

Feco-prevalence of Helicobacter Pylori Infection and Associated Risk Factors Among Patients Living with HIV/AIDS on ART at Tefera Hailu Memorial General Hospital Sekota, Northeast Ethiopia

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Abstract

Background: Globally, two-thirds of humans are infected with *Helicobacter pylori* (*H. pylori*), a flagellated Gram negative bacterium, brings peptic ulcer disease and others, mainly, in HIV patients on ART. Its infection among HIV/AIDS patients is not well understood in developing countries, including the study area.

Objective: To assess prevalence of *H. pylori* infection and associated risk factors among HIV/AIDS on ART patients at Tefera Hailu General Memorial hospital Sekota Northeast, Ethiopia.

Methods: An institution based cross sectional study was conducted on HIV/AIDS on ART patients from February to June 2019. A face-to-face interview was administered to assess risk factors for *H. pylori* infection by using semi structured questionnaire. A stool sample was tested for *H. pylori* antigen using the ImmunoCardSTAT HpSA kit as per the manufactures` instruction. Data were entered into excel spreadsheet, cleaned, exported to and analyzed by using the SPSS version 20. Logistic regression model was used to determine the association between explanatory and outcome variables. For all cases, $p\text{-value} \leq 0.05$ was considered statistically significant.

Results: A total of 88 HIV/AIDS patients on ART were included in this study. Of these, 53.4% were females, 54.5% were urban dwellers, 69.3% were single, 51.1% had formal education and 58.0% were non-employed. From these, study participants, a total of 88 stool samples were collected and analyzed, and 57 (64.8%, 95% CI: 54.5-73.9) *H. pylori* positivity was observed. Among explanatory variables tested, number of family members (AOR: 17.059; 95%CI: 1.751, 166.185; $p\text{-value} = 0.015$) and water sources for drinking and cooking (AOR: 0.096; 95%CI: 0.010, 0.951; $p\text{-value} = 0.045$) were statistically significant with *H. pylori* positivity. Other factors did not show association with *H. pylori* infection ($p\text{-value} \geq 0.05$).

Conclusion: Prevalence of *H. pylori* among HIV on ART patients was within the ranges of global prevalence (10%-76%). Number of family members and water sources for drinking and cooking purpose were found to be factors associated with the *H. pylori* positivity in this study. This finding necessitates the need to design and apply intervention measures that could decrease transmission and thus minimize the clinical consequences of infection.

Background

Helicobacter pylori (*H. pylori*) is a bacterium characterized by its gram-negative, spiral-shaped with lophotrichous flagella and urease production causes for peptic ulcer disease (PUD), and gastric carcinoma (1-3). Stomach protects itself from the gastric fluid by mucus that wraps the stomach wall, and the bacterium takes the advantage of this protective mechanism by existing in the thick mucus lining (3). It has various virulence factors such as outer membrane proteins, lipopolysaccharide "O" antigen, exotoxins, secretory enzymes and effector cytotoxin besides flagella (4). Its route of transmission appears to be interpersonal and environmental, predominantly through the gastro-oral, faecal-oral and oral-oral from one person's mouth to another (5, 6).

Helicobacter pylori infects about half of the world's population and its prevalence varies globally with a greater prevalence reported from the developing countries. Its global estimate was reported at 48.5% while continental reports were 69.4% in South America, 37.1% in North America, 24.4% in Oceania, 54.6% in Asia, 47.0% in Europe and 79.1% in Africa (7-9). In addition, the overall pooled prevalence of *H. pylori* infection in a systematic review and meta analysis study was 52.2%, and a sub-group analysis indicated that the highest prevalence was recorded from the Amhara National Regional State (54.6%) (10).

The trend of *H. pylori* infection showed a decreasing pattern in the last three decades from 1990 to 2017; 64.4% in the first decade (1990–2000), 62.2% in the second decade (2001–2011) and 42.9% in the third decade (2012–2017). This decrement might be related with relative improvements in sanitation, water access, life style and behavioral changes, quality of life and socioeconomic status, and increased awareness on the transmission, diagnosis, eradication therapy, prevention and control of *H. pylori* infection (10).

