Prevalence and factors associated with *Helicobacter pylori* infection among Adults Between 18 and 40 Years at Butembe Health Centre III Kyankwanzi District, Uganda.

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Abstract

Background:[a]
The prevalence of *Helicobacter pylori* infection varies by geography, ethnicity, and socioeconomic factors. Available data on the prevalence of *Helicobacter pylori* infection in Uganda are not representative of the general population. We sought to describe the prevalence and factors associated with *H.pylori* among adults between 18 and 40 years at Butemba Health Centre III.

Methodology:
Using a cross-sectional design, *H. pylori* infection was assessed by the *H.pylori* antibody test among 181respondents attending Butemba Health Centre III in Kyankwanzi. Data were collected by face-to-face interviews using a questionnaire. Associations between *H. pylori* infection and factors associated were analyzed using logistic regression.

Results:
The overall prevalence of *H. pylori* infection was **29.2**%. However, *H. pylori* infection was highest (54.14%) in the age of 18 to 30 years study participants followed by 31 to 40 years (45.8%). *H. pylori* was associated with smoking of cigarettes (AOR = 0.732; 95% CI: 0.275-1.950), drinking alcohol (AOR = 4.373; 95% CI: 1.359-14.06), Poor sanitation (AOR = 5.33; 95% CI: 2.556-11.11) were also independently associated with H. pylori infection.

Conclusion and recommendation:
The prevalence of *H. pylori* infection in Kyakwanzi at 29.2% calls for population-based studies in the region and offers an opportunity to study the transmission dynamics of *H. pylori* infection. Changes in public health measures need to be instituted in the management of *H. pylori* infection to include education of the population and health care workers on the non-specific and insidious clinical presentation of the condition.

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1 Background of study

Helicobacter pylori (H.pylori) is one of the commonest chronic bacterial infections of humans affecting more than 50% of the world's population (Holcombe *et al.,* 1992). This makes it the World's most widespread infection especially in developing countries where the rates are estimated to be 80% (Ferenci *et al.,* 2010). The prevalence of *H.pylori* varies in geography, ethnicity, age, and socio economic status.

Studies that have been recently carried out reveal a high prevalence of *H.pylori.* In Asia, a clinical study

in Yangzong counties, a prevalence of 63.41% was found, a nationally representative cross-sectional study in Turkey showed a prevalence of 82.5%. Studies were done in Morocco, Ethiopia, and Nigeria, *H.pylori* was 75.5%, 65.7%, and 93.6% prevalent respectively. In Uganda, a prevalence of 44.3% was found among children aged 0-12 years (Hestivik *et al.,* 2010), 74% in dyspeptic patients referred for endoscopy, and 86% in patients with cancer and benign tumors.

The gram-negative spiral bacterium inhibits the mucous layer of the gastric mucosa of the human stomach. The helix shape of the bacterium is thought to have evolved to penetrate the mucoid lining of the stomach leading to the development of chronic gastritis, gastric ulcers, and duodenal ulcers(Khalifa *et al.,* 2010).The WHO classifies H.pylori as a class 1 carcinogen(de Martel *et al.,* 2013). It is estimated that 75% of non-cardia gastric cancers that occur Worldwide can be attributed to *H.pylori* (de Martel *et al.,* 2006).

H.pylori is contagious although the exact route of transmission is not known. Person-to-person transmission by either oral-oral route or fecal-oral route is most likely. It can also be transmitted through the ingestion of waste polluted water. Many of the reported factors associated with the infection include poor sanitation, deficient hygiene, and crowded living conditions which are very prevalent in developing countries

Helicobacter pylori are the most widespread bacterial infection in the World, estimated to infect more than half of the World's population. This bacterium is more prevalent in developing countries than developed countries(80-90% and <40%) respectively (Ferenci *et al.,* 2010). This is majorly due to the poor public health standards in developing countries.

The bacterium penetrates the mucoid lining of the human stomach leading to the development of chronic gastritis, gastric and duodenal ulcers, recurrent peptic ulcers, and gastric cancer which is Worldwide heavy burden accounting for 10% of new cases of cancers(Parkin, 2006)

The infection mostly affects people leaving in places with poor hygienic and housing conditions. Studies about the infection in Uganda have been done among dyspeptic patients referred for endoscopy, patients with cancer and benign tumors, and children aged 0-12years. The currently available studies about the infection were done in urban settings and this study aimed at determining the prevalence of the infection in adults aged between 18 and 40 years in a rural setting.

