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Original Article

Sero-Prevalence of Helicobacter pylori Infection among Pregnant Women Attending Antenatal Clinic in Garissa County, Kenya

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ABSTRACT

The public health impact of H. pylori (HP) infection is gradually becoming evident. The bacterium is now being implicated as an etiologic agent in various gastric diseases. In developing countries, HP infection is markedly more prevalent at younger ages than in developed countries. According to the World Gastroenterology Organization, the prevalence of H. pylori in Kenya was 48% in ages between 2-4, 80% at the age of 6, and 95% in the adult population. The main objective of the study was to determine the prevalence of Pylori infection among pregnant patients attending the antenatal clinic in Garissa County, Kenya. This study utilized a cross-sectional study design to determine the prevalence of H. pylori infection. Probability proportion to the size and a simple random technique was used to collect the data. Blood samples drawn from study participants were tested according to the standard H. pylori tests and as per the Kit manufacturers' instructions and procedure. Information from the laboratory analysis and questionnaires were then recorded in the questionnaire. Informed consent was obtained from the study participants before the study data collection tools were administered. Data Collected was entered into Excel and then exported to SPSS version 20. Frequencies and percentages were used to describe data, while Chi-square and binary logistic regression analysis were used to establish the association between the independent and dependent variables. Results show that the seroprevalence of H. pylori among sample pregnant women was 45%. Inferential analysis shows that respondents levels of education ($\chi 2 = 10.07$, df = 1, p = 0.002), parity ($\chi 2 = 15.776$, df = 3, p = 0.001) and type of toilet ($\chi 2$ (10.415(3), p = 0.015) was associated with the prevalence of H. pylori at bivariate level. Logistic regression analysis establishes that having a higher level of education (A.O.R = 2.483, p = 0.023, living in urban areas (A.O.R = 0.274, p = 0.014), being in casual employment A.O.R = 0.208 p = 0.024), having more than four children (A.O.R =

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7.971, p = 0.006) and sharing of beds (A.O.R = 0.034, p = 0.0001) were predictors of H. pylori infection. This study concludes that about half of the study participants had H. pylori infection and socio-demographic and environmental conditions contribute to the prevalence. There is a need to sensitize pregnant women on the cause and prevention of H. pylori. Also, maintaining proper environmental and sanitation hygiene will aid in reducing transmission.

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INTRODUCTION

Helicobacter pylorus is a Gram-negative, microaerophilic bacterium. It causes chronic low-level inflammation of the stomach lining and is associated with the development of duodenal and gastric ulcers and stomach cancer (Goodman & Cockburn, 2001). There is overwhelming evidence showing that infections with *H. pylori* are higher in developing countries as compared with developed countries (Bardhan, 1997). Despite this, studies on specific aspects of *H. pylori* in developing countries are still few. Local studies show a high prevalence of *H. pylori* among Kenyans (Ogutu et al., 1998). Due to the widespread use of antibiotics, resistance is developing, and in a local study, virtually all *H. pylori* isolated were resistant to metronidazole (Lwai-Lume et al., 2005). Evidence of clarithromycin resistance has been established in other studies (Chey et al., 2007). To forestall the development of such a scenario, it is necessary that we develop protocols on when treatment for *H. pylori* can be started in our setup.

H. pylori infection is significantly associated with the development of gastric cancer. Gastric cancer mortality is high and hence early detection of the causative agent will have a significant impact on the prevention or delay of progression to development of gastric malignancies. Knowledge of the magnitude of *H. pylori* infection in our setup is missing. Since this would form a foundation for other studies on treatment and diagnostic protocols for *H. pylori* among pregnant mothers. Therefore, the study will help establish the prevalence of hp among pregnant mothers and formulate prevention and control strategies. The general objective was to determine the seroprevalence of *H. pylori* among pregnant women attending antenatal clinics in Garissa County, Kenya. The specific objectives were.

- To determine the prevalence of *H. pylori* among pregnant mothers in Garissa County.

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- To determine socio-demographic and economic factors associated with *H. pylori* among pregnant women in Garissa County.

- To determine environmental factors associated with *H. pylori* among pregnant women in Garissa County.

