with their water sources located 30 meters or less from a nearby latrine are at risk of consuming contaminated water.

Conclusions

Most respondents eat fresh fruits without either washing or peeling. Some of the respondents do not wash their hands before preparing food; furthermore, some respondents leave cooked food uncovered, and a few preserve cooked food in a refrigerator.

There are respondents without a rubbish pit, and pit latrines at home, and almost half of the respondents do not cover their pit latrines.

A significant number of respondents drink untreated and un-boiled water directly after collecting from boreholes, rainwater, or water from the swamps.

There are, therefore, very significant risks of eating contaminated food, getting into contact with fecal matter, or drinking contaminated water, and exposure to Typhoid infections among respondents.

Recommendations.

Residents should be sensitized to regular washing of hands after visiting latrines and before preparing or eating food. They should also be sensitized on washing and/or peeling fresh fruits before eating, and how to treat water at home before drinking, using cheap, simple, and effective methods like filtration, boiling, and using water treatment agents like Aquar Safe and Water Guard.

Local health and law enforcement require households in this area to have rubbish pits and pit latrines to avoid a potential outbreak of Typhoid fever.

The study used the questionnaire and checklists as data collection tools; therefore, future studies should incorporate other methods of data collection, such as direct observation.

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List of abbreviations.

TF — Typhoid Fever
HC IV — Health Centre IV
OPD — Outpatient Department
SPSS — Statistical Package for the Social Sciences
SOPs — Standard Operating Procedures
LMICs — Low- and Middle-Income Countries
IgM — Immunoglobulin M
IgG — Immunoglobulin G
ID — Identification
WHO — World Health Organization

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Conflict of interest.

There is no conflict of interest.

Availability of data.

Data used in this study are available upon request from the corresponding author.

Authors contribution.

DN designed the study, conducted data collection, cleaned and analyzed data, and drafted the manuscript.

RM supervised all stages of the study from conceptualization of the topic to manuscript writing and submission.

AS supervised the research process.

HN supervised the research process.

JFN supervised the research process.

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