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Research Article

Prevalence of Typhoid Fever and its Risk Factors in Lalo Assabi District, West Wollega, Oromiya, Ethiopia

Kumsa Eba, Damtew Bekele*

Department of Biology, College of Natural and Computational Sciences, Ambo University, Ambo, Ethiopia

ABSTRACT

Typhoid fever is a cause of morbidity worldwide and a major public health problem in Ethiopia and other developing countries. The objective of the study was to assess the prevalence of typhoid fever and its risk factors among the study participants in rural and urban community of Lalo Assabi District, West Wollega Zone, Ethiopia. The study design used in this study was a community based cross sectional. The method used was a secondary data from all the District health stations and laboratory diagnosis. In the present retrospective study result, the prevalence in 2014-2018 was 10% from secondary data. In this study 76.9% of the respondents had knowledge about typhoid fever. However, it was revealed that 58.6% males and 60.4% females were claimed to have suffered from typhoid fever. Among this, typhoid fever was higher in illiterate, elementary school and high school students than respondents with certificate, diploma and degree holders ($p<0.001$). The study found out that 93% of respondents who used pit latrine, 61.6% were suffered with typhoid fever. Also 60.3% of the respondents disposed the solid wastes on field that have direct proportional relation for prevalence of typhoid fever ($\chi 2=20.83$, df=3, $p<0.001$). In case of water supply and prevalence of typhoid fever, largest percent (75%) who drunk from river water were suffered with typhoid fever. Additionally, the study found out that 54.9% patients had typhoid fever based on clinical examination and serological test results. This indicated that the risk factors were still continued and that there were no effective control measures in place. Therefore an understanding of factors that influence the occurrence of typhoid fever in Lalo Assabi District was important in the management of the typhoid fever and environmental sanitation by group minimizes the risk factors.

Keywords: Lalo Assabi District; *Salmonella typhi*; Typhoid fever; Typhoid prevalence; Widal test

BACKGROUND

Typhoid fever is a systemic prolonged febrile illness caused by certain *Salmonella* serotypes including *Salmonella typhi*, *S. paratyphi A*, *S. paratyphi B* and *S. paratyphi C* [1]. Enteric fever is a generic term for infections caused by both *S. typhi* and *S. paratyphi*. Typhoid and paratyphoid fever refers to the infections caused by the individual serovars. It remains a significant health burden, particularly in resource poor regions of the world [2].

Typhoid fever is common among crowded and impoverished populations with inadequate sanitation and is transmitted through ingestion of water or food that has been contaminated by faeces or less commonly, urine of infected humans. Without effective treatment, typhoid fever has a case fatality rate of 10%–30% [3]. Other contributing factors include delay in diagnosis, emergence of antibiotic-resistant strains, problems in the identification and management of carriers and the lack of availability of safe, effective and cheap vaccine. Increase in regional movement of large numbers of migrants is another important factor where there is rapid economic expansion.

Typhoid fever is also a problem in developed countries although the reason for this is different as most of the disease is acquired abroad or from chronic carriers who handle food [4]. Studies show that *Salmonella* can survive for days in ground water/sea water and for months in contaminated eggs and the infectious dose may vary between 103-106 organisms [5]. The incubation period is about 5 to 21 days [6]. Besides the above mentioned risk factors, climatic variables such as rainfall, vapor pressure and temperature have been shown to have important effects on the transmission and distribution of typhoid infections in human populations

Correspondence to: Damtew Bekele, Department of Biology, College of Natural and Computational Sciences, Ambo University, Ambo, Ethiopia, E-mail: damtish2002@gmail.com

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[7]. There is no animal reservoir for enteric fever and therefore transmission occurs only among humans. The transmission is complicated by the presence of chronic asymptomatic carriers which forms a reservoir for the infecting bacteria.

Enteric fever arises mainly in areas with poor water quality and sanitation. These two factors suggest that there should be possibilities for regional elimination of the disease. However, large efforts are needed in many areas to reach such a goal [8]. One area of great importance is the improvement of diagnostic methods since current methods suffer from major limitations [9]. Inaccurate diagnostic methods have consequences for infected individuals, with increased risks of complications due to inaccurate treatment. Because of the high prevalence of the disease in developing countries that lack adequate sewage disposal and water treatment, elimination is currently unrealistic [10].

