

# Knowledge Attitude and Practice of Food Handlers on Prevention and Transmission of Typhoid Fever in Adama Science and Technology University Students Café

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## Abstract

**Background:** Food handlers are as a person who directly engages in the handling of food, or who handles surfaces likely to come into contact with food for a business. Typhoid fever is one of the frequently occurring among the major diseases which are reported as food borne illnesses. Close contact with infected person, using infected water and food, poor food handling and poor practice of food handlers are major risk factors for the diseases. Food handlers play an important role in ensuring food safety throughout the chain of production, processing storage and preparation of foods

**Objective:** To assess knowledge, attitude and practice of food handlers towards prevention and transmission of typhoid fever in Adama science and technology University, south east Ethiopia, 2023.

**Method:** An institutional based cross-sectional study design was conducted in Adama science and technology University students 'cafe among 177 food handlers in 2023; to measure knowledge, attitude and practice of food handlers on prevention and transmission of typhoid fever. A conventional random sampling technique was carried out to interview number of food handlers in study area. The data was collected from Mar1 to June 7, 2023. Finally, the result was presented using texts, tables and figures.

**Result:** The level of knowledge about how typhoid fever is transmitted and prevented was low among study participants; only 34.6% and 38.6%, respectively, knew how typhoid fever spreads and how it is prevented. The most commonly mentioned methods of preventing typhoid fever were washing hands with soap before eating (87.3%), drinking boiled water (75.7%) and washing hands before cooking, cooking food thoroughly and eating food while hot (75.7%). Most respondents (96%) reported seeking medical assistance when sick, with 95.8% of them seeking care from religious sources of health care.

**Conclusion and Recommendation:** Even though majority of study participants had poor knowledge and attitude level on how to handle food in Adama University students' cafe, the food handlers had good practice level on prevention and control on typhoid fever activities in the Adama science and technology university students' cafe.

**Keywords:** Typhoid fever, Knowledge, Attitude, practices, Food Handler.

## 1. Introduction

### 1.1 Background

Typhoid fever is a systemic prolonged febrile illness caused by certain *Salmonella* serotypes including *Salmonella typhi*, *S. paratyphoid A*, *B* & *C*. It is a life-threatening systemic disease characterized by step-wise rise of fever (38-41°C) and frequent abdominal manifestations. It continued to be a major endemic disease in developing countries where there are unsanitary practices (1).

Among different genus of *enterobacteria*, *salmonella* is one of the most medical important bacteria, which is a gram-negative rod shaped, flagellated, motile and facultative anaerobic (2). Generally, the typhoid fever onset is after 10-14 days with different symptoms which are dependent on some factors. After ingestion in food or water, typhoid organisms pass through the pylorus and reach the small intestine (3).

Then they penetrate the mucous layer of the gut and traverse the intestinal layer through phagocytic micro fold (M) cells that reside within Peyer's patches and become phagocytized. Once phagocytosed, salmonellae disseminate throughout the body in macrophages via the lymphatic and colonize reticuloendothelial tissues (liver, spleen, lymph nodes, and bone marrow), where it resides during the incubation period (4).

The worldwide incidence was estimated to reach up to 17 million cases and about 600,000 deaths per annum. Areas with high disease burdens include South and East Asia and Africa (5). The causative agent of typhoid fever was first isolated in the late 19<sup>th</sup> century, and the first serological test for the diagnosis of the disease was introduced in 1896 by Fernand Widal. Widal test is based on the principle of agglutination reaction between *Salmonella enteric* serotype Typhi somatic (O) and flagella (H) antigens and agglutinations produced against them. Due to this Widal test is still widely used in developing countries including Ethiopia. Although Widal test is relatively cheap, easy to

understand, timely to perform and requires simple training and equipment as compare other techniques that are used for the diagnosis of typhoid fever like bacterial culture and DNA amplification (6). Fecal contamination with food, water, nails, and fingers etc., may suggest the importance of fecoral, human to human transmission. Accordingly, food handlers with poor personal hygiene working in food serving establishments could be potential sources of infections including salmonellosis, with the potential of causing diarrheal diseases. Although governments all over the world are doing their best to improve the safety of food supply, the occurrence of food borne disease remains a significant health issue in both developed & developing countries (7)

## 1.2 Statement of the problem

In the world, around 21.5 million people have been infected in each year, particularly in Asia, Africa and South America. There are approximately five million children in each year on more than 13,600 children's die from diarrhea disease, According to United nation in the developed world, the estimation exceeds 10,000 deaths, and an average of 500 children's death reported annually (4,8).