2 Methodology

3 Materials and Methods

Study design

A cross-sectional study was carried out to determine the prevalence and factors associated with *H. pylori* among adults between 18 and 40 years. Their serum was tested using Rapid antibody-coated test strips to detect the presence of *H. pylori* antigens. The study period was from May 2016 to June 2016.

Study site

The study was carried out at Butemba Health Centre III in Kyankwanzi District. The Health Centre is located in the rural remote District of Kyankwanzi. Butemba Health Centre III has patients from the surrounding villages of Butemba, Bukwire, Kaseeta, Katanabirwa, Kamirambazzi, and Nalukonge. The majority of the patients are from low social-economic class with very few from the middle class. The main economic activity is animal (cattle) rearing, with poor housing conditions, lack of clean water, and poor sanitation.

Population

Target population

Adults aged 18 to 40 years living in the rural areas of Kyankwanzi and the surrounding areas.

Accessible population

All adults aged 18 to 40 years at Butemba Health Centre III.

Study population

The study was carried out on adults between 18 and 40 years attending Butemba health Centre III, during the study period men and women who fulfilled the selection criteria were included in the study.

Selection criteria

Inclusion criteria

All adults aged 18 to 40 years at Butemba Health Centre III who gave consent were included in the study.

Exclusion criteria

All adults that aren't aged 18 to 40 years and those without consent were excluded from taking part in the study.

Sample size estimation

Using a sample size formula by Kish Leslie for cross-sectional studies, the sample size was estimated.

N= Zα2P (1 - P) / δ2

Where N= sample size required

P= Estimated prevalence of *H. pylori* infection in adults aged 18 to 40 years. A prevalence of 44.3% was used considering the prevalence in children aged 0-12 years (Hestivik *et al.,* 2010) to estimate that in adults which is not known.

1-P = the probability of not having *H. pylori* infection.

Zα = Standard normal deviate at 95% confidence interval corresponding to 1.96

δ = Absolute error between the estimated and true population prevalence of H. pylori of 5%.

N= 1.96×1.96×0.443×0.557 / 0.05×0.05

N=379 samples

Data and Sample collection

Data collection

Data was collected using a questionnaire administered by the researcher. It was written in English but administered in both English and Luganda.

Sample collection

Blood samples were collected intravenously from the median cubital vein on the arm using a simple syringe and needle. The different vacutainer tubes without anticoagulants were labeled differently with the patient's name, age, and laboratory number for easy identification.

A tourniquet was tied around the arm of the patient above the venipuncture site. After palpating and locating the vein, the site on the patient's arm was cleaned with an alcohol swab. The needle was fitted in a syringe and then venipuncture was performed with about 2-5ml of blood withdrawn into a red vacutainer tube. The tourniquet was removed and used cotton, the pressure was applied a little to stop bleeding at the venipuncture site.

The samples were left to clot and centrifuged at 13000rpm for five minutes and the serum was separated from the blood cells carefully. Safety measures were taken by wearing appropriate personal protective equipment like gloves, laboratory coat, closed shoes, and holding the hair together.

Determining the presence of antibodies

The *H.pylori* antibody rapid test detects the presence of helicobacter pylori antibodies through visual interpretation of color development on the internal strip. The *H.pylori* antigens are immobilized on the test region of the membrane. During testing, the specimen reacted with *H.pylori* antigen conjugated to colored particles and pre-coated onto the sample pad of the test. The mixture then migrated through the membrane by capillary action and interacts with reagents on the membrane. Where there were sufficient antibodies to *Helicobacter pylori* in the specimen, a colored line formed at the test region of the membrane. The presence of this colored line indicated a positive result, while its absence indicated a negative result. The appearance of a colored line at the control region served as a procedural control, indicating that the proper volume of the specimen had been added and membrane wicking had occurred.

4 Data analysis

The prevalence of *H.pylori* among adults aged 18 to 40 years was summarized as proportion using STATA version 12 as an estimation measure. The magnitude of proportion of *H.pylori* was determined by the regression analysis approach for factors associated.

For factors associated with *H.pylor*i infection, were assessed using STATA Ver.12 to run either Logistic or Robust Poisson regression analysis where the former is used when prevalence is< 10%.

Quality Control

The test was determined following a sequential flow of pre-analytical stage, analytical stage, and post-analytical stage. The pre-analytical stage involved; collecting the right samples, avoiding hemolysis, using the right sample containers, and labeling with the correct patient information. The post-analytical stage involved correct results interpretations and troubleshooting in case of variation in results. Quality control was ensured by right pipetting, using new and sterile pipette tips for each sample.