MATERIALS AND METHODS

A descriptive cross-sectional analytical study was utilized to evaluate the prevalence of *H. pylori infection* among pregnant mothers attending antenatal clinics. The Dependent variable was the prevalence of *H. pylori* infection, while the independent variables were Socio-demographic, economic and environmental factors. The study was conducted in the Garissa sub-county, which is an administrative county in the former North-eastern province. It is the capital and largest urban area in Garissa town, which has a population of 841,353 composed of 458,975 mean and 382,244 women (2019 census) and has a land area of about 44753 km^2. There is a total of 141394 households with an average of 6 people per household (KNBS, 2019). The county is mostly inhabited by ethnic Somalis. There are 111 health facilities distributed across the county ONE level 5, 14 other hospitals, 29 health centres and 67 dispensaries (MOH, 20I9). The study population included all pregnant mothers attending antenatal clinics in Garissa Sub County. All pregnant mothers who attended the antenatal clinics and who consented and without a history of taking antibiotics or proton pump inhibitors beyond four weeks were included in the study. Mothers with documented *H. pylori infection*, a history of taking antibiotics or proton-pump inhibitors beyond four weeks, and those who refuse to participate will be excluded from the study.

Using a list of twenty-three public and private health facilities in Garissa County with their catchment population, the probability proportional to size sampling technique was used to select the number of respondents attending the various antenatal care sessions at the various health facilities. Health facilities were stratified per the Ministry of Health's classification of health facilities. Study participants were randomly selected at the respective health facilities until the sample size per facility was achieved. Fishers (1998) was used to determine the sample size of 243. The minimum sample size based on the previous studies was calculated using single proportion formula by assuming that the prevalence of *H. pylori* is 80% in adults. The investigator recruited those pregnant mothers attending antenatal clinics who fulfilled the inclusion criteria. Each mother was given information on the study and signed consent was obtained. Demographic data were recorded in a semi-structured questionnaire.

Blood samples (3 - 5 ml) were collected from each patient by venipuncture into a 5 ml clean plain vial containing no anticoagulant. Samples were taken to the laboratory, where they were allowed to stand for 20 min for blood to clot before centrifugation. The serum was separated and transferred into another clean test tube and corked. A standard positive control test was run after every 20 tests, and all of them were verified as positive. The Linear HpSA strip is a rapid lateral flow chromatographic immunoassay that utilizes a monoclonal anti-*H. pylori* antibody as the capture and detector antibody. Approximately 3-5 ml of serum was transferred into the sample diluent vial for 15 seconds. Three drops of the specimen were applied to the test, and the result would be read after 15 minutes. The results will be reported as positive or negative based on the manufacturers' instructions. Questionnaires were coded and were, entered into an excel sheet and then exported into the SPSS version. 20 for analysis. Frequencies and percentages were used to describe data. The Chi-square test of association was used to determine the association between the relationship between the independent and dependent variables. Binary logistic regression analysis was used to establish predictors of seroprevalence of *H. pylori*.

RESULTS AND DISCUSSION

Prevalence of *H. pylori*

Serological tests for *H. pylori* identified a point prevalence of *H. pylori* among pregnant mothers was 45% (110); forty-five per cent of study participants tested positive.