South of the Sahara, and Latin America was an endemic area due to different situations. From those situations which are attributed to rapid population growth, increased urbanization, inadequate sanitation, and insufficient water supply and crowding in homes and settlements (9).

In Democratic Republic of Congo between 2004 and 2005 more than 42,500 cases and 214 deaths due to multi resistant strains of Salmonella typhi are becoming increasing in worldwide; mostly people live in regions which have high endemic diseases (8).

Transmission of the infection is by feco-oral route, when contaminated food or water is consumed or from contaminated hands (10). The incubation period may be difficult to determine due to insidious onset, and mild or atypical clinical picture. However, it ranges usually from 8–14 days (8).

Although typhoid fever is much less in developed countries, it remains as a serious public health problem in several other countries like Asia region. In this study about 315 are in high incidence rate from 3,600,534,000 populations and about 10,118,879 are typhoid fever cases. It is rare in developed countries now a day, but still it infects the persons who traveled to the poor sanitary system and lack of antibiotics. In 2002, a study done in developing countries shows that among typhoid fever infected individuals 262 about 70 % (183) had traveled unemotionally within 6 weeks before outset of disease. In other hand 400 cases occurred in each year, and 75% of those are acquired due to international traveling, this is because of great burden in developing countries (3, 11).

Typhoid fever is common among crowded and impoverished populations with inadequate sanitation and is transmitted through ingestion of water or food that have been contaminated by feces or less commonly, urine, of infected humans (12).

Typhoid fever has become a major problem with an estimated annual incidence of 540 individuals per 100,000 populations. The information in sub-Saharan Africa region is very series and the issue clearly requires urgent and rapid action, particularly in

east Africa (Ethiopia and Kenya) which seems to have a high burden of typhoid fever (13).

Study in Addis Ababa, Ethiopia, which was conducted for investigation of typhoid fever outbreaks in children, indicates that 55.6% of the patients were with clinical impression of typhoid fever. Blood culture confirmation was positive for 34 out of 54 cases with 63% positivity rate (14). Even though, all conducted research & reports from different health institutions in Ethiopia indicate that typhoid fever was still a common problem up to the most recently. Therefore, this study will be tried identify the gap of the knowledge, attitude and practice among food handlers towards prevention and transmission of typhoid fever in Adama Science and Technology University Students café.

## 1.3. Significance of the study

The result of this research will provide important information to Adama Science and Technology University and enable them to plan intervention program on typhoid fever infections. This study is expected to provide the knowledge Attitude and Practice of Food handler on prevention and transmission of typhoid fever to control the diseases.

Knowing the risk factors helps us to take action early on the risk factors to decrease occurrence of typhoid fever. This study may help as a base for further study on the rest of risk factor in the area or else were in the country. It also provided recommendation for the concerned authority.

The findings of this study can also be used by policy makers to effectively manage typhoid fever and to tackle problems that happen due to preventable factors contribute to typhoid fever. The finding helps the Food Handler and the health workers to know the magnitude of the problem in the study area/

## 2. Objective

### 2.1 General objective:

➤ To assess the knowledge, attitude and practice of food handlers towards prevention and transmission of typhoid fever in Adama Science and Technology University Students Cafe, south east Ethiopia, 2023

### 2.2 Specific objectives

- To determine the knowledge of food handlers about prevention and transmission of typhoid fever.
- To determine attitude of food handlers on prevention and transmission of typhoid fever.
- To determine practices of food handlers on food processing and preparation to prevent typhoid fever.