The global HIV/AIDS pandemic is still ongoing and about 75 million people have been affected since the beginning of the epidemic, with 37.9 million [32.7–44.0 million] people were living with HIV/AIDS at the end of 2018 (11). Patients with HIV/AIDS experience many form of opportunistic infections including gastrointestinal symptoms The prevalence and role of *H. pylori* infection among HIV infected patients in gastro duodenal lesions might be different from the general population and it remains blurred whether dyspepsia is adverse effects associated to highly active antiretroviral therapy (HAART) or as a result of *H. pylori* infection (12). The prevalence

of *H. pylori* infection in HIV/AIDS patients varies from 10% - 76% globally, depending on the time period, geographical location and population (13-17). Various reports revealed that its prevalence in Serbian PLHIV was 34.4% (18); 22.1% in China (19); 37.2% in Brazil (15), 51.5% in Ghana (20), 22.5% in Uganda (21) and 73.1% in Kenya (22).

Another study conducted in the Addis Ababa, Ethiopia demonstrated that of the 106 HIV positive patients, 68 (64.2%) were positive for anti - *H. pylori* IgG antibodies (23).

Risk factors associated for acquisition of *H. pylori* and HIV infections are different: *H. pylori* is transmitted by gastro - or fecal-oral routes and is associated with low socioeconomic conditions, whereas HIV transmission is through sexual intercourse, infected body fluids, and transplacentally (24). A study carried out in China showed that *H. pylori* infection had no statistically significant association with gender, housing, congested living, educational status, drinking water or toilet facilities (21). Another report from Ghana revealed as lack of tap water and higher was identified as risk factors associated for *H. pylori* infection (20). But, there is a scarcity of data about the prevalence and associated risk factors of *H. pylori* infection in HIV patients in the Ethiopia, particularly, in the study site. Therefore, this study aimed to describe its prevalence in HIV patients and to investigate associated risk factors at the Tefera Hailu General Memorial hospital Sekota Northeast, Ethiopia.

Materials And Methods

Study Design, Period and Setting

A cross - sectional study was conducted February to June 2019 at the Tefera Hailu Memorial General Hospital at Sekota, Northeast Ethiopia. The hospital serves for more than half a million people from around and neighboring districts. The hospital is located 720 Km north from the capital, Addis Ababa and 525km from the city of Bahir Dar.

Source population

All patients who visited at the Tefera Hailu Memorial General Hospital at Sekota, Northeast Ethiopia were the source population.

Study population

HIV/AIDS patients who had follow up at the ART clinic of the Tefera Hailu Memorial General Hospital within the study period.

Inclusion criteria

After informed consent, all voluntary ART follow up patients whose HIV positivity was confirmed by both clinically and laboratory examination at Tefera Hailu Memorial General Hospital.

Exclusion criteria

HIV/AIDS follow up patients who were critically sick, HIV/TB co-infected patients, not voluntary to participate, study participants who received antibiotics for the treatment of *H. pylori* and/or any other gastro intestinal infection in the previous two weeks,

Study variables

Dependent variable:

Prevalence of *H. pylori* infection

Independent variables

Socio-demographic variables (Gender, Age, Residence, and Marital status), Socio-economical status (educational status, income, family number, type of diet, source of water, and occupation), Socio-cultural practices (Alcohol, smoking, chat chewing and coffee drinking habits), and Clinical factors (HIV/AIDS infections).

Sampling technique

Eighty eight study participants were included in this study by using a non-probability (convenient) sampling technique from the ART follow up patient's registration list among the 889 HIV/AIDS patients who had ART follow up at Tefera Hailu General Memorial Hospital.

Socio-demographic data collection

Semi-structured questionnaire (*refer additional file*) was administered to eligible HIV patients on ART follow up for interview to obtain socio-demographic, socio-economic information and other information on associated risk factors for transmission of *H. pylori* infection after the consent form obtained. The questionnaire was composed socio-demographic characteristics and it was questionnaire prepared in English version and was translated into Amharic version the patient speaks and then retranslated into English version for analysis, write up and report. Data were collected by trained laboratory personals after they had common understanding of how to collect the data.