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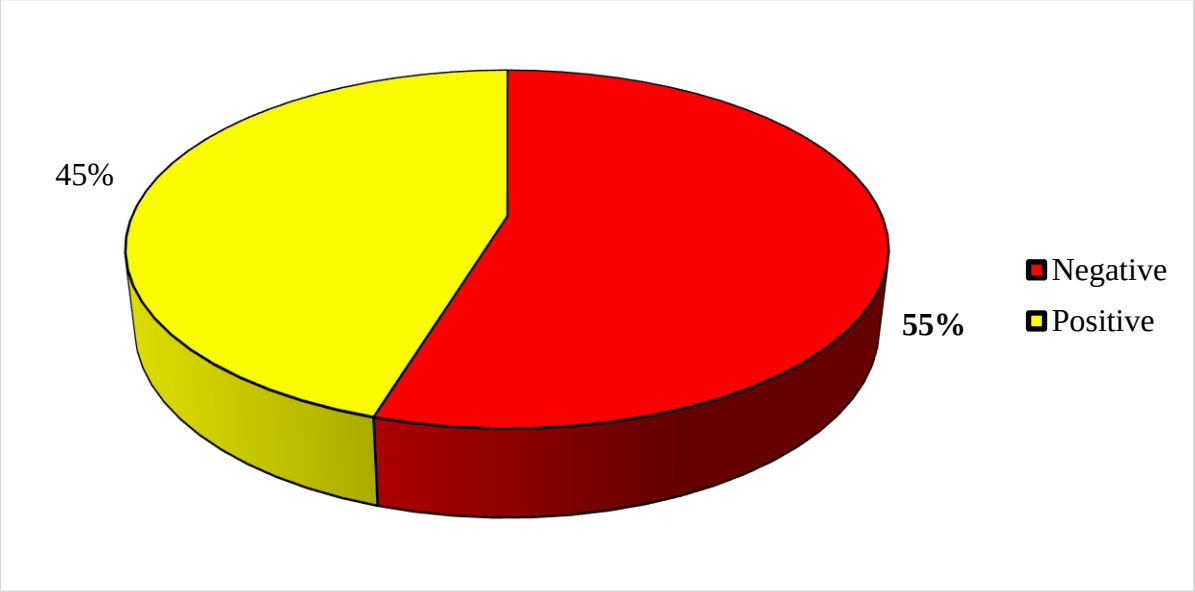
Figure 1: Seroprevalence of *H. pylori* among pregnant women in Garissa County



Socio-Demographic and Economic Factors Associated with Sero-Prevalence of *H. pylori*

Table 1 shows cross-tabulations between socio-demographic/economic factors and the prevalence of *H. pylori* among study participants. Chi-square test of independence illustrate significant statistical significance between respondent's level of education ($\chi 2 = 10.07$, $df = 1$, $p = 0.002$) and parity ($\chi 2 = 15.776$, $df = 3$, $p = 0.001$). The findings above show that 37.3% of women living rural were found to be less infected as compared to their counterparts from the urban centre who were more vulnerable to the *H. pylori* infection, represented by 47.8%. A previous large study in China found a lower prevalence rate of infection in rural areas than in urban but the finding was difficult to interpret due to possible misclassification of *H. pylori* status by serodiagnosis (Mitchell et al., 1992). And at the same time, this study disagrees with a population-based study in Mexico which found no difference in *H. pylori* infection between urban and rural communities (Torres et al., 1998).

On the other hand, the women who were aged above 45 were found to be more vulnerable to *H. pylori* infection than those below age 45 years as denoted by (68%), while women of age 35-44 and of 25-44 age bracket were also found to be vulnerable to the *H. pylori* as represented by% and 54.9% respectively. Also, the study found that the level of income of respondents also contributed greatly to the prevalence of *H. pylori* as the majority of the respondents had high income, and the cases of *H. pylori* were minimal, as denoted by 70% of the families who were employed with good income. The findings reveal the socio-demographic factors such as age, education level, and marital status. The level of income was found to influence the infection of *H. pylori* among pregnant women in Garissa County. The findings were in line with those of Naja (2008), who found a statistical and positive significance between socioeconomic variables such as education and income and *H. pylori* infection among women.

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Table 1: Socio-Demographic/Economic Characteristics and Prevalence of *H. pylori* among Pregnant Women in Garissa County

Independent Variables	Blood_spa Negative	Positive	Test of Association
Age Group (Years)			
<15 years	5(3.8%)	4(3.6%)	
>45 years	17(12.8%)	8(7.3%)	
15-24 years	45(33.8%)	43(39.1%)	$\chi2$ = 2.259(4), *p = 0.6909*
25-34 years	39(29.3%)	32(29.1%)	
35-44 years	27(20.3%)	23(20.9%)	
Education Level			
None	73(54.9%)	82(74.5%)	$\chi2$ = 10.07(1), *0.002*
primary and above	60(45.1%)	28(25.5%)	
Residence			
Rural	37(27.8%)	22(20.0%)	$\chi2$ = 2.002(1), *p = 0.157*
Urban	96(72.2%)	88(80.0%)	
Marital Status			
Married	120(90.2%)	100(90.9%)	$\chi2$ = 0.033(1). *p = 0.856*
Not married	13(9.8%)	10(9.1%)	
Employment			
Casual	20(15.0%)	15(13.6%)	
Not employed	50(37.6%)	40(36.4%)	$\chi2$ = 6.931(3), *p = 0.074*
Permanent employment	28(21.1%)	12(10.9%)	
Self-employment	35(26.3%)	43(39.1%)	
Income			
>20000	10(7.5%)	12(10.9%)	
>5000	34(25.6%)	19(17.3%)	
10001-15000	33(24.8%)	30(27.3%)	$\chi2$ = 3.246(4), *p = 0.518*
15001-20000	11(8.3%)	12(10.9%)	
5000-10000	45(33.8%)	37(33.6%)	
Parity			
>Four	47(35.3%)	62(56.4%)	
One	25(18.8%)	6(5.5%)	$\chi2$ = 15.776(3), *p = 0.001*
Three	36(27.1%)	28(25.5%)	
Two	25(18.8%)	14(12.7%)	

