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Original Research Article

Risk factors associated with the prevalence of *Helicobacter pylori* among community members in Kibwezi West Sub-County, Makueni County

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ABSTRACT

Background: *Helicobacter pylori* are gram-negative pathogens that live in the digestive tract and are linked to intestinal ulcers, stomach ulcers, chronic gastritis, stomach cancer, and a variety of extra-gastric problems. Close to half of the world's populace is afflicted. The principal focus of the investigation sought to establish the extent of *H. pylori* infection in Kibwezi West Sub-County and the socioeconomic parameters that drive it.
Methods: Purposeful selection, cluster selection, and simple random sampling strategies were utilized in the study's analytic cross-sectional architecture. Participants ranged from 18 to 70 years old, and their stool samples (344) were analyzed using the concept of immunochromatography in vitro to determine the antigens of *H. pylori* in stool. At $p \leq 0.05$, Chi^2 tests were conducted between independent and dependent variables.
Results: A number of 344 residents of Kibwezi West Sub-County were surveyed, with a response rate of 100% (344). The majority of those sampled were aged below 58 years (90.1%, n=310), married (81%, n=280), female (75%, n=259), and practicing Christians (84%, n=288). The *H. pylori* test results indicated 32% (n=109) tested positive, with 68% (n=225) returning negative results. The statistical significance of education level (p=0.024), source of drinking water (p=0.001), and diabetic status (p=0.010) was confirmed.
Conclusions: The prevalence of *H. pylori* is lower that reported in most Kenyan studies, including the Kenya health information system for Kibwezi West Sub County in the year 2020. Infection with *H. pylori* was strongly linked to education, drinking water source, and diabetes. This study proposes a number of intervention strategies.

Keywords: Helicobacter pylori, Risk factors, Prevalence

INTRODUCTION

Helicobacter pylori are gram-negative pathogens that affect around 1/2 of the global populace. Recurrent *H. pylori* infection has been attributed to gastro-esophageal reflux disorders, duodenal ulceration, stomach sores, recurrent inflammation and stomach cancer.[1] In 2015, it believed that 4.4 billion individuals globally infected.[2]

According to surveys performed with the assistance of Hooi et al and published throughout 1970 and 2016, South America and Western Asia had the greatest rates of *H. pylori* infection, with 69.4% and 66.6% respectively.[2] In Saudi unwell patients with recurring stomach discomfort and those under the age of 55, Akeel et al discovered a high prevalence of this infection. Severe gastritis also appeared to be substantially associated with *H. pylori* infection.[3]

According to Zamani et al Nigeria has the greatest frequency of *H. pylori* infection on the continent, at 89.7%.[4] The increased incidence of *H. pylori* on the continent is assumed to be attributed to sociodemographic and geographic aspects.[5] Based on Lehours the incidence of this ailment is higher in people in poor countries, including people in low socio-economic backgrounds.[6]

In an investigation performed in Kenya, *H. pylori was* shown to be present in 73.3% of children and 54.8% of elderly individuals with dyspepsia.[7] Established potential variables for increased illness in African countries include home water sources, sanitation and personal hygiene.[8] According to Li et al diabetic individuals showed considerably greater incidence of *H. pylori* illness than non-diabetic participants.[9] Furthermore distinction currently only applies to type II diabetes not type I.

Dinda and Kimang'a identified *H. pylori* genetic material in 2 household shallow wells and one stream in Nairobi.[7] The wells were in two locations. Their findings supported the idea that *H. pylori* might be transmitted through contaminated drinking water. According to Miernyk et al *H. pylori* was once found among rural populations, with social and economic factors such as congestion and consumption of formerly channelled/ supplied water being associated with *H. pylori* acquisition.[10]

Despite the availability of data in the KHIS revealing an increase in *H. pylori* infection from 20.1% in 2015 to 27.5% in 2020, no research has been published in Makueni County among community individuals.[11] As a result, the goal of the investigation sought to determine the extent of *H. pylori* illness and its association with socioeconomic variables. The study's specific objectives were: To establish the extent of *H. pylori* amongst Kibwezi West Sub County community members, to identify socioeconomic factors associated with the presence of *H. pylori* amongst Kibwezi West Sub-County residents and to determine association between socio-economic factors and extent *of H. pylori* amongst Kibwezi West Sub County community members.

METHODS

The researcher used an analytical cross-sectional method for his investigation. This method works well for obtaining data to determine the relationship between independent and dependent variables.[12] The participants in this study were residents of Kibwezi West Sub County, Makueni County, Kenya. The six wards that make up the Sub-County are Kikumbulyu North, Kikumbulyu South, Emali, Makindu/Kiboko, Nguumo, and Nguu/Masumba.