Specimen collection and laboratory analysis

Stool specimen was collected from each study participants by using wide-mouthed clean, dry, and leak proof container. It was then tested for *H. pylori* antigen with ImmunoCard STAT HpSA kit by following manufacturer's instruction. A 5–6 mm-sized stool sample was added to a vial which contained 1ml sample diluent and was then emulsified by vortexing for 15s. The tip of the vial was then snapped off and four drops were added to the sample port of the test cassette. It was then read after 5 min incubation time at ambient temperature. Results were then interpreted as negative when there was a blue line observed in control (C) window only, and as positive when there was an additional pink line in the test (T) window. It was then finally confirmed as positive if the pink line was clearly visible and weakly positive when it was so faint (25).

Quality assurance

Pre-test was done prior to data collection so as to optimize the experimental set up for *H. pylori* test. A standardized procedure was strictly followed during stool sample collection, storage and analytical process.

Data analysis

Data were entered by EPI statistical software and analyzed using SPSS version 20. A result was summarized by frequency, percentages means and 95% confidence interval to measure the strength of association, bivariate analysis was used to screen those variables which are candidates for multivariate analysis and those variables having P value ≤ 0.2 were reanalyzed by multivariable analysis to control confounding. The strength of associations with *H. pylori* infection and independent variables were measured by Adjusted Odds Ratio (AOR) with 95% confidence interval. Variables with P value ≤ 0.05 were considered as statistically significant.

Ethical consideration

The study was conducted after we secured the ethical approval from the School of Biomedical and Laboratory Sciences Ethical Review Committee, University of Gondar. Permission was obtained from Tefera Hailu Memorial General Hospital higher management. Informed consent/assent was obtained from each study participants and /or from their parents/guardians. Study participants were interviewed alone to keep their privacy and data obtained from these patients were coded to keep confidentially. Test results were given to clinicians who are working on ART clinics for appropriate patient management.

Results

As it is shown in Table 1, a total of 88 study participants living with HIV on ART follow up were included in this study and majority of them (64, 72.7%) were in the age range of >18 years. Females constituted 47(53.4%), and single in terms of their marital status accounted 61(69.3%) of the study participants. Table 2 also described that the majority of the study participants 65(73.9%) reported that they lived with more than three people in the same house. Sixty four (72.7%) of the study patients had monthly income of >1500 ETB, 76(86.4%) used water sources for drinking and cooking water from protected-pipe lines, and 72(81.8%) used toilet for excretion. Regarding the personal habits, 52(59.1%) drunk alcohol and of which, 3(6.1%) had alcohol at always time, 65(73.9%) had coffee and among these, 38(58.5%) drunk it always. Twenty eight (31.8%) of the PLWHIV who were included in this study had history of familial infection with *H. pylori*.

Table 1
Socio-demographic characteristics and *H. pylori* positivity of HIV/AIDS patients who were on ART follow up (N=88) at Tefera Hailu General Memorial Hospital, Sekota, Northeast

Ethiopia, 2019								
Variables	Categories	<i>H.pylori</i> positive,n (%)	<i>H. pylori</i> negative, n(%)	Total, n(%)	COR (95% CI)	<i>p-value</i>	AOR(95% CI)	<i>p-value</i>
Sex	Male	23 (56.1)	18(43.9)	41(46.6)	1		1	
	Female	34(72.3)	13(27.7)	47(53.4)	0.489(0.201,1.188)	0.114	0.490(0.196,1.221)	0.126
Age(years)	≤18	13(54.2)	11(45.8)	24(27.3)	0.537(0.205,1.405)	0.205	0.649(0.225,1.858)	0.423
	>18	44(68.8)	20(31.2)	64(72.7)	1		1	
Residence	Urban	28(58.3)	20(41.7)	48(54.5)	0.531(0.216, 1,307)	0.168	1.676(0.662,4.243)	0.276
	Rural	29(72.5)	11(27.5)	40(45.5)	1		1	
Marital Status	Single	40(66.6)	21(34.4)	61(69.3)	1		1	
	Married	17(63.0)	10(37.0)	27(30.7)	0.893(0.348,2.291)	0.813	1.002(0.361,2.779)	0.998
Education Level	Non-formal education	30(69.8)	13(30.2)	43(48.9)	1.538(0.636,3.719)	0.339	1.089(0.404,2.935)	0.866
	Formal education	27(60.0)	18(40.0)	45(51.1)	1		1	
Occupation	Employed	36(70.6)	15(29.4)	51(58.0)	1			
	Non-employed	21(56.8)	16(43.2)	37(42.0)	0.547(0.225,1.327)	0.182	0.512(0.206,1.268)	0.148