Environmental Factors Associated with the Prevalence of *H. pylori*

Table 2 shows environmental factors associated with study participants. 53.9% of the participant had pit latrines at their homesteads, 20.2% did not have toilets, while 25.9% had a flush type toilet. Sixty-three per cent of the study participants did not wash their children's hands after visiting the toilet. Concerning the household source of water, 42.4% of study participants had access to tap water, 21% of them drew water from boreholes, and only 12.3% drew water from dug wells. Regarding the type of house, fifty-eight per cent lived in a permanent house while the rest, 42%, lived in a semi-permanent house. About 57.6% of study participants shared beds, and a large proportion of respondents (82.7%) washed their hands before preparing food. The findings imply that washing hands before preparing food was found to reduce infection of *H. pylori* among pregnant women in Garissa County. The study also reveals majority of the residents in Garissa County do not wash their children's hands after visiting the toilets which could be the contributing factor to the high

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prevalence of *H. pylori* among pregnant women in Garissa County. The findings disagree with those of Ogutu *et al.* (1998), who established that hand washing after using the toilet had no significant association with *H. pylori* prevalence.

Table 2: Environmental factors

Factor		Frequency	Percent
Toilet Type	Flush	63	25.9
	None	49	20.2
	Pit latrine	131	53.9
	Total	**243**	**100.0**
Wash Child's hands	No	153	63.0
	Yes	90	37.0
	Total	**243**	**100.0**
Water source	Borehole	51	21.0
	River	59	24.3
	Tap	103	42.4
	Well	30	12.3
	Total	**243**	**100.0**
Type of House	Permanent	141	58.0
	Semi-permanent	102	42.0
	Total	**243**	**100.0**
Sharing of Bed	Own bed	103	42.4
	Shared bed	140	57.6
	Total	**243**	**100.0**
Hand wash when Preparing food	Visiting toilet, Yes	201	82.7
	Visiting toilet, No	42	17.3
	Total	**243**	**100.0**

Environmental Factors and Prevalence of *H. pylori*

Table 3 illustrates the test of association between environmental characteristics of respondents and the prevalence of *H. pylori*. Chi-square test of independence shows that the type of toilet (χ^2 = 10.415 (*3*), *p = 0.015)*, the type of house (χ^2 = 9.539 (1), *p = 0.002*)**,** and sharing of bed (χ^2 = 59.695 (1), *p = 0.001*) was associated with the prevalence of *H. pylori* among study participants. There was no statistical association between household water supply (*p = 0.265*), washing a child's hand after visiting the toilet (*p = 0.384*), hand washing before preparing food (*p = 0.171*), and prevalence of *H. pylori*. The findings were of a different view from those of Yamaoka (2012), who found that the end of *H. pylori* infection is dictated by the bacterial virulence determinants, the host genetic factors, and the environmental components such living conditions and predisposing factors.