Study Limitation

The time for carrying out the study (2 months) was a limiting factor to obtain the large sample size and most people did not want to take part in a study that did not involve giving them money.

Ethical considerations

Institutional consent.

The research was approved by the Makerere University Faculty of Medicine Ethics and research committee. Permission to conduct the study was also obtained from the Health Centre administration.

Informed consent and patient care.

Written Informed consent was obtained from the participants before enrollment into the study. Confidentiality was observed throughout the study and results only communicated to the concerned people.

5 RESULTS

Patient recruitment

From 09th May and 28th June 2016, a total of 216 adults aged 18 to 40 years at Butemba Health Centre III presenting to Centre, were identified and screened for eligibility to participate in the study. Thirty-five patients were excluded for various reasons as shown on the study profile, while 181 were enrolled in the study and followed up.

6 Demographic characteristics of the study respondents

The table above illustrates the demographic characteristics of the study respondents. Most of the study participants were females constituting 55.8%. However, majority of them were youths aged less than 35 years comprising 54.14%. Most of the Study respondents were married representing 56.91%. Most of the respondents were less educated that is primary level and below constituting 55.25%.

Prevalence of *H.pylori* among adults between 18 and 40 years in Butemba Health Centre III

Figure 1: Prevalence of *H. pylori* among adults between 18 and 40 years in Butemba Health Centre III

Factors associated with prevalence of *H.pylori* infection

Above illustrates the factors associated with the prevalence of *H. Pylori* infection among adults aged 18 to 40 years attending Butemba Health Centre III. 107 of the respondents smoked cigarettes which was 31.03% of *H.pylori* antibody tested positive yet 74 respondents never smoked but still tested positive (21.46%) (OR= 0.732) which was clinically insignificant with 95%CI = 0.275 – 1.950 and p-value 0.533.

Table 2 also illustrates that 121(35.09%) respondent drunk alcohol tested positive for *H.pylori* antibody test against the 60 (17.4%) respondents who didn't drink alcohol but still tested positive for *H.pylori* antibody test, however, 82.6% of respondents who didn't use alcohol tested negative for *H.pylori* antibody test, (Odds ratio 4.373 with 95%CI of 1.359 – 14.06) which was clinically significant.

70.71% of respondents who had poor sanitation tested positive for *H.pylori* antibody test while 29.29% tested negative with an odds ratio of 5.33 which is clinically significant

7 Discussion

The study findings revealed that the prevalence of *H.pylori* among adults between 18 and 40 years at Butemba Health Centre III was 29.2%. This finding appears to be lower than compared to other studies done elsewhere in the developing world. The overall prevalence is higher in developing countries than in developed countries with prevalence being 80-90% and <40% respectively (Ferenci *et al.,* 2010).

The difference in results is probably due to the variations in the study population, such as the urban dwellers, and the age and health conditions of the patients. Also, differences in the geographic regions, the type of test specimens (stool and blood), the analytical methods used, and the target molecules, that is, antigen versus antibodies, are likely to have influenced the differences in the study findings. The current study population was mainly above 18 years of age, hence a lower prevalence than that reported by Hestivik *et al.,* (2010) where a prevalence of 44.3% was found among children age 0-12 years.

The study also examined possible predisposing factors to infection. It was found that cigarette smoking, poor sanitation, and drinking alcohol were the predisposing factors to *H. pylori* infection with a p-value<5% level of significance.

Among lifestyle factors, alcohol intake was found to be associated with an increase in *H.pylori* prevalence with drinkers having higher odds compared to subjects that never drank, this was in disagreement with a study done on a pooled analysis of 3 studies from Germany, comprising 1410 adults aged 15-69 years showed that prevalence of current *H. Pylori* infection was lower among subjects who consumed alcohol (34.9%) than non-drinkers (38.0%).