Globally, an estimated 12-33 million typhoid fever cases occur and even if the estimates vary from time to time, 190,000–600,000 deaths per year occur due to typhoid fever [11]. According to WHO report and other studies, south-central and south-east Asia are the main regions of the world where typhoid fever is highly prevalent [2]. A recent study in Ethiopia indicated that, the prevalence of typhoid fever cases is high, although coordinated epidemiological surveillance is necessary to know the true burden of the disease [9,12].

The causative agent of typhoid fever was first isolated in the late 19th century and the first serological test for the diagnosis of the disease was introduced in 1896 by Fernand Widal [13]. The test is based on the principle of agglutination reaction between *Salmonella enterica serotype typhi* somatic lipopolysaccharide O and flagellar H antigens and agglutinins produced against them [14].

The disease is communicable for as long as the infected person excretes *S. typhi* or *S. paratyphi* in the feces or urine. A study [12] showed *Salmonella typhus* is widespread in the community. Being an important communicable disease in the national list, typhoid fever has received considerable control efforts at national, regional and District levels. However, despite all the efforts taken to control, the disease continues to occur in Lalo Assabi leading to significant morbidity. Therefore the objective of this study was to assess available data to determine the temporal occurrence of typhoid fever as well as the associated risk factors in Lalo Assabi District. However, there is still a knowledge gap concerning environmental and personal hygiene in the study area. Therefore, the study would also look at the risk factors and knowledge of the residents about the disease in the study area.

MATERIALS AND METHODS

Study area description

The study was conducted in Lalo Assabi District which is found in Oromiya Regional State, West Wollega Zone. It is about 490 km away from Addis Ababa and has four town Kebeles (the lowest administrative unit of Ethiopia) and 27 rural Kebeles. It is bordered on East by Ghimbi town, on the West by Gulliso District, on the North by Boji Birmaji District and on the South by Ganji District. The administrative center for this District is Inango town. It experiences bimodal rainfall starting from July-October; the rest of the year remains dry. It is one of the drought prone areas of the country and the main source of water supply is river water. The District has about three government health stations and one known private health clinic.

Geographically, the District lies between 9°-20°N latitudes and 35°-45°E longitudes. The total area coverage of the District is estimated at 76 to 261 hectares of land. The altitude of the District ranges from 1500 m to 1900 m above sea level with the annual rain fall of 1750 mm and the mean annual minimum and maximum temperature of 20°C and 30°C respectively. One of the Ethiopian coffee varieties known as Wollega coffee is mainly grown in the West Wollega zone including Lalo Assabi District. The map of the study area is indicated in Figure 1.

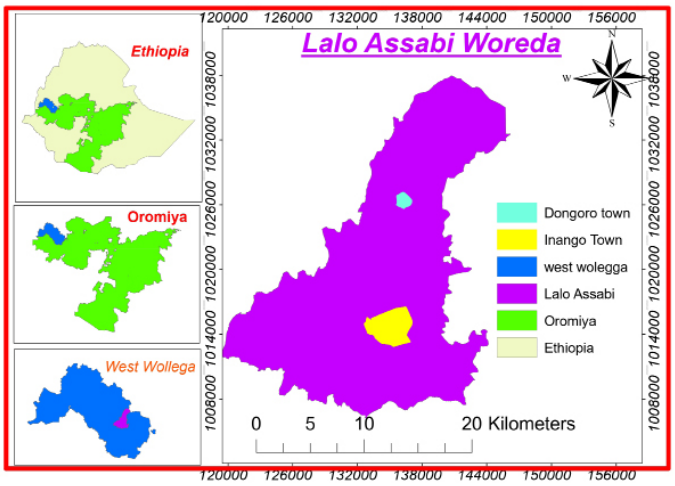

Figure 1: Map of Lalo Assabi District, West Wollega, Oromiya regional state.

Study design and period

A community based cross sectional study was conducted to assess the prevalence of typhoid fever and its risk factors in Lalo Assabi District during the period between December 2018 and August 2019. The study started with analyzing secondary data from local health stations of the District and primary data were obtained from respondents through structured questionnaires and the laboratory diagnosis using widal test. Observation of the area was also made during the data collection.

Source of population

The study population consisted of adults aged eighteen years and above. The questions were presented for only one family member. The source of population was all patients having symptoms of typhoid fever attending in one of the three health station (Wanjo, Inango and Dongoro) and who were willing to give verbal consent and blood sample.

Sample size determination

The sample size was determined by using the following formula [15].