## 3. Methods And Materials

### 3.1 Study Area and Period

The study will be conducted in Adama Science and Technology University. From MAR 1, 2023- JUNE 07, 2023 G.C. Adama is located 79 km from Addis Ababa on the way to Harar and it is found in East Shewa zone of Oromia region of Ethiopia.

### 3.2 Study design

An institutional based cross sectional study design was conducted.

**3.3. Population**

*3.3.1 Source of population*

All food handlers working in Adama Science and Technology University Students cafeteria in Adama town.

*3.3.2 Study population*

All food handlers enrolled in Adama Science and Technology University Students’ cafeteria for food preparation and who were selected by convenience sampling method.

**3.4 Inclusion and Exclusion criteria.**

*3.4.1 Inclusion criteria*

- All food handlers working in cafeteria who are included in convenience sampling method and willing to participate.
- All food handlers who are routinely came into direct contact with food in the course of production.

*3.4.2 Exclusion criteria*

Therefore, by using the above formula.

$$n = \frac{[Z_{\alpha/2}]^2 p(1 - p)}{d^2}$$

Where, n = desired sample size

$$n = \frac{[1.96]^2 0.649(1-0.649)}{(0.05)^2} = 348$$

since total population less than 10000, using correction formula

$$n_f = \frac{n}{1 + \frac{n}{N}} = \frac{348}{1 + \frac{348}{300}} = \frac{348}{1 + 1.16} = \frac{348}{2.16} = 161$$

**N=--300**

nf =final sample size

**N=total population**

Non-respondent rate was assumed 10% for refusal to participation, which is 16. Then the final sample size will be **177**

*3.5.2 Sampling technique*

The study participant was selected by conventional Random sampling method from the source population.

**3.6 Variables**

*3.6.1 Dependent variable*

- knowledge, attitude and practice of food handlers towards prevention and transmission of typhoid fever

*3.6.2 Independent variables*

- age
- sex
- marital status
- immunization status
- type of food establishment
- income

**3.7 Data collection and analysis**

*3.7.1 Data collection instruments*

The data collection was conducted by self- administered structured questioner with socio-demography (6 questions), knowledge related question (7 questions), attitude related question (7 questions) practice related question (12 questions) and check list for general observation (9 questions) in total 41 items was utilized for the study.

- Eligible Food handlers who were not presented at data collection

**3.5 sampling**

*3.5.1 Sample size*

To determine the sample size, we used the following single proportion population formula

d = Marginal error = 0.05

z = the standard normal variable or deviate, α was 0.05 with 95% confidence interval [1.96].

p = Estimated proportion, for knowledge (**64.9 %**) from Southwest Nigeria to test their knowledge on food safety information gathered from the food handler’s to deduced the level of their knowledge or awareness about Salmonellosis (typhoid infection or fever (18).

*3.7.2 Data collection Procedure/technique*

Data was collected using structured questionnaires. Face to face interview was used

*3.7.3 Data quality control measures*

To keep the quality of collected data, questionnaires was translated from English to local language for better communication with the respondents and then translated back to English to check consistency. A pre-test was conducted to see the practicability of the questionnaire’s Five percent (5%) of the sampling population were carried out. The sampling was selected by using conventional random sampling and proper checking was conducted for the sake of data completeness and accuracy.

*3.7.4 Data analysis*

After data collection, the questionnaire was checked for completeness and data entry was made using EPI DATA version 3.1 and the entered data was exported to STATA version 15.0 software. Descriptive statistics and categorical data analysis.

### 3.8 Operational definitions

**Knowledge-**in this study a food handler is considered as having good level of knowledge if she/he correctly answered more than half (50%) of all items(questions) used to measure knowledge.

**Attitude-** in this study a food handler is consider as having positive attitude if she/he correctly answered more than half (50%) of all items(questions) used to measure attitude.

**Practice-** in this study a food handler is consider as having good level of practice if she/he correctly answered more than half (50%) of all items(questions) used to measure practice.