Using water from rivers, lakes, and streams were associated with higher odds of infection compared to using private taps after adjusting for several background variables including location and ru-

Table 1. Demographic characteristics of the study respondents

	Frequency (n=181)	Percentage %
Sex •		
Male	80	44.2
Female	101	55.80
Age group in years • 18- 30	98	54.14
31 – 40	83	45.86
Marital status •		
Married	103	56.91
Not married	78	43.09
Occupation		
Not Working	73	40.33
Formally Employed	21	11.60
Self Employed	87	48.07
Education •		
primary and below	100	55.25
Secondary and above	81	44.75

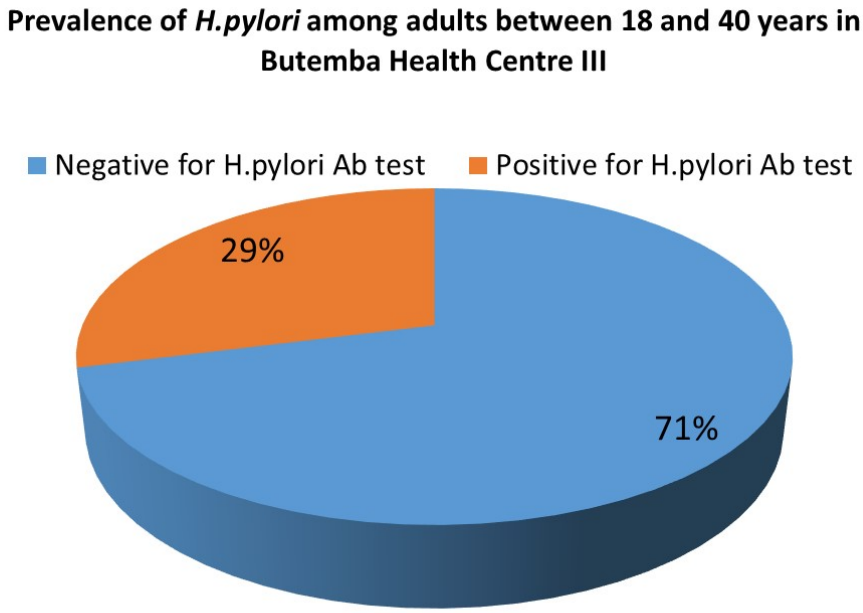

Chart 1. Above illustrates the prevalence of *H.pylori* among patient aged 18 and 40 years at Butemba Health Centre III. The Patients with a positive *H. Pylori* Antibody test was 29.28%. With a confidence interval of 22 – 35%

ral/urban residence. Studies in Peru by Klein *et al.,* (1992) found an association between *H. pylori* infection and surface water sources, such as rivers, for household use. The presence of *H. pylori* in water supplies might be the result of contamination from human sewage. We postulate that the use of contaminated surface water sources with inadequate treatment at the household level is involved in the transmission of *H. pylori* infection in Uganda.

8 Conclusion and Recommendations

The prevalence of *H. pylori* among patients between 18 and 40 years at Butemba Health Centre III was established at 29.2%, the results are signifi-

Table 2. Factors associated with prevalence of *H.pylori* infection.

Factors associated with *H.pylori* infection		*H.pylori* Positive Antibody test	H.pylori Negative Antibody test		
	Freq n=181	**%**	**%**	**Odds Ratio**	**95%CI**
Smoke of cigarette					
• No	74	21.46	78.54	0.732	0.275 – 1.950
• Yes	107	31.03	68.97		
Drinking alcohol					
• No	60	17.4	82.6	4.373	1.359 – 14.06
• Yes	121	35.09	64.91		
Sanitation					
• Poor	101	70.71	29.29	5.33	2.556 –11.113
• Good	80	23.2	76.8		
Meals per day					
• One	44	12.76	87.24	0.453	0.332 – 1.521
• Two	58	16.82	83.18		
• Three and more	79	22.91	77.09		

cantly below those demonstrated by other studies done in developing countries. Cigarette smoking 31.03%, poor sanitation 70.71%, and alcohol drinking 35.09% were some of the predisposing factors.

The study demonstrated the need for a larger sample size as there were many cases of no response to some questions. Another suggestion is to redesign questionnaires in a suitable way to have a larger response rate. A possible explanation is a difference in eating patterns, especially in school-going young people, with less affordability for meals in rural areas. Further, studies should be done in more detail to examine the rural and urban prevalence and other predisposing factors using a large population. The people in the areas around the health Centre should be sensitized to improve their sanitation, living conditions, and eating habits (when and what to eat).

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Abbreviations and Acronyms:

CagA: Cytotoxic Associated gene A

CI: Confidence Interval

DNA: Deoxyribonucleic acid

ELISA: Enzyme Linked Immunosorbent AssayPylori: Helicobacter pylori

PCR: Polymerase Chain Reaction

PPI: Proton pump inhibitor

Rpm: Revolutions per minute

SAT: Stool antigen test

SES: Social economic status

SPSS: Statistical package for social scientists

VacA: Vacoulating cytotoxic

WGO: World Gastroenterology Organization

WHO: World Health Organization

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