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

Where n is the sample size, N is the population size, and e (0.05) is the level of precision. Accordingly about 398 respondents were determined.

Sampling technique and procedure

The study was carried out using simple random sampling

technique to select both Kebeles and respondents. Accordingly five Kebeles (two from town Kebeles and three from rural Kebeles) were selected. From the selected Kebeles 398 respondents were selected.

Then close and open ended questionnaires were prepared regarding typhoid fever risk factors, personal hygiene, environmental sanitation and ways of eating foods and drinking water and socio-demographic factors.

Also, secondary data records between 2014 and 2018 were obtained from three health stations. Then observation of the study area was made across the village during data collection. Eventually the diagnostic arm of the study was involved for screening community members/patient who attended Inango health station using blood samples to confirm chronic carriers of *Salmonella typhus* by cooperative work with laboratory technicians.

Widal test procedure

Widal test was done according to the procedure described which is used by the present health centers [16]. Agglutination was a positive test result and if the positive reaction was observed with the test sample, it indicated presence of clinically significant levels of the corresponding antibody in the patient's serum.

Inclusion and exclusion criteria

All household heads or their representatives aged above 18 years and individuals that have permanent residence in the area for at least six months were included whereas critically ill as well as homeless respondent or individual who moves from place to place were excluded based on a study [17].

Data analysis

The data collected through the above methods were coded; tabulated and analyzed using Statistical Package for Social Sciences (SPSS) version 20.

Descriptive statistics like frequencies and percentage as well as inferential statistics like chi-square test was used to check whether or not there exists a significance difference between the socio-demographic groups, prevalence and risk factors of typhoid fever, knowledge, attitude and practice toward personal and environmental hygiene of the respondents. A p value ≤ 0.05 was considered to be statistically significant.

RESULTS

Socio-demographic characteristics of the study participants

As shown in Table 1, in study areas, females constituted 54.5% while males were 45.5%. The majority of the respondents (30.4%) were aged between 28-37 years; whereas the least percentage (18.6%) was those with age above 47.

The majority (30.2%) of the respondent's attained secondary school and the least percentage (5.5%) of respondents was illiterate. Majority (56.5%) of the respondents have medium income (1500-2000) per month, however, 19.6% were grouped under low income (<1500) Birr per month.

Table 1: Socio-demographic characteristics of the respondents, Lalo Assabi District.

No	Variables	Categories	Frequency (n=398)	Percentage (%)
1	Gender	Male	181	45.5
		Female	217	54.5
2	Age group	18-27	107	26.9
		28-37	121	30.4
		38-47	96	24.1
		>47	74	18.6
3	Residence	Rural	240	60.3
		Urban	158	39.7
4	Level of education	No reading and writing	22	5.5
		4-Jan	41	10.3
		8-May	116	29.1
		12-Sep	120	30.2
		Certificate	25	6.3
		Diploma	34	8.5
		Degree	40	10.1
5	Occupation	Employed	55	13.8
		Un-employed	171	43
		Self-employed	172	43.2
6	Marital status	Married	235	59
		Single	158	39.7
		Divorced	5	1.3
7	Marital status	<3	108	27.1
		5-Mar	197	49.5
		7-May	76	19.1
		>7	17	4.3
8	Religion	Coptic orthodox	70	17.6
		Muslims	26	6.5
		Protestant	282	70.9
		Other	20	5
9	Marital status	>2000	95	23.9
		1500-2000	225	56.5
		<1500	78	19.6
Total		398	100	

Bivariate analysis of socio-demographic characteristics for typhoid fever prevalence

The study findings revealed that majority (76.9%) had knowledge about typhoid fever. They were informed through health extension workers suggesting that control of typhoid would be easy for them if such awareness was practically applied. Those who had awareness were two times more than who do not (AOR=2.394 with a 95% CI=1.991-2.878). Also, majority of the residents

(76.1%) reported that typhoid fever was a preventable disease while 23.9% did not. The results showed that majority (71.4%) of the study population said they had suffered typhoid disease one time or another in their lifetime, while (28.6%) did not. The respondents those who suffered were three times than who were free (AOR=3.591 with a 95% CI=2.794-4.615). Furthermore, the mass of the respondents reported that ≥ 2 (66.8%) of persons were affected by typhoid fever per family and only about 33.2% were either free or affected among the respondents (AOR=0.45 with a 95% CI=0.391-0.518).