Due to its lack of water, Makueni County is classified as an arid and semi-arid environment. The County has few water supply systems, with a maximum output of 18,490 m^3 per day. Because of the increased frequency of *H. pylori* illness, Kibwezi West Sub County was chosen via purposive sampling (37.3%). Cluster sampling was employed to organize community members in terms of wards, and simple random sampling was employed to choose 344 community members from the Sub-County, which has a population of 200,909 residents.

Background characteristics (age, gender, marital status, residential location, religion) and risk factors were included as independent variables (socio-economic factors). The extent of *H. pylori* amongst Kibwezi West Sub County residents, Makueni County, Kenya, was the dependent variable. Stool samples were analyzed using the idea of immunochromatography in vitro to detect *H. pylori* antigens in a qualitative manner in order to ascertain prevalence. A questionnaire was utilized to collect information on background characteristics and factors linked with *H. pylori* illness amongst community members. The questionnaire was examined by supervisors and peers to confirm its validity. A pre-test was conducted among the residents of Kibwezi East Sub County to confirm that questionnaire items were reliable.

The Chi-square test was used to look into the links between categorical variables (background and socio-economic factors) and *H. pylori* infection status.

RESULTS

Background characteristics of the respondents

A total of 344 residents of Kibwezi West Sub-County were surveyed, with a response rate of 100% (344). The sociodemographic profile of the study participants is shown in Table 1. As shown in the table, there was almost equal representation from the four clusters in the Sub-County. The majority of participants sampled were aged under 58 years (90.1%, n=310). Most respondents were married (81%, n=280), female (75%, n=259), and practicing Christians (84%, n=288).

The extent of H. pylori infection among the community members

The *H. pylori* test results are shown in Figure 1. Only a third (32%, n=109) of the samples tested positive, with the rest (68%, n=225) returning negative results.

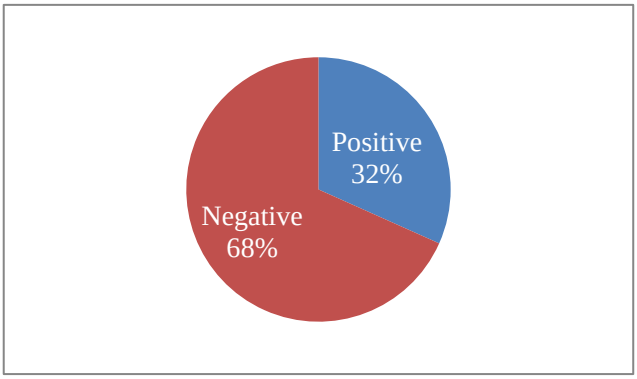

Figure 1: *H. pylori* test results for the respondents.

A Chi-square analysis was applied to examine the relationship of background features and the infection status of the residents. As shown in Table 2 none of tested features considered significant for *H. pylori* infection.

Socio-economic factors associated with H. pylori

Table 3 shows several socio-economic characteristics of the respondents that were relevant to *H. pylori* transmission. Almost 9 out of 10 residents (89%, n=305) had some form of employment. Similarly, 88% (n=302) engaged in farming as their source of income. Sixty-three percent (n=215) had attained primary education, followed by secondary education at 22% (n=74). On average, most households (87%, n=298) had 4-5 family members, lived in a house that had 3-4 sleeping rooms (99%, n=341), and used a pit latrine (80%, n=276). Additionally, 82% (n=283) relied on dams for water supply, and 16% (n=55%) relied on shallow wells. One in every eighteen residents (5.5%, n=19) of Kibwezi West Sub-County has diabetes mellitus type 2 as most prevalent (88%, n=15).

Association between socio-economic factors and H. pylori test results

Table 4 shows the association between the various socio-economic characteristics of the residents and the infection status. The proportion of those who turned positive for *H. pylori* differed significantly by level of education (LR=10.620, df=3, p=0.014), such that those with a high level of education were less infected. The proportion of those who turned positive for *H. pylori* differed significantly with the source of drinking water (LR=123.177, df=2, p=0.001) in that those who got water from the dam were mostly infected. Further, the proportion of those who turned positively to *H. pylori* differed significantly among participants with diabetes mellitus (p=0.010). Nonetheless, there was no evidence of a link between *H. pylori* infection and employment status ($\chi2$=0.055, df=1, p=0.814), number of members in a household (LR=0.276, df=2, p=0.871), number of rooms used for sleeping per household (LR=0.004, df=1, p=1.000), and type of toilet in the homesteads ($\chi2$=0.510, df=1, p=0.475).

