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Prevalence of *Helicobacter pylori* and hygiene practices among public secondary school students in Ikeja local government area, Lagos, Nigeria

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ABSTRACT

This study determined prevalence of *Helicobacter pylori* and hygiene practices among public secondary school students in Ikeja Local Government Area (LGA), Lagos state, Nigeria. An institutional-based, cross-sectional study was conducted among two randomly selected secondary schools. One hundred (100) consented students participated in the study and interviews were conducted using a semi-structured questionnaire while blood samples were collected by venipuncture. Respondents' ages were 16.1 ± 2.8 years and 54.0% were females. Mean number of persons living in a room was 7.0 ± 3.5, and however, 39.0% of the respondents lived in a room with 4 - 6 persons. The prevalence of *H. pylori* was 59.0% (59/100). Majority, 64.4% of those infected with *H. pylori* were 15 years and above while 62.7% females were tested positive to *H. pylori.* Some, 38.9% of the participants infected with *H. pylori* drink tap water while 84.7% did hand washing after visiting toilets with water and soap. Mostly, 64.0% of those tested positive to *H. pylori* did not experience abdominal pain in the last 4 weeks. No significant association existed between drinking water source, hand washing practice after defecation and *H. pylori* positivity. Routine examination of school students is required to detect *Helicobacter pylori* in order to commence treatment immediately and awareness about the *H. pylori* infection should be increased throughout secondary school to prevent further infection.

KEYWORDS

***Helicobacter pylori*; Hygiene; School Children; Lagos Slums; Hand Washing; Sanitation**

1. INTRODUCTION

Helicobacter pylori (*H. pylori*), which was the first formally recognized bacterial carcinogen and one of the most successful human pathogens, has been etiologically associated with gastritis and gastritis associated diseases, peptic ulcer, gastric adenocarcinoma and primary gastric lymphoma [1,2]. The prevalence of infection varies between and within countries in relation with race, ethnicity, and geographical area of the population [3]. Epidemiology of *H. pylori* infection demonstrated a high prevalence in developing up to 90% than in developed countries [4]. Although, high prevalence is found among the immigrants compared with the local population in the developed countries [5], a low prevalence rate (6.5%) has been reported among school children in Germany [6]. Unless the infection is treated, colonization persists lifelong and has been attributed to the poor socioeconomic status, hygienic practices, and overcrowding in their residences [7,8]. In a study by Haluszki *et al*. [9], it was reported an increased risk associated with smoking and the ingestion of salted or pickled foods while consumption of uncooked vegetables has also been described as a mode of *H. pylori* transmission [10]. However, it has been estimated that most infected subjects develop no clinical signs and symptoms of peptic ulceration and continue their lives with superficial chronic gastritis [3]. High percentage (17%) of infected subjects will develop peptic ulcer (4.25%), experience ulcer complications and

still fewer (1%) will progress to gastric cancer development of disease depends on bacteria, host and environmental factors [1,11] .

Evidence for its substantial casual role in the pathogenesis of gastric cancer has substantially increased since its isolation in 1982. *H. pylori*, a gram-negative bacillus that colonizes the stomach is probably the most common chronic bacterial infection worldwide [12]. It has been suggested that communities with a high prevalence of stomach cancer commonly have a high rate of infection with *H. pylori* infection and decrease in the incidence of gastric cancer and the decreasing rate of the prevalence of *H. pylori* infection has been observed, especially in the developed countries [13]. Nevertheless, controversial reports, especially from African countries where despite the high rate of *H. pylori* infection, gastric cancer has a very low prevalence, make it hard to conclude on the significant role of *H. pylori* infection on the incidence and prognosis of gastric cancers [14]. However, a prospective cohort study among Japanese patients with non-cancerous gastric and duodenal pathological conditions demonstrated that patients who were positive for *H. pylori* infection in the study initiation were significantly more likely to develop gastric cancers [15].