Sex, age, level of education and occupation versus occurrence of typhoid fever

These study results revealed that, 58.6% males and 60.4% females claimed to have suffered from typhoid at one time or another in their life time. This indicates that males and females were at risk with relatively equal chances of being infected by the disease and therefore equally susceptible, although this was not statistically significant (χ^2=0.133 df=1 p=0.715) (Table 2).

The annual occurrence of typhoid fever in Lalo Assabi district from 2014-2018

The secondary data regarding prevalence of typhoid fever in Lalo Assabi District was collected from three health stations (Inango,

Table 2: The independent variables and occurrence of typhoid fever, Lalo Assabi District.

Risk factors		Frequency (%)	Typhoid fever		χ^2	p value
			Positive	Negative		
Sex	Males	181(45.5)	106(58.6)	75(41.4)	χ^2=0.133	0.715
	Females	217(54.5)	131(60.4)	86(39.6)		
Age group	18-27	107(26.9)	74(69.2)	33(30.8)	χ^2=14.46	0.002
	28-37	121(30.4)	61(50.4)	60(49.6)		
	38-47	96(24.1)	66(68.8)	30(31.3)		
	>47	74(18.6)	54(73)	20(27)		
Level of education	Illiterate	22(5.5)	18(81.8)	4(18.2)	χ^2=54.3	0
	4-Jan	41(10.3)	28(68.3)	13(31.7)		
	8-May	116(29.1)	94(81)	22(19)		
	12-Sep	120(30.2)	68(56.7)	52(43.3)		
	Certificate	25(6.3)	11(44)	14(56)		
	Diploma	34(8.5)	14(41.2)	20(58.8)		
	Degree	40(10.1)	17(42.5)	23(57.5)		
Occupation	Employed	172(43.2)	113(65.7)	59(34.3)	χ^2=8.235	16
	Un-employed	171(43.0)	112(65.5)	59(34.5)		
	Self- employed	55(13.8)	25(45.5)	30(54.5)		
	Total	398(100.0)	250(62.8)	148(37.2)		

Table 3: Comparison of sanitation with washing and occurrence of typhoid fever.

Independent variables		Claim of suffering (%)	No claim of suffering (%)	Total (%)	χ^2 Statistic
Kind of toilet	Flush	8(28.6)	20(71.4)	28(7.0)	χ^2=11.78 df=1 p=0.001
	Pit latrine	228(61.6)	142(38.4)	370(93.0)	
	open defecation	0	0	0	
	Total	236(59.3)	162(40.7)	398(100.0)	
Solid waste disposal	On field (yard)	176(73.3)	64(26.7)	240(60.3)	χ^2=20.83 df=3 p=0.000
	Into garbage can	20(41.7)	28(58.3)	48(12.1)	
	In the ditch	39(59.1)	27(40.9)	66(16.6)	
	On road side	32(727)	12(27)	44(11.1)	
	Total	267(67.1)	131(32.9)	398(100.0)	
Drainage quality	Leaking	102(61.4)	64(38.6)	166(41.7)	χ^2=20.10 df=2 P=0.000
	Polluted water	160(82.5)	34(17.5)	194(48.7)	
	Give smell	26(68.4)	12(31.6)	38(9.5)	
	Total	288(72.4)	100(25.1)	398(100.0)	
Washing hand after toilet	Not practiced	74(64.9)	40(35.1)	114(28.6)	χ^2=26.24 df=2 p=0.000
	Using soap	25(29.1)	61(70.9)	86(21.6)	
	Without soap	108(54.5)	90(45.5)	198(49.7)	
	Total	207(52.0)	191(48.0)	398(100.0)	
Kind of houses	Permanent	59(46.5)	68(53.5)	127(31.9)	χ^2=18.62 df=2 p=0.000
	Semi-permanent	130(69.1)	58(30.9)	188(47.2)	
	Temporary	57(68.7)	26(31.3)	83(20.9)	
	Total	246(61.8)	152(38.2)	398(100.0)	

Wanjo and Dongoro) based on clinical and laboratory diagnosis. Results indicated that there was a fluctuating trend of typhoid occurrence without death in the study area. The annual typhoid disease burden decreased from 2153 cases in 2014 to 1654 cases in 2015, followed by an increase to 2277 cases in 2016 and finally further down to the lower prevalence of 1193 cases recorded in 2017. However, the disease incidence decreased again to 1048 cases in 2018. The overall typhoid record between 2014 and 2018 indicated a fluctuation trend from 2153-1048 cases. In general there were about 1665 cases on average each year.