### 3.9. Ethical Consideration

Before the study began, Ethical clearance was obtained from Rift Valley University, Adama Campus, College of Health and Medical Sciences Institutional Health Research Ethics Review Committee (IHRERC). Permission letter obtained from school of graduate studies was submitted to Adama Science and Technology University administration to get permission for the study from each hierarchy. Informed, voluntary, written and signed consent was taken from the for each individual participated in the study. The data collector also informed as the

collected data will not result in any harm to the user and offer full rights and freedom to take part in the study. Participant's name will not be appeared on data collection tool and confidentiality was maintained.

### 3.10 Expected outcome

This study will determine the knowledge attitude and practice of food handlers on prevention and transmission of typhoid fever decrease the morbidity associate with typhoid fever. In addition, this study will identify the common predictors of typhoid fever

## 4. Result

### 4.1 Socio-demographic characteristics

A total 177 respondents comprising 70 (39.5%) males and 107 (60.45%) females were enrolled into the study. Most respondents were aged 25-34 years (36.1%) followed by 15-24 years (32.7%). Fifteen (8.4%) respondents had no formal education; however, 44.6% and 26.5%, respectively, had completed primary and secondary education. (Table.1)

**Table.2** Socio-demographic characteristics of respondents in Adama Science and Technology university food handlers, Ethiopia (2023)

Variable	Category	Number	%
Age (years)	15–24	58	32.7
	25–34	64	36.1
	35–44	24	13.5
	45–54	15	8.5
	≥55	16	9.2
Gender	Male	70	39.3
	Female	107	60.7
Educational level	Pre-school	23	13.2
	Primary	79	44.6
	Secondary	47	26.5
	Tertiary	13	7.3
	None	15	8.4
Marital status	Single	62	34.87
	Married	93	52.76
	Separated/Divorced/Widowed	22	12.37

### 4.2 Knowledge and attitude of hygiene and sanitation:

69.10% (122) of the respondents have good knowledge towards food handling whereas 36.10% (55) have poor knowledge towards food handling. 51% (90) of the respondents have good attitude towards food handling whereas 49 % (87) have poor attitude towards food handling. 93(52.76%) participants reported to have heard about typhoid fever before the outbreak. The HEW was the most common source of information reported by respondents 89(50.3%) followed by community meetings 56 (31.6%). Only 46(26%) of respondents reported having received health education during the course of the outbreak. Among this group, sources of health education reported were health facility staff (44.8%), house-to-house hygiene promoters 82(46.5%) and

community meetings 80(45.4%). The level of knowledge about how typhoid fever is transmission and prevention were low among study participants; only 61(34.6%) and 68(38.6%), respectively, knew how typhoid fever spreads and how it is prevented. Many respondents 146(82.3%) identified eating contaminated food as the manner in which typhoid fever infection is contracted, followed by eating with dirty hands 133(75%) and drinking contaminated water 118(66.8%). The most commonly mentioned methods of preventing typhoid fever were washing hands with soap before eating (87.3%), drinking boiled water 134(75.7%) and washing hands before cooking, cooking food thoroughly and eating food while hot 134(75.7%). (Table 2-2.2).

**Table 3.** Knowledge and attitude of *Salmonella typhi* prevention and control methods in Adama Science and Technology university students' cafe (2023)

Variables	Responses	Number	%
Heard about typhoid fever	Yes	93	52.8
	No	84	47.2
Source of information on typhoid fever	Ministry of Health/health workers	89	50.3
	Media (TV, radio, newspapers, posters...)	39	22.3
	Community meeting	56	31.6
Received health education	Yes	46	26
	No	131	74
Source of health education	Health facility staff	79	44.8
	House-to-house hygiene promoters	80	45.4
	Street campaigns	17	9.8
	Place of worship	4	2.3
	Camp school	12	6.9
	Community meetings	82	46.5
Knowledge of how typhoid fever spreads	Yes	61	34.6
	No	116	65.4
Knowledge of how typhoid fever is transmitted	Drinking contaminated water	118	66.8
	Eating contaminated food	146	82.3
	Eating with dirty hands	133	75
	Contact between houseflies and food	66	37.5
	Contact with vomit or stool	45	25.4
	Drinking water stored over one day	33	18.5
Knowledge of how typhoid fever is prevented	Yes	68	38.6
	No	109	61.4
Knowledge of ways to prevent typhoid fever	Drinking treated and boiled water	134	75.7
	Wash hands with soap before eating and after leaving the toilet	155	87.3
	Washing hands before cooking, cooking food thoroughly and eating food while hot	134	75.7
	Washing fruit, vegetables and boiling vegetables	94	52.9