Most studies attributed sociodemographic factors to the *H. pylori* positivity. For instance, Barik [11] reported that 80% of adult population was infected with *H. Pylori* in developing countries with age being the strongest risk factor. Also, it was found that *H. Pylori* positivity had a strong association with age > 40 years in Yemen [16]. Similarly, Ito, *et al*. [17] indicated that males were at significant risk for the infection of *H. pylori* while Replogle *et al*. [18] noted that the infection risk was the same for males and females. In Nigeria, however, among the few studies that investigated *H. pylori* infection attributed it to environmental factors such as hygiene practices and diet [19]. Despite the fact that environmental factors such as water sources, housing conditions, hygiene practices have roles to play in its infection, there is dearth of information on the available literature on these factors. Therefore, this study determined prevalence of *H. pylori* and hygiene practices among public secondary school students in Ikeja LGA, Lagos state, Nigeria.

2. MATERIALS AND METHODS

2.1. Study Area

Lagos metropolis is situated between Lat. (6 22' and 6 42') N and Long. (42' and 4 22') E, and comprises of 20 Local Government Areas, namely—Agege, Ajeromi/Ifelodun, Alimosho, Amuwo-Odofin, Apapa, Badagry, Epe, Eti-Osa, Ibeju-Lekki, Ifako-Ijaiye, Ikeja, Ikorodu, Kosofe, LagosIsland, LagosMain-land, Mushin, Ojo, Oshodi/Isolo, Somolu and Surulere. It is located in the tropical rain forest zone of the country and climate oscillates between a dry season (November to April) and a wet season May to October). Ikeja LGA, the study area is situated between Lat. (53000 and 54000) N and Long. (72000 and 73000) E, with an estimated total population of 313,196 (males: 169, 233 and females: 143,963) [20]. The LGA is made up of 12 settlements namely; Aguda, Omole, Agidingbi, Ikeja (Central), Ogba, Ikeja G.R.A, Maryland, Onigbongbo, Ojodu, part of Ilupeju, Onileke and Opebi. There are 13 public secondary schools, 16 private secondary schools and two military secondary schools, giving a total of 28 secondary schools, all distributed among the 12 major settlements in the L.G.A (Ministry of Education, Planning, Research and Statistics Division, The Secretariat, Alausa, Ikeja, Nigeria, Personal communication).

2.2. Study Design and Study Location

This study was an institutional-based, cross-sectional and involved secondary school students in Ikeja LGA, Lagos state. Respondents were selected by simple random sampling. A set of semi-structured questionnaire was developed to elicit information such as demographic characteristics of students, source of drinking water, sanitary practices and perceived health problems of respondents. Also, blood samples from selected students were collected, tested for Immunoglobulin antibodies against *H. pylori* by ELISA (manufactured by Organics and marketed by May and Baker pharmaceuticals Nigeria Ltd).

2.3. Study Population and Sampling Techniques

This study was carried out among public secondary school students. Two schools were selected from the 13 public secondary schools by simple random sampling. One hundred (100) consented students of these two secondary schools participated in the study. During the planning of the study, the researchers approached the authorities in-charge of the selected schools particularly the principals and the Local Education District Officer in-charge of public schools with formal letters to obtain permission to carry out the work in the schools and also explained the study objectives. Furthermore, a lecture on the theme and objectives of the study was given at one of the "Parents Teachers Association" (PTA) meetings ensuring that they understood all aspects of the study. Permission and supervision were granted over the collection of blood samples from students in the school by health officials from Ministry of Health sought by Ministry of Education. Consent forms after they had been completed and signed, were obtained from parents/guardians, heads of schools and the students. Parents, who accepted their

children to be included in the study, presented them at the time of blood sampling by one of the authors who is qualified.

Simple random sampling technique was used to represent a proportional distribution from the various arms of classes. Each arm of class was given an equal chance of being selected. Selection of the various arms was made by balloting. For example, in the different arms of JS 1, about 6 - 8 arms in both the schools, were assigned numbers on a small piece of paper each; these were dropped into a big bowl; thoroughly mixed and a class captain was asked to pick a piece of paper. Consenting students in the class(es) selected were interviewed while blood samples were collected immediately after the interview from the respondents. Interviews were conducted by two trained research assistants (one male and one female) who are university graduates and were acquainted with questionnaire research. They were trained in how to use the instrument and how they should introduce themselves and the research objectives modestly to the students during the interview.