Risk factors associated with the prevalence of typhoid fever in Lalo Assabi district

The present finding revealed that, majorities (93%) of respondent were used pit latrine during urine and feaces excretion and a very few (7%) of respondents were used flash toilet. As indicated, from the table 93% of the respondents who used pit latrines, 61.6% were suffered with typhoid fever (Table 3). Those who disposed of their wastes in a flush toilet were almost ten times less than those who did not, yet they suffered from typhoid as well ($\chi 2$ =11.78 df=1 p=0.001).

Water sources, availability, treatment and occurrence of typhoid fever

The result showed that, 47.7, 37.2 and 15.1% of respondents used spring, taped water and river respectively in study areas. Although, no one used roof harvesting water in those areas, they reported that roof harvesting was usable during the rainy season. In case of water supply and prevalence of typhoid fever, largest percent (75%) who drunk from river water were suffered with typhoid fever. However, the respondent who drunk from spring and taped water were also suffered with typhoid fever with values of 58.9% and 45.9% respectively. These results indicated that there were more than one sources of water in the study area with the spring water being more used in the area followed by tap and river water respectively ($\chi 2$=15.52 df=2 p<0.001).

Preventive and control measures of typhoid fever in Lalo Assabi district

In case of prevalence of typhoid fever, 54.8% out of 270 respondents were suffered from typhoid fever. However, only 28.1% out of 128 respondents who used water with soap were suffered with typhoid fever. Those who washed their hands using soap did not suffer from typhoid as much as those who washed their hands without soap as shown in Table 4 ($\chi 2$=24.88 df=1 p<0.001).

Table 4: Eating habits, food handling, education with cleaning exercises and occurrence of typhoid fever.

Intervention measures	Response	Having been suffered (%)	Not been suffered (%)	Total (n=398)	p value
Hand washing before eating	No washing practice	0	0	0	$\chi 2$=24.88 df=1 p=0.000
	By water	148(54.8)	122(45.2)	270(67.8)	
	By water with soap	36(28.1)	92(78.9)	128(32.2)	
	Total	184(46.2)	214(53.8)	398(100.0)	
Food handling perception	prosecution done	64(63.4)	37(36.6)	101(25.4)	$\chi 2$=5.476 df=1 p=0.019
	health education given	224(754)	73(24.6)	297(74.6)	
	inspection done	0	0	0	
	Total	288(72.4)	110(27.6)	398(100.0)	
Participation in cleanliness	adequate	84(47.7)	92(52.3)	176(44.2)	$\chi 2$=20.84 df=1 p=0.000
	not adequate	156(70.3)	66(29.7)	222(55.8)	
	Total	240(60.3)	158(39.7)	398(100.0)	
Health education	given	160(47.9)	174(52.1)	334(83.9)	$\chi 2$=4.577 df=1 p=0.032
	not given	40(62.5)	24(37.5)	64(16.1)	
	total	200(50.3)	198(49.7)	398(100.0)	

Slide agglutination of widal test

Slide agglutination of Widal test was performed in the clinical laboratory as a primary screening test of serum for presence or absence of the O antigen and H antigens of *S. typhi*. Slide agglutination reaction for O antigen showed that 157 (53.6%) of patients have reactive agglutination result and 78 (26.6%) have reactive agglutination reaction for H antigen (Table 5).

Table 5: Results of widal test of febrile patients suspected of typhoid fever in Inango Health Center Dec. 2019-Feb. 2019.

Reaction result	O antigen		H antigen	
	Frequency	%	Frequency	%
Reactive	157	53.6	78	26.6
Weakly reactive	92	31.4	60	20.5
Non reactive	44	15	155	52.9
Total	293	100	293	100

DISCUSSION

The study finding revealed that majority (76.9%) of the respondents had knowledge about typhoid fever. Majority of the study population also, knew that typhoid fever is preventable disease. This study is agreed with the study of [17] in which about 63.8% of respondents had good knowledge related to typhoid fever. The difference might be due to the effort of health extension workers implementation in Ethiopia.

The study finding showed that males and females were at risk with relatively equal chances of being infected by the disease and therefore equally susceptible ($\chi 2$=0.133 df=1 p=0.715). Also, in the present finding, the majority (50.5%) aged between 18-47 years suffered from typhoid than others in other age groups in their life time ($\chi 2$=14.46 df=3 p=0.002).