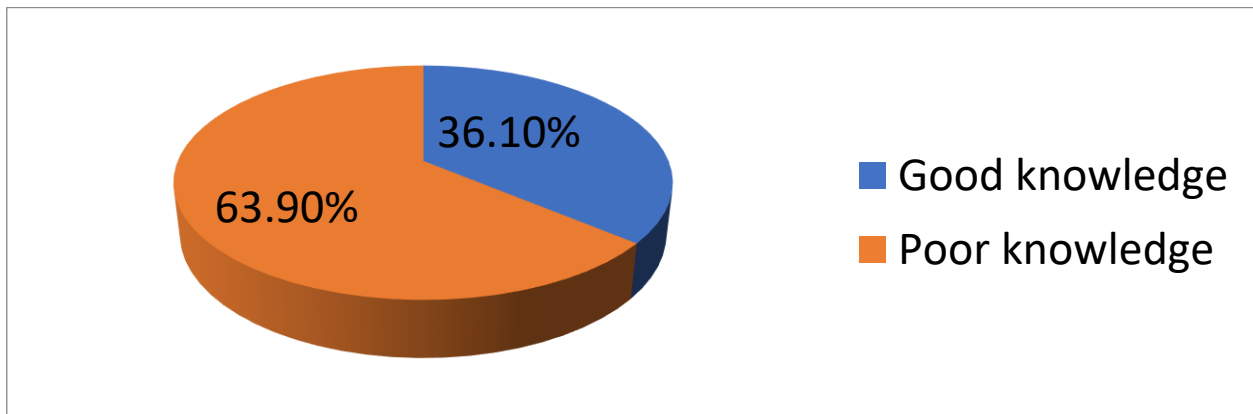
**Table 2.1** Attitude of *Salmonella typhi* prevention and control methods in Adama Science and Technology university students' cafe (2023)

Do you agree the typhoid fever is communicable diseases?	strongly agree	77(44%)
	agree	60(34%)
	disagree	44(25%)
	strongly disagree	0
How much do you agree with medical checkup of food handlers to minimize transmission of typhoid fever?	strongly agree	35(20%)
	agree	45(25%)
	disagree	55(31%)
	strongly disagree	42(24%)
Do you believe that food handler without hand washing facilitate transmission of typhoid fever?	I believe	78(44%)
	I don't believe	60(34%)
	I don't know	39(22%)
Do you believe that treating typhoid patient helps as to prevent typhoid fever?	I believe	80(45%)
	I don't believe	65(37%)
	I don't know	32(18%)
Do you agree with typhoid carrier transmute the diseases through improper food handling?	strongly agree	90(51%)
	agree	54(30%)
	disagree	33(19%)
	strongly disagree	0
Do you agree that person with typhoid fever don't have to work in food and drinking establishment?	strongly agree	81(46%)
	agree	55(31%)
	disagree	41(23%)