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Table 3: Environmental factors associated with the prevalence of *H. pylori* among pregnant women in Garissa County

Independent Variables	Positive	Negative	Test of Association
Toilet Type			
Flush	43(32.3%)	18(16.7%)	$\chi 2 = 10.415(3), p = 0.015$
None	23(17.3%)	26(24.1%)	
Pit latrine	67(50.4%)	64(59.2%)	
Wash Child's hands after visiting the toilet			
No	87(65.4%)	66(60%)	$\chi 2 = 0.757(1), p = 0.384$
Yes	46(34.6%)	44(40%)	
Household water supply			
Borehole	25(18.8%)	26(23.6%)	$\chi 2 = 3.963(3), p = 0.265$
River	29(21.8%)	30(27.3%)	
Tap	64(48.1%)	39(35.5%)	
Well	15(11.3%)	15(13.6%)	
Type of House			
Permanent	89(66.9%)	52(47.3%)	$\chi 2 = 9.539(1), p = 0.002$
Semi-permanent	44(33.1%)	58(52.7%)	
Sharing of Bed			
Own bed	86(64.7%)	17(15.5%)	$\chi 2 = 59.695(1), p = 0.001$
Shared bed	47(35.3%)	93(84.5%)	
Handwashing during food preparation			
Yes	106(79.7%)	95(86.4%)	$\chi 2 = 1.87(1), p = 0.171$
No	27(20.3%)	15(13.6%)	

Logistic Regression analysis

Logistic regression analysis displayed in table 4.5 show that having at least primary level of education (A.O. R=2.483, *p = 0.023*); living in an urban area (A.O. R=0.274, *p = 0.014*); having casual (A.O.R=0.208, *p = 0.024*) and permanent employment (A.O.R=0.068, *p = 0.003*); earning a monthly salary of more than 20,000 (A.O.R=0.036, *p = 6.699*) and sharing of bed (A.O.R=0.0034, *p = 0.0001*) were strong predictors of logistic regression

Table 4: Binary logistic Regression Analysis

Variables	Variable Categories	*Sig.*	Exp (B)	95% CI for Exp (B)	
				Lower	Upper
Education level	None		Ref		
	Primary & above	0.023	2.483	1.132	5.448
Residence	Rural		Ref		
	Urban	0.014	0.274	0.097	0.772
Employment status	Not employment		Ref		
	Casual	*0.024*	0.208	0.053	0.812
	Self-employment	0.205	0.517	0.187	1.434
	Permanent employment	*0.003*	0.068	0.012	0.389
Income	<5000		Ref		
	5000-10000	0.024	11.692	1.391	98.311
	10001-15000	0.995	0.996	0.324	3.065
	15001-20000	0.071	2.982	0.909	9.780

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Variables	Variable Categories	*Sig*.	Exp (B)	95% CI for Exp (B)	
				Lower	Upper
	>20000	0.036	6.699	1.137	39.456
Parity	One		Ref		
	Two	0.077	2.793	0.893	8.731
	Three	0.370	0.542	0.142	2.069
	Four	0.006	7.971	1.798	35.330
Water supply	Tap		Ref		
	Well	0.947	0.950	0.210	4.298
	Borehole	0.516	0.613	0.139	2.692
	River	0.075	0.289	0.074	1.131
Sharing Bed	Owned bed		Ref		
	Shared bed	*0.0001*	0.034	0.012	0.095
Constant		0.423	2.280		

DISCUSSION

The findings show a point prevalence of 45% among study participants is similar to a cross-sectional survey by (Baingana *et al*., 2014) which established a 45% infection prevalence among four hundred and forty-seven pregnant mothers in Uganda. The prevalence observed in their study, however, differed across various health facilities sampled. Further, the odd of infections among pregnant mothers across the sample health facilities was 3-5 folds. This figure is lower than the previous report from Khartoum, Sudan, which showed that *H. pylori* were detected in 59.6% of individuals with gastroesophageal reflux disease and that 80% of non-pregnant patients with Barrett's oesophagus were positive for *H. pylori* (Ahmed, 2004). It is also lower than the *H. pylori* positivity ratio of 59.0% in the Ikeja local government area of Lagos, Nigeria (Mynepalli and Mumuni, 2014). It is also lower than 50%-70% in Turkey (Karaer *et al.,* 2008), Mexico and in, Texas, the United States (Felkner et al., 2007), more than 80% in Egypt (Bassily et al., 1999) and Gambia (Bunn *et al.,* 2003). The low rate of *H. pylori* infection in this study disagrees with the observation of an 88% rate of *H. pylori* infection in Egypt (Bassily et al., 1999). In contrast, the result of this study is higher than the prevalence of 17.5% observed among pregnant women on the African Island of Zanzibar (Farag et al., 2017). Also, higher than the prevalence of 20%-30% of *H. pylori* infection among pregnant women in most European countries (Weyerman et al., 2005), Japan (Kitagawa et al., 2001), and Australia (Eslick et al., 2002), this reflects the difference in hygienic practices or other socio-demographic characteristics, while a high prevalence (74%) of *H. pylori* infection was reported among pregnant women at the US–Mexico border (Goodman & Cockburn, 2001). The prevalence of *H. pylori* infection in pregnant women varies according to geographic area, socioeconomic conditions and method used to detect *H. pylori* infection. Furthermore, inadequate sanitation practices, low social class and crowded or high-density living conditions seem to be related to a higher prevalence of *H. pylori* infection. These observations suggest that poor hygiene and crowded conditions may facilitate the transmission of infection among family members and they are consistent with data on intra-familial and institutional clustering of *H. pylori.*