The overall prevalence of *H. pylori* infections among the study participants in this study was 57(64.8%; 95% CI: 54,5-75.0) (Figure 1).

Regarding the prevalence of *H. pylori* in terms of each socio-demographic factors, 34(72.3%) of the female participants were HpSA positive. Regarding the age, 44(68.8%) of PLWHIV on ART with > 18 years old were positive for *H. pylori*, 29(72.5%) of the rural dwellers, and 30(69.8%) of patient with non-formal education were found to be infected with *H. pylori* (table1). About the socio-demographic factors and personal habits, *H. pylori* positivity was observed among 20(87.0%) Number of family member's living in the house ≤ 3, 16(66.7%) in patients with ≤1500etb/month income, 11(68.8%) patients with the habit of open field excretion, 35(67.3%) in alcohol users, and 19(67.9%) in those with history of Family infected history with *H. pylori* (table2).

Associated risk factors for *H. pylori* infection for HIV/AIDS on ART follow up patients

As it is detailed in Table 1 above and Table 2 below, the multivariable logistic regression analysis showed that the socio-demographic characteristics of the patients such as sex, age, marital status, residence, occupation, and educational level and many socio-economic status and personal habits like Monthly income, Do you wash your hand after toilet?, use of alcohol and coffee, chewing chat and family infected history with *H. pylori* did not show statistical association with *H. pylori* infection. Number of family member's living in the house with ≤ 3 had 17 (AOR=17.059; 95%CI: 1.751, 166.185) times more risk ($p=0.015$) for *H. pylori* infections than their counterparts. In addition, patients who had rivers and bore-holes originated source of drinking and cooking water had the odds of 0.096 (AOR = 0.096; 95% CI: 0.010, 0.951) $p=0.045$ times more protected from *H. pylori* infections than those who used protected pipe line water sources. Those study participants who had usual alcohol use, smoking cigarette and chat chewing habits and those who did not have hand wash practice after toilet were all infected with *H. pylori* though it was not possible to assess for the possible association of these risk factors to *H. pylori* infections by calculating the odds owing to small numbers of cells in a 2 by 2 table (Table 2).

Table 2

Socio- economic factors and personal habits with *H. pylori* positivity in HIV/AIDS patients who were on ART follow up (N=88) at Tefera Hailu General Memorial Hospital, Sekota, Northeast Ethiopia, 2019