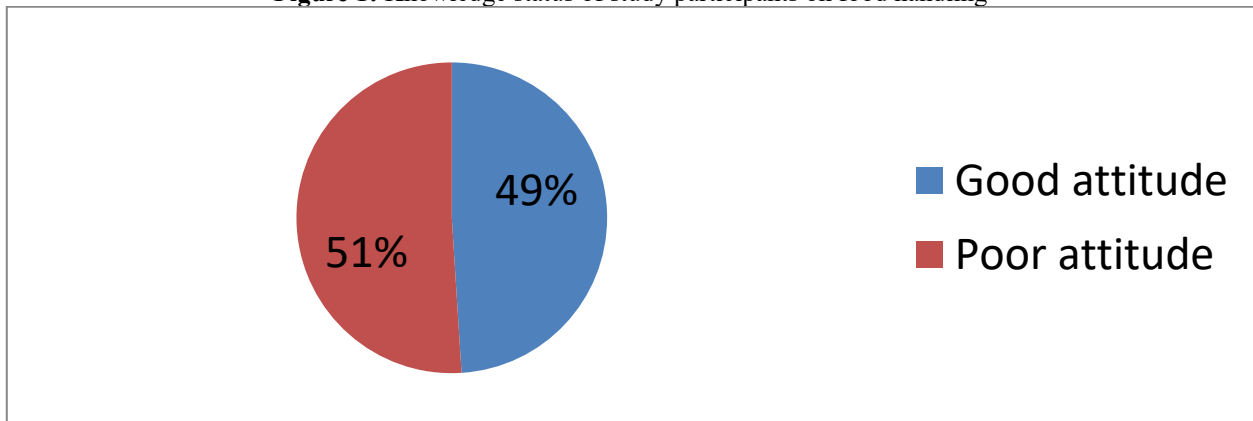
	strongly disagree	0
Do you think proper wearing of food working cloth has importance in prevention of typhoid fever?	I believe	82(46%)
	I don't believe	70(41%)
	I don't know	25(13%)

**Table 2.2 Practice of *Salmonella typhi* prevention and control methods in Adama Science and Technology university students' cafe (2023)**

Do you have medical checkup certificate for typhoid fever?	yes	32(18%)
	no	145(82%)
Does the establishment have latrine?	yes	177(100%)
	no	0
Does the establishment have shower service for food handlers?	yes	177(100%)
	no	0
Do you clean the kitchen every day?	yes	167(94%)
	no	10(6%)
Do you wash your hand before preparing food?	yes	177(100%)
	no	0
Do you continue working when you are sick?	yes	177(100%)
	no	0
Do you wash your hand after toilet	yes	177(100%)
	no	0
If yes, what do you use?	water only	15(8%)
	soap	152(86%)
	others	10(6%)
Do you wash your cloth frequently?	yes	167(94%)
	no	10(6%)
Do you wear proper cloth during food preparation?	yes	177(100%)
	no	0
Do you cut your nail frequently?	yes	177(100%)
	no	0



**Figure 1:** Knowledge status of study participants on food handling



**Figure 2** Attitude status of study participants on food handling.

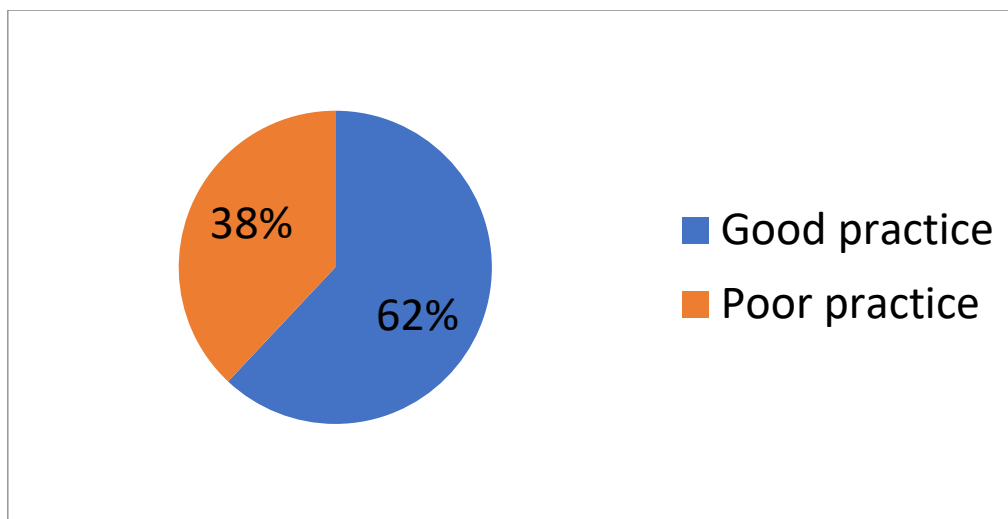
### 4.3 Practice of hygiene methods for prevention and control of *Salmonella typhi*