The present study showed that the prevalence of typhoid fever was higher in illiterate, elementary school and high school. However, the prevalence was low in respondents rank with certificate, diploma and degree holders ($\chi 2$=54.3 df=6 p<0.001). It is suggested that due to public health education and awareness on

the modes of transmission, people are able to practice healthier lifestyles like hand washing with soap and proper sewage disposal. This indicated that people in the area were more susceptible to this disease. These results concur with the study carried out in Kibera [18], where a high prevalence of typhoid fever (24.7%) occurred due to overcrowding with poor access to clean water and sanitation.

The present finding revealed that, majorities (93%) of the respondent were used pit latrine during urine and feaces excretion. The result of this study was comparable with the reports from [17,19] in which 71.2% and 83% of the residents disposed their human wastes in a pit latrine respectively. However, it contrasts with the study done [20] in which more than half of the respondents (54.5%) did not use them at all. The difference might be due to socio-demographic characteristics and national and regional development. The health extension workers may promote the awareness among the rural communities to construct latrines but have been less active in teaching proper use and maintenance. In order to combat diseases caused by inadequate sanitation more efficiently, the installation of sanitary excreta facilities should be encouraged with measures taken to dispose of wastes and improve personal and food hygiene.

The research finding showed that majority (60.3%) of the respondents disposed the solid wastes on field (yard), while only 12.1% disposed the solid waste into garbage can, in which ways of solid waste disposal and prevalence of typhoid fever has direct proportional relationships ($\chi2$=20.83 df=3 p<0.001). Where sanitation and garbage disposal are lacking, typhoid fever continues to destroy life.

The study finding revealed that out of 48.7% of respondents living around polluted water sources due to poor constructed drainage system, 82.5% were caught by typhoid fever. Also, out of 41.7% in study areas, 61.4% were suffering with typhoid fever because of drainage leakage at different places ($\chi2$=20.10 df=2 p<0.001). Intermittent access to water is also a common problem for households in many low-resource countries [21] and can lead to increased risk of typhoid fever by a number of mechanisms.

The present result finding revealed that the respondent who drunk from spring and taped water were also suffered with typhoid fever with values 58.9% and 45.9% respectively compared to those who drunk from river water ($\chi2$=15.52 df=2 p=0.000). Because, even though the spring and tap water was used at most as water sources, it was not cleaned and chlorinated regularly. Thus, making prevention of typhoid in the study area was difficult to maintain throughout the year. Water from rivers and borehole was not safe because feacal matter may gain access into the water through runoff or seepage from sewers and pit latrines [22]. This could have been a major contributing factor to the high bacteremia cases considering that a number of patients reported to have used bushes to dispose off their faecal waste and urine.

The result of the present finding showed that a few number of the respondent (42.2%) had protected their water sources. This indicated that there was minimum effort made towards the water protection in prevention of water contamination and in the long run prevention of typhoid fever in the study area. However, protection of underground water sources was not a main concern to the majorities of dwellers hence protection of the water sources had no influence on control of prevalence of typhoid fever ($\chi2$=3.223 df=1 p=0.073).

The result of the present study finding showed that the mass of the respondents were seeking treatment from different health care providers. This study result was comparable with the research done [19] in which the patient obtained treatment from District clinic, dispensary, herbalic clinic and no treatment at all with values 58.96, 32.86, 2.6 and 5.7% respectively. The discrepancy of the results between the studies might be due to socio-demographic variation and difference in geographical locations.

The present study finding revealed that, majority of the respondent wash their hand either by water or water with soap. In this analysis the respondent reported that washing hands before eating is culturally known. But typhoid prevalence was still high may be because of other contributing factors. Hence, 54.8% of the respondents were suffered from those who used water only. However, only 28.1% of the respondents were suffered with typhoid fever among those who used water with soap ($\chi2$=24.88 df=1 p=0.000).

The result of the present study finding reveled that, the mass of the respondent had a view on teaching the food handlers and kitchen workers on personal hygienic practices improves food safety, while few of them considered that prosecution or examination of the food handlers prior to food handling was the solution ($\chi2$=5.476 df=1 p=0.019). These results suggest that health education and promotion was an important tool which could cause much improvement as compared to involvement of public health officers in food hygiene. The finding supports the work of Bangladesh [23]. Hand washing prior to food handling is important where these activities are usually done by the maid servants.