Variables	Categories	<i>H. pylori</i> positive, n(%)	<i>H. pylori</i> Negative, n(%)	Total	COR(95% CI)	<i>p</i> - <i>value</i>	AOR (95% CI)	<i>p</i> - <i>value</i>
Number of family member's living in the house	≤ 3	20(87.0)	3(13.0)	23(26.1)	5.045(1.363,18.680)	0.015	17.059(1.751,166.185)	0.015
	> 3	37(57.0)	28(43.0)	65(73.9)	1		1	
Monthly income?	≤ 1500 ETB*	16(66.7)	8(33.3)	24(27.3)	1.122(0.417,3.021)	0.820	2.581(0.739,9.014)	0.137
	>1500ETB	41(64.0)	23(36.0)	64(72.7)	1			
Source of drinking and cooking water?	rivers and bore-holes	6(50.0)	6(50.0)	12(13.6)	0.490(0.143,1.675)	0.255	0.096(0.010,0.951)	0.045
	protected-pipe lines	51(67.1)	25(32.9)	76(86.4)	1		1	
Where do you excrete?	open field	11(68.8)	5(31.3)	16(18.2)	1.243(0.389,3.972)	0.713	2.121(0.390,11.541)	0.384
	toilet	46(63.9)	26(36.1)	72(81.8)	1		1	
Do you wash your hand after toilet?	No	2(100.0)	0(0.0)	2(2.3)	-	-	-	-
	Yes	55(64.0)	31(36.0)	86(97.3)	-	-	-	-
Hand wash material	without soap	39(65.0)	21(35.0)	60(68.2)	1.032(0.404,2.635)	0.948	2.318(0.657,8.181)	0.191
	with soap	18(64.3)	10(35.7)	28(48.3)	1		1	
Do you drink alcohol?	No	22(61.1)	14(38.9)	36(40.1)	1		1	
	Yes	35(67.3)	17(32.7)	52(59.1)	1.310(0.540,3.177)	0.550	1.890(0.524,6.814)	0.331
How often you drink alcohol?	Sometimes	30(65.2)	16(34.8)	46(93.9)	-	-	-	-
	Always	3(100.0)	0(0.0)	3(6.1)	-	-	-	-
Do you drink coffee?	No	16(70.0)	7(30.4)	23(26.1)	1		1	
	Yes	41(63.0)	24(37.0)	65(73.9)	0.747(0.269,2.075)	0.576	-	-
How	Sometimes	14(51.9)	13(48.1)	27(41.5)	1		1	

often you drink coffee?								
	Always	26(68.4)	12(31.6)	38(58.5)	2.012(0.726,5.572)	0.179	1.799(0.541,5.981)	0.338
Smoke cigarette	No	55(64.0)	31(36.0)	86(97.7)	-	-	-	-
	Yes	2(100.0)	0(0.0)	2(2.3)	-	-	-	-
Chew kchat?	No	54(63.5)	31(36.5)	85(96.6)	-	-	-	-
	Yes	3(100.0)	0(0.0)	3(3.4)	-	-	-	-
Is your diet?	Non-Salty	25(62.5)	15(37.5)	40(45.5)	1		1	
	Salty	32(66.7)	16(33.3)	48(54.5)	1.200(0.499,2.886)	0.684	0.861(0.250,2.963)	0.813
Family infected history with H. pylori	No	38(63.3)	22(36.7)	60(68.2)	1		1	
	Yes	19(67.9)	9(32.1)	28(31.8)	1.222(0.472,3.164)	0.679	2.137(0.492,9.276)	0.311
*ETB –Ethiopian birr								

Discussion

H. pylori infection is known as a public health problem across the globe. Its prevalence vary geographically; a study showed that the developing countries have much higher infection rates (90.0%) than the developed countries (1.2–12.0%) (26).. Prevalence of *H. pylori* infections in HIV patients on ART and associated risk factors has not been well documented in different corners of the sub-Saharan Africa, where more than 66.7% of HIV-infected individuals exist, and where, at the same time, the vast majority of the population gets infected with *H. pylori* during childhood (1, 27).

In the present study, it was found that the prevalence of *H. pylori* infection in people living with HIV/AIDS on ART was 64.8%. It is similar with a result reported from Ethiopia 64.2% (23); however, various studies in Ethiopia and other countries showed that the overall prevalence of *H. pylori* infection in adult dyspeptic patients, as found by the different diagnostic methods, varied between 69.0% and 91.0% (28), 57.9% – 69.7% in Iran (29), and 73.1% in Kenya (30).

The prevalence of this study is higher than reports from different parts of the world such as studies conducted in Brazil where *H. pylori* infection among HIV positive patients ranges from 32.38%(12) to 37.2%, but lower among HIV negative study participants (75.2%)(15); 51.0% in Romania (30), 8/45(17.7%) by serology and 9/45(20.0%) by ¹³C-urea breath test in Italy (31); 17.3% in Taiwan (16) and 22.1%, China(32) in HIV-infected than in non- infected (63.5% and 44.8%, respectively) patients; 18.2–34.4%, in Serbia depending on the study period, namely the type of applied ART (18); 51.5% in HIV patients in Ghana, but lower than HIV negative study groups (88.0%) (20); 46.8% in Nigeria (4); 28/56(50.0%) in HIV positive patients and 31/56 (55.0%) in HIV negative controls in Cameroon (33); 22.5% in Uganda (21). A study conducted in Addis Ababa, Ethiopia among dyspeptic and non-dyspeptic HIV patients showed 31.6% *H. pylori* (34) which is lower than the finding observed in our study.