Descriptive statistics show an even distribution of ages among the study participants slightly more than a third of the respondents in this survey aged more than twenty-five years. Surprisingly, a large proportion of survey participants reported having no education and lived in urban areas. Logistic regression analysis establishes that the level of education, residing in urban areas, earning a high income, having a parity of more than four, and sharing a bed predict the prevalence of *H. pylori* among pregnant women. Alvarado-Esquivel's (2013) survey illustrates a glaring difference in *H. pylori* prevalence in rural and urban municipalities of respondents and parity. The study established that seroprevalence odds increased with every increase in the number of pregnancies ($p = 0.005$). Results in this study contradict bivariate analysis by Wanyama

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et al. (2016), wherein the level of education was statistically indifferent ($p = 0.144$ vs $p = 0.002$) to the prevalence of *H. pylori* infection among pregnant women. Other variables observed, such as occupation, maternal age, and marital status, were consistent with this study's findings

Descriptive statistics in this study show that a significant proportion of the study participants lived in urban areas and that more than half had pit latrines, and about a fifth did report not having a toilet. This statistic paints a worrying urban sanitation problem in the study area. As a limitation, this study has not investigated the respondents' pit latrine; with that notwithstanding, the study area is classified as an arid and semi-arid location. As such, developmental challenges to access to safe sanitation and access to safe water are expected. The present study reports that forty-two per cent of study participants have access to tap water, while the rest drew household water from boreholes, wells, rivers, and wells. Development Initiatives (2020) reports that over the past decade, Garissa and Madera Counties have reported a decline in household water access by at least 10.4 and 1.6 percentage points. Regarding sanitation, Garissa County has had an eight-percentage point increase in access to sanitation over the period. Hygiene behaviour in hand washing in food preparation among study participants is desirable as recommended. Existing literature has shown a direct association between the prevalence of *H. pylori* infection and environmental factors such as the source of water and type of toilet. For instance, in a cross-sectional survey, Abdella et al. (2020) established the household source of drinking water was associated with *H. pylori* infection. The current study's bivariate level has also established a direct association with the prevalence of *H. pylori*.

CONCLUSIONS

About half of the study participants screened had *H. pylori* infection. This figure highlights an underlying public health problem that needs to be addressed. Socio-demographic and economic characteristics in education levels of primary level and above, parity of more than four children, being employed and earning a higher level of income were significant predictors of *H. pylori* infection. Hygiene behaviour in handwashing during food preparation was desirable. The type of toilet and sharing of beds at the household level were significant predictors of *H. pylori* infection. Also, based on the study objective, it was concluded that the pregnant women who live in urban centres were found to be more vulnerable to the infection of *H. pylori* as compared to their counterparts from those who live in rural areas. The study further concluded that family income could influence the infection of *H. pylori* as the study evidenced that the pregnant women from low earning income were seen to be infected more by *H. pylori* than those from higher-income bracket reason being those from high income checked medical attention fast and early than those from low earning income. Lastly, based on the study objective, it was concluded that washing hands by pregnant women before preparing food was seen to reduce the infection of *H. pylori*. Moreover, the study concluded that washing children's hands after visiting the toilet could also reduce the infection of *H. pylori*. The study also found statistical and positive significance between Socio-demographic and economic characteristics, environmental factors, and infection of *H. pylori* infection among pregnant women in Garissa County.

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