When asked question on what fecal disposal facilities they frequently use, most respondents (98.2%) reported using pit latrines for feces disposal. Respectively 61.5% and 59.0% of respondents reported that they always washed their hands before eating and after using the latrine prior to the time that preventive

and control measures were instated; during the same period, close to 25% reported that they sometimes or never washed their hands. At the time of data collection, the proportion of people who reported to always wash their hands before eating and after using the latrine had increased significantly to 71.3% and 71.7%, respectively. About 87.0% of respondents reported using soap when they wash their hands and 13% used water only. (Table4)

**Table 5.** Distribution of KAP about *Salmonella typhi* prevention among controls and cases in Adama Science and Technology University students’ cafe, Ethiopia (2023)

KAP	Responses	Case (%)
Knowledge washed hands before eating	Always	130 (73.5)
	Sometimes or never	47 (26.5)
Knowledge on washed hands after toilet prior	Always	127 (71.8)
	Sometimes or never	50(28.2)
Knowledge on currently washes hands before eating	Always	171 (96.5)
	Most of the time	6 (3.5)
Attitude on currently washes hands after toilet	Always	172 (97.0)
	Sometimes or never	5 (3.0)
Has heard about typhoid fever	Yes	85(48.2)
	No	92 (51.7)
Attitude on Receiving health education	Yes	43(24.1)
	No	134 (75.9)
Knows how typhoid fever spreads	Yes	59 (33.5)
	No	118 (66.5)
Knowledge how typhoid fever is prevented	Yes	66(37.5)
	No	110 (62.3)
practice on Seeks medical assistance when sick	Yes	167 (94.1)
	No	10 (5.9)



**Figure 3:** Practical status of study participants on food handling.

### 5. Discussion

Outbreaks of communicable diseases such as typhoid fever significantly contribute to increased morbidity and mortality during situations of mass population displacement. Poor environmental and living conditions, overcrowding and inadequate access to health and social services such as health care, clean water and adequate sanitation usually characterize such situations. These conditions increase the risk of outbreaks of water and foodborne diseases and hamper the timely control of those outbreaks. Hence, it is important to institute effective,

evidence-based and participatory preventive and control measures to mitigate outbreaks as quickly as possible. Availability of adequate quantities of safe water, improved sanitation facilities, as well as very good knowledge, attitude and most importantly, consistent and correct practice of appropriate hygiene and sanitation methods are critical to the prevention and control of such outbreaks. Thorough understanding of these dynamics in Adama Science and Technology University students’ café is therefore critical and this study contributes to that objective. In general, our findings

showed that knowledge towards typhoid fever prevention and control was low among the study population, which may have contributed to the prolonged transmission of *Salmonella typhi* in the University. Only a quarter of respondents had received health education about typhoid fever prevention and control during the outbreak and only 34% knew how the disease is transmitted despite ongoing community mobilization and hygiene education at the time of the study. Furthermore, less than 40% of respondents knew how typhoid fever can be prevented. House-to-house hygiene promotion, the main source of health education among the food handlers of Adama Science and Technology University students' Café, accounted for less than 50% of the information provided to respondents; this demonstrates a further challenge to community mobilization and participation in hygiene education interventions in the University.