The *H. pylori* prevalence observed in the current study in PLWHIV is lower than studies conducted in various areas of the world such as 75.0% among PLWHIV, and 87.0% in HIV negative study participants in Italy (35); 81.0% in Zambia (36); 68 (75.6%) in Nigeria (37); 36/44 (81.8%) among HIV positives and 148/171 (86.5%) in HIV negative dyspeptic patients in Northwest Ethiopia (38). The sex specific prevalence of *H. pylori* in our study was shown that female study participants accounted 72.3% which is higher than that of male participants. Similarly, a study conducted in Nigeria showed that 47 (33.8%) were women and 18 (13%) were men (4); 372 (75.9%) females in Ghana (20); 41/61 (67.2%) females in Nigeria (37).

This overall disagreement of *H. pylori* prevalence in different studies might be due to the use of different methods for the diagnosis of *H. pylori* between the present study and the previous studies where we used the faecal antigen (ImmunoCardSTAT HpSA kit) test method where as many other studies used culture, ImmunoCardSTAT HpSA rapid test kit and /or SD Bioline H. pylori Ag rapid test kit, serological assay for IgG / IgA antibodies, H. pylori ELISA kit, ¹³C-urea breath test, histology in either in single or in combination. In addition, this variation might be gone with the type of specimens collected and processed where we collected and analyzed stool specimen, but other studies used different specimens such as stool, blood, and biopsies specimens in combination or single type. The sample size included in the study might also have a contribution for such a variation of *H. pylori* prevalence in PLWHIV in different studies conducted all over the globe. .

Regarding to the factors associated to *H. pylori* infection among HIV positive patients, we did not find statistically significant differences regarding the socio-demographic factors such as sex ($p = 0.126$), age ($p = 0.423$), residence ($p = 0.276$), marital status ($p = 0.998$), educational level ($p = 0.866$), and occupation ($p = 0.148$) with that of *H. pylori* infections among the PLWHIV. In addition, *H. pylori* infection was not found to be statistically significantly associated risk factors to personal habits of our study participants such as alcohol ($p = 0.337$) and coffee ($p = 0.338$) use, chat chewing, smoking cigarette, use of salty diet and lack of hand washing practice after toilet ($p = 0.190$). In agreement with this, level of education ($p = 0.416$), lack of employment ($p = 0.673$), personal factors like alcohol consumption ($p = 0.618$) and cigarette smoking were not associated with *H. pylori* positivity in a study conducted in Addis Ababa, Ethiopia (34). In contrary to this, drinking coffee ($p = 0.025$) and chat chewing ($p = 0.008$) were found to be the risk factors associated with *H. pylori* infections of the patients in a study conducted in Northwest part of Ethiopia (39). Another study done in Northwest Ethiopia before a decade demonstrated that *H. pylori* infection is very high and associated with history of alcohol intake ($p < 0.01$) and older age ($p < 0.01$) (38).

It was found that the study participants with ≤ 3 number of family members living in the same house had about 6.0% more vulnerable for *H. pylori* infection as compared with those who had > 3 family members ($p = 0.015$), and those who used rivers and bore-holes as their source of drinking and cooking water were about 9.6% protective of *H. pylori* infections compared to those who used their water sources from protected-pipe lines ($p = 0.045$). Unlike to this, a study conducted in Northwest Ethiopia showed that the use of unhygienic water supply from rivers and well are contributing risk factors for infections of with *H. pylori* ($p = 0.017$) as compared to those who had water from protected pipeline sources (39). Another study conducted in the Uganda revealed that the number of family members living in same house did not show a statistically significant association to the *H. pylori* infections of the patients ($p = 0.93$), but lower age was found to be a contributing factors for *H. pylori* positivity (21).