Table 1: Background characteristics of the respondents.

Characteristics		Frequency	Percentage (%)
Age (years)	18-27	72	20.9
	28-37	83	24.1
	38-47	87	25.3
	48-57	68	19.8
	>58	34	9.9
	Total	344	100
Gender	Male	85	24.7
	Female	259	75.3
	Total	344	100
Marital status	Single	42	12.2
	Married	280	81.4
	Separated	9	2.6
	Widowed	13	3.8
	Total	344	100
Clusters (Areas of residence)	Kiku. North	57	16.6
	Kiku. South	58	16.9
	Emali	58	16.9
	Makindu/ Kiboko	58	16.9
	Nguumo	57	16.6
	Nguu/ Masumba	56	16.3
	Total	344	100
Religion	Christian	288	83.7
	Muslim	56	16.3
	Total	344	100.0

Table 2: Cross-tabulation of background characteristics by *H. pylori* status.

Characteristic		*H. pylori* test results						Significant at p≤0.05
		Positive		Negative		Total		
		N	%	N	%	N	%	
Gender	Male	27	31.8	58	68.2	85	100	$\chi2$=0.000, df=1 p=0.986
	Female	82	31.7	177	68.3	259	100	
Age (years)	18-27	27	37.5	45	62.5	72	100	$\chi2$=1.993, df=3 p=0.574
	28-37	24	28.9	59	71.1	83	100	
	38-47	30	34.5	57	65.5	57	100	
	48-57	19	27.9	49	72.1	68	100	
	>58	9	26.5	25	73.5	34	100	

Continued.

Characteristic		*H. pylori* test results						Significant at p≤0.05
		Positive		Negative		Total		
		N	%	N	N	%	N	
Marital status	Single	11	26.2	31	73.8	42	100	LR=2.601, df=4, p=0.627
	Married	91	32.5	189	67.5	280	100	
	Separated	2	22.2	7	77.8	9	100	
	Widowed	5	38.5	8	61.5	13	100	
Cluster	Kik North	15	26.3	42	73.7	57	100	χ2=3.443, df=5 p=0.632
	Kik South	20	34.5	38	65	58	100	
	Email	23	39.7	35	60.3	58	100	
	Makindu Kiboko	16	27.6	42	72.4	58	100	
	Nguumo	19	33.3	38	66.7	57	100	
	Nguum/ Masumba	16	28.6	40	71.4	56	100	
Religion	Christian	89	30.9	199	69.1	288	100	χ2=.501, df=1 p=0.479
	Muslim	20	35.7	36	64.3	56	100	

Table 3: Socio-economic factors.

Characteristics		Frequency	Percentage (%)
Employed	Yes	305	88.7
	No	39	11.3
	Total	344	100
Occupation	Farmer	302	87.8
	Teacher	2	0.6
	Business	1	0.3
	Housewife	5	1.5
	Student	34	9.9
	Total	344	100
Level of education	Primary	215	62.5
	Secondary	74	21.5
	Tertiary	26	7.6
	None	29	8.4
	Total	344	100
Number of family members	<3	5	1.5
	4-5	298	86.6
	>6	41	11.9
	Total	344	100
House: Sleeping rooms	<2	3	0.9
	3-4	341	99.1
	Total	344	100.0
Toilet type	Pit	276	80.2
	VIP	68	19.8
	Total	344	100
Drinking water source	Borehole	6	1.7
	shallow well	55	16.0
	Dam	283	82.3
	Total	344	100.0
Has DM	Yes	19	5.5
	No	325	94.5
	Total	344	100
DM type	Type 1	2	11.8
	Type 2	15	88.2
	Total	17	100

Table 4: A cross-tabulation of socio-economic factors by *H. pylori* status.