This trend may be attributable to four main reasons. First, the coverage of community mobilization and hygiene education may have been inadequate to ensure sufficient knowledge levels and behavioral change among the food handlers. Second, the methods of community mobilization and hygiene education may have been inappropriate for this setting. Experience has shown that in such settings, constant repetition and reinforcement of information is required to achieve behavioral change. To this effect Participatory Hygiene and Sanitation Transformation (PHAST) approach could have been used as an incremental method to achieve required community participation in promoting hygiene and health. Third, there may have been challenges to the quality of hygiene education messages and products used for community mobilization among food handlers. Fourth, community hygiene promoters and Community Health Workers who were responsible for hygiene education about typhoid prevention and control may not have been fully trained in hygiene promotion and prevention of hygiene-related diseases. Thus, their inadequate knowledge and skills may have been a barrier to conducting adequate community mobilization and achieving quality hygiene education. Among study participants, there was low incidence of open defecation in the university and improvement in the practice of typhoid fever prevention and control methods, such as hand washing. 37% washed their hands before eating and a 39% increase in the proportion who washed their hands after using the latrine. Furthermore, the proportion of respondents who reported to always wash their hands was high during the same period and 87% reported using soap for hand washing. These findings may be attributed to a sufficient number of provided latrines and hand washing stations located strategically among Adama Science and Technology university students' café. However, my observations of hygiene practices showed deficiencies in hand washing methods, which may be another reason for the prolonged outbreak. We observed that the hand washing methods used fell short of WHO recommendations; thus, infective organisms such as typhoid bacteria may not be completely eliminated from students' café hands after using the latrine. Given that the anal cleansing method is widely used for self-cleaning after latrine use, the risk of sustained transmission of typhoid bacteria is high.

Poor hand-washing practices might be linked to gaps in the health information provided to the community by the hygiene promoters and CHWs responsible for hygiene promotion and community mobilization. Our observation of practice also

revealed several other high-risk behaviors, such as preparation and serving of food near open drainage systems, use of open drainage ditches and poor management of waste water; an example of the latter is channeling waste water into ditches where pipes for clean water are laid, which may result in contamination through seepage. There is some evidence that people who spent longer time in students' cafe are expected to have been exposed to hygiene promotion activities and would have adopted good hygiene practices, but this was not always the case in students, cafe; similar findings were observed in Adama Science and Technology students' cafe. This hypothesize that those who had spent longer periods in the cafe had become complacent, as compared with new arrivals. These findings are consistent with those of similar studies demonstrating an association between poor knowledge of foodborne diseases and socio-demographic characteristics, such as low education level and age under 45 years, which influenced the attitudes of food handlers at a medical college in India (23). These results have been further confirmed by studies conducted in Bangladesh, Nigeria, Tanzania, Cameroon, South Africa and South Sudan (23, 24). These findings provided evidence for better targeting of community mobilization and hygiene education interventions. However, these findings were in contrast with those of similar studies in Ghana and Pakistan (25), which reported good knowledge, attitudes and practices towards typhoid fever in the surveyed communities.

## 6. Conclusion and Recommendation

### 6.1 CONCLUSION

Even though majority of study participants had poor knowledge and attitude level on how to handle food in Adama science and technology University student's cafe, the food handlers had good practice level on prevention and control on typhoid fever activities in the Adama Science and Technology university students' cafe. However, practice methods of key hygiene activities, such as hand washing, were observed to be inadequate, which may be a plausible reason for the prolonged transmission of *Salmonella Typhi* in the University. These findings highlight the fact that outbreak response interventions in the study population, particularly community mobilization and hygiene education, were ineffective.

Having formal education, being government employee and being house wives may be factors significantly associated with good knowledge of life style modification. Therefore, it is necessary to understand these patients' factors in order to develop effective strategies and interventions that enlist the patient as a participant in the management of their health.

### 6.2 RECOMMENDATION

Based on these findings, we recommend reinforcement of health education and hygiene promotion activities for food handlers in Adama Science and Technology University students' café. During future outbreaks, specific groups, such as people with low levels of education, those who are working as food handlers in should be targeted to receive appropriate hygiene, sanitation and health information. In addition to provision of water and soap, the promotion of the correct method and frequency of hand washing with soap and water is also recommended among Adama Science and Technology University students' café food handlers. Furthermore, we recommend proper training, supervision and monitoring of community hygiene educators and CHWs.



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