The variations observed about risk factors associated with *H. pylori* infections in different studies are possibly owing to the size of the study participants included, the differences in socio-economic levels, personal habits and variations in individual practices and geographical locations. Moreover, as shown in most epidemiological data, the living standards associated with improved hygiene (toilets, running water, safe drinking water, and hand washing practice within families) are associated with reduction in the infection prevalence. In most of the high standard of living countries, the prevalence is nowadays low and a decreasing trend has been noted(40, 41). It is the reason why the infection rate is especially higher in developing countries, where contaminated water, combined with social hardships and poor sanitary conditions, plays a key role.

Limitation

The limitation of this study was that the numbers of the study participants (HIV patients) were small

Conclusion

H. pylori is a common bacterium, and about 50.0% of the world's population has been estimated to be infected. Our data showed that the prevalence of its infection was within the ranges reported by various studies from different parts of the globe. Use of river water source and family members ≤ 3 in a house were statistically significant associated risk factors to *H. pylori* infections of the PLWHIV. Improving the water supply and sanitary conditions to decrease the prevalence of *H. pylori* in Ethiopia, mainly in the study area is mandatory.

Declarations

Ethics approval and consent to participate

It is done after we secured ethical approval from the School of Biomedical and Laboratory Sciences, College of Medicine and Health Sciences, University of Gondar. Permission was obtained from the Tefera Hailu Memorial General Hospital, Sekota administrative bodies. After giving a brief description about the purpose of the study, eligible HIV patients gave informed written consent for their participation in the questionnaire of this study. Confidentiality was ensured using code numbers than names and keeping the data locked.

Consent for publication

Not applicable

Availability of data and materials

All data generated or analyzed during this study are included in this published article.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

MK is the principal investigator of the study and he performed the design of the study, data management, study supervision, analysis, interpretation of data and manuscript preparation. MG and TG: involved in the designing, supervision, acquisition of data and critical review of the manuscript. Finally, both authors read and approved the final manuscript for publication

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Figures

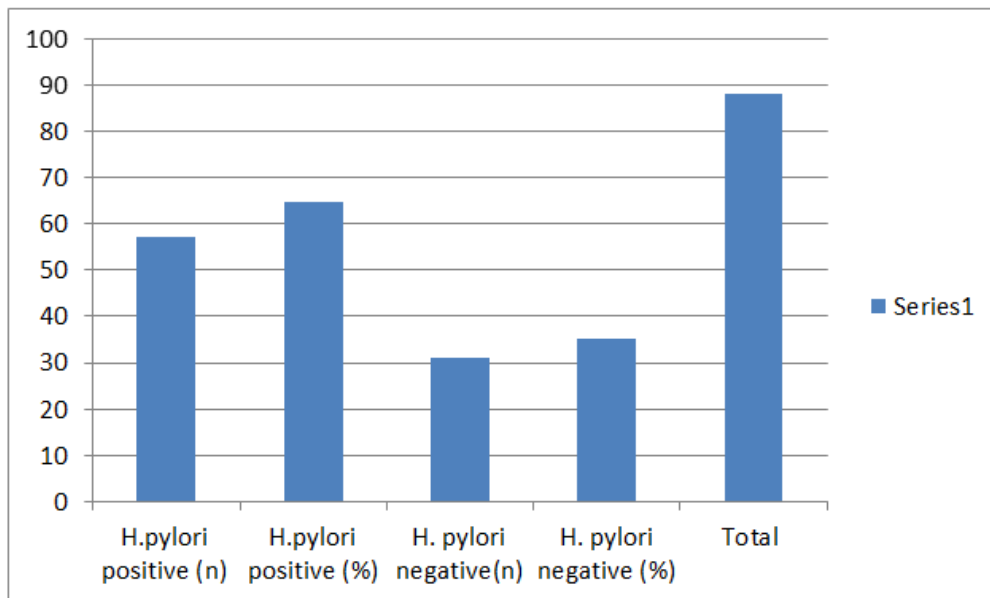


Figure 1

Prevalence of *H. pylori* infection among HIV patients on ART attending at the Tefera Hailu Memorial General Hospital Sekota, Northeast Ethiopia

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