The present study found out that, prevalence of typhoid fever was low (47.7%) around the respondents who clean their environment when compared with the respondents not participated in environmental cleaning (70.3%) ($\chi2$=20.84 df=1 p=0.000). Similarly, recent evidence suggests that environmental reservoirs of infection may also support disease transmission [7].

The present study results also found out that majority had informed about typhoid fever through health extension workers and community activity mobilization while minorities of the residents had not. These results showed that health education was being given some times as a typhoid preventive measure in Lalo Assabi District ($\chi2$=4.577 df=1 p=0.032). These showed that the majority of the resident though had heard about the disease, proper action against typhoid prevention had not taken. Preventive measures must be emphasized and community must be involved in order to encourage behavioral change with regard to hygiene.

The result of the present study indicated that, the mass of the respondent eat raw meat (44%) and drink raw milk (57.8%) while about 56% and 42.2% of them eat cooked meat and drink boiled milk respectively (OR=0.211; with a 95% CI=0.169-0.265). This study result corresponds with report [24] where food hygiene must concerned with all measures necessary for ensuring the safety, wholesomeness and soundness of food at all stages of production, preparation, marketing and distribution. The present finding found out that, majority (55.5%) of the respondent had habit of eating raw, unwashed fruit and vegetables while only few of them (44.7%) wash before consumption.

In addition to this finding, the result found out that, majority of the respondents (95%) had no refrigerator. So they reported that they kept some fruit, vegetables, injera and meat in the drawer, on Table and in plastic bags. This was where it can simply be contaminated and could not stay long for later consumption. This was statistically significant that (OR=0.930 with 95% (CI=0.827-0.907). The result of this study was less than the study done in Mendida Town, where 92.7% of respondents use by washing fruit and vegetables with water while only 7.3% did not [17]. Vegetables like lettuce are easily contaminated and are very hard to wash well [25].

The study finding also revealed that, only 9.5% of the respondents cooked were for only one meal. However, the majorities of the respondents (90.5%) cooked an extra wot to use at different meals. Furthermore, 18.8% of this respondents used wot without reheating which may be the prime suspect of the cause of typhoid fever while 81.2% of them used wot after being heated (OR=0.736 with 95% CI=0.686-0.789). The present finding also showed that, most of the respondent (74.5%) had experience of washing their utensils before use while 25.1% of them use as it is (OR=8.143 with 95% CI=4.986-13.30). Similarly a study conducted in India identified that, improved personal hygiene and intensive community health education are the public health measures that could help to prevent and control typhoid fever [26].

Due to polyvalent nature of Widal antigens, there is a high possibility of cross-reactivity with bacterial and non-bacterial infections. Hence the probability of them not detected in case of early diagnosis. Since some diseases such as malaria, ulcerative colitis, non-typhoidal *Salmonellae*, rheumatoid arthritis and nephrotic syndrome may show similar symptoms and produce high 'O' antibody test, they should always be evaluated as differential diagnosis [27-29]. In addition, the infecting strains of *S. typhi* are poorly immunogenic.

CONCLUSION

Therefore, there is big conflicting evidence as to the relative importance of somatic and flagella agglutinin tests for the diagnosis of typhoid fever. Ideally, the Widal test should be done on paired sera to detect an increase in the agglutination titer. However, to aid treatment decisions before convalescent samples can be obtained, single acute-phase serum sample are done. The results from a single sample are difficult to interpret due to high false positive results. The role of the Widal test is controversial because the sensitivity, specificity and predictive values vary considerably between geographical areas. Despite these shortcomings of both sensitivity and specificity, because the Widal test is simple and inexpensive, it is still widely used as a diagnostic test.

RECOMMENDATIONS

Well-designed rubbish collection and dumping site should be built by the ministry of public health and sanitation in the area and proper use of community health workers should be enhanced. In addition local health center should strengthen supportive supervision for health extension workers in order to strengthen effective health education to the community on the causes of the diseases and possible preventives measures.

ETHICAL CONSIDERATION

Ethical approval for this study was given from the Lalo Assabi District administration and health bureau. Informed consent was obtained from the respondents after providing them with all the necessary details about this study. Participation in the study was strictly on voluntary basis. Persons who consented to the study were assured of the freedom to withdraw participation at any point during the course of the study.

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