Socio-economic factor		*H. pylori* test results						Significant at p≤0.05
		Positive		Negative		Total		
		N	%	N	%	N	%	
Level of education	None	3	10.3	26	89.7	29	100	LR=10.620, df=3, p=0.014
	Primary	66	30.7	149	69.3	215	100	
	Secondary	30	40.5	44	59.5	74	100	
	Tertiary	10	38.5	16	61.5	26	100	
Employed	Yes	96	31.5	209	68.5	305	100	$\chi 2$=0.055, df=1, p=0.814
	No	13	33.3	26	66.7	39	100	
Occupation	Farmer	94	31.1	208	68.9	302	100	LR=2.676, df=4, p=0.613
	Teacher	1	50	1	50	2	100	
	Housewife	2	40	3	60	5	100	
	Student	11	32.4	23	67.6	34	100	
No. members in the household	<3	2	40	3	69.5	5	100	LR=0.276, df=2, p=0.871
	4-5	95	31.9	203	68.1	298	100	
	>6	12	29.3	29	70.7	41	100	
Sleeping rooms	<2	1	33.3	2	66.7	3	100	LR=0.004, df=1, p=1.000
	3-4	108	31.7	233	68.3	341	100	
	Don’t know	1	100	0	0	1	100	
Toilet type	Pit	85	30.8	191	69.2	276	100	$\chi 2$=0.510, df=1, p=0.475
	VIP	24	35.3	44	64.7	68	100	
Drinking water source	Borehole	6	100	0	0	6	100	LR=123.177, df=2, p=0.000
	Shallow-well	50	90.9	5	9.1	55	100	
	Dam	53	18.7	230	81.3	283	100	
Has DM	Yes	1	5.3	18	94.7	19	100	Fisher’s exact p=0.010
	No	108	33.2	217	66.8	325	100	

LR=Likelihood ratio, DM=Diabetes mellitus.

DISCUSSION

Among the population surveyed, males and females had a close range of prevalence (31.8% and 31.7%), and this indicated that every person in Kibwezi West Sub County can acquire the infection. The results could be attributed to the fact that males and females are exposed to a similar environment. The findings slightly differ from a study by Lehours who indicated that the infection is more common in females than in males.[6]

This investigation further revealed that the prevalence of *H. pylori* illness varied by age group, with 37.5% in the 18-27-year-old group and 26.5% in the over-58-year-old group. This finding are consistent with those of Nabwera et al who in their study of Kenyan school-aged children in multiple Nairobi hospitals in 2000, reported a high occurrence rate of *H. pylori* infection (80.7%) among youngsters.[13]

Another investigation in Kenya by Kimang‘a et al discovered the extent of *H. pylori* was extremely high (73.3 percent) for teenagers but low (54.8 percent) for the elderly, corresponding to Shmuely et al study involving Nakuru residents, who documented high frequencies of infection among young respondents.[14,15]

The investigation didn't show correlation of all background characteristics (age, gender, religion, marital status, and residence) and the extent of *H. pylori* illness. The results of this study determined the extent of *H. pylori* illness amongst Kibwezi West Sub County residents to be 32%. This study favorably compares the findings with data from KHIS, whereby Kibwezi West Sub County prevalence is found to be slightly higher at 37.3%.[11] The results of the study, which took place in Makueni County in Kenya, a developing country, reveal that the frequency of *H. pylori* continues to be a community health threat in developing regions. The study's diagnostic test of choice was the *H. pylori* stool antigen test.

According to this study, *H. pylori* infection was closely linked to level of education, the source of drinking water, as well as being diabetic. In a study of the general populace in Cameroon, investigators reported a link between education and the prevalence of *H. pylori* infections within respondents.[16] However, the prevalence of *H. pylori* reported in people with advanced education by Abongwa et al was lower than that seen in this study.[16] In addition, the association between *H. pylori* and the sources of drinking water could be a result of 90.9% of the participants using common sources, such as shallow wells and dams. Similar findings by Smith et al demonstrated *H. pylori* presence among rural residents, with social and economic characteristics being congestion and consumption of water that was once channelled or supplied to the residents.[17] The study indicated a considerable relationship between diabetes and *H. pylori* infection, as many studies suggest that *H. pylori* is more common in people with type 2 diabetes than in healthy people. The cause could be due to *H. pylori* infection,

which causes inflammation and the generation of inflammatory cytokines, as well as hormonal imbalances linked to diabetes mellitus.

CONCLUSION

In conclusion, the extent of *H. pylori* seems to be lower than what is reported in most Kenyan studies. This study discovered a strong relationship between the level of education, drinking water source, and diabetes, all of which appeared to correlate with *H. pylori* illness. As a result, the authors recommend that asymptomatic and healthy people be tested for *H. pylori* on a regular basis. This will enable better and speedier treatment for those who have tested positive, decreasing transmission and halting the overall spread of the disease.

Also, the County government of Makueni, through the ministry of health, should ensure that water samples from all public water sources are being collected and tested for *H. pylori* infection to determine areas where fecal contamination of water sources could be occurring. In addition, public health officers and community health volunteers should encourage community members to adhere to environmental hygiene and sanitation rules.

Further, and in view of the observation that socio-economic factors are linked to *H. pylori* infections, the study recommends additional research uncovering certain aspects that have yet to be completely investigated and which could lead to an "African conundrum" for *H. pylori* illness.

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