2.4. Laboratory Analysis

Blood samples (3 - 5 ml) were collected from each student by venipuncture, into 5ml 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 centrifuged. Supernatant serum was separated and transferred into another clean test tube and corked. Specimens were stored at –20˚C till they were ready to be assayed.

The ImmunoComb II *H. pylori* IgG kit was used for the quantitative determination of IgG to Hp in serum. It consists of an indirect solid-phase EIA. The solid phase is a comb with 12 projections ("teeth"). Each tooth is sensitized at two positions: Upper spot—goat antibodies to human immunoglobulin (internal control). Lower spot—antigens of inactivated *H. pylori*. The developing plate has 6 rows (A - F) of 12 wells, each row containing a reagent solution ready for use at a different step in the assay. The test was performed stepwise, moving the comb from row to row, with incubation at each step. At the onset of the test, serum specimens were pre-diluted 1 in 11 and added to the diluent in the wells of row A of the developing plate. The comb is then inserted into the wells of row A antibodies to Hp if present in the specimen, will specifically bind to Hp antigens in the lower spot on the teeth of the comb. Simultaneously, immunoglobulin present in the specimens was captured by the anti-human immunoglobulin on the upper spot (internal control).

Unbound components were washed away in row B. in row C, the anti-Hp IgG captured on the teeth will react with anti-human IgG labeled alkaline phosphatase (AP). In the next two rows, unbound components are removed by washing (*i.e.* rows D and E) in row F, the bound alkaline phosphatase reacts with chromogenic components. The results were visible as gray-blue spots on the surface of the teeth of the comb. The test kit includes a positive control (anti-Hp IgG) and a negative control which were included in each assay run. Upon completion of the test, the tooth used with the positive control should show two gray-blue spots. The tooth used with negative control should show upper spot and either no spot or a faint lower spot. The upper spot should also appear on all other teeth, to confirm that the specimen was added.

2.5. Data Analysis

Data generated from the field were edited daily. Then they were coded and entered into the computer for analyses using Epi-Info 6.04 statistical software packaged. Data were presented as mean standard deviation for continuous variables and percentages for categorical variable. Chi-square statistic was used to determine the associations between demographic characteristics, housing conditions, drinking water sources, hygiene practices and *H. pylori* positivity among the students. Statistical significance was defined at $p < 0.05$.

2.6. Ethical Considerations

The study was approved by the joint Ethical committee of University of Ibadan and University College Hospital, Ibadan, Nigeria and consent was obtained from selected schools principals and the respondents, the Local Education District Officer in-charge of public schools and Parents' Teacher's Association of the selected school.

3. RESULTS

3.1. Demographic Characteristics of the Participants

Table 1 presents the demographic profile of the participants. The mean age which ranged from 9 - 19 years was 16.1 ± 2.8 years. There were (54.0%) female and (46.0%) male. Most (82.0%) were Christians while 16.0% practice Islam. Most of the participants' father (94.0%) and mother (90.0%) had completed secondary education. Majority (60.0%) lived in flat type apartment as depicted in **Figure 1**. Mean number of persons living in a room was 7.0 ± 3.5 (rang = 1 - 15) while 39.0% of those who lived in a room were between 4 - 6 persons as illustrated in **Figure 2**.

3.2. Prevalence of *H. pylori* Infection

The *H. pylori* positivity ratio was found to be 59.0% (59/100) as shown in **Figure 3**. Majority (64.4%) of participants, aged 15 years and above) were infected with *H.*

Table 1. Socio-demographic characteristics.

Socio-demographic characteristics	Number N = 100	%
Age (years)*		
≤14 years	47	47.0
≥15 years	53	53.0
Sex		
Male	46	46.0
Female	54	54.0
Religion		
Christianity	82	82.0
Islam	16	16.0
Traditional	2	2.0
Fathers educational status		
No formal education	2	2.0
Primary school education	4	4.0
Secondary school education	94	94.0
Tertiary education	0	0.0
Mothers educational status		
No formal education	2	2.0
Primary school education	8	8.0
Secondary school education	90	90.0
Tertiary education	0	0.0

* = 16.1 ± 2.8 years, Minimum age = 9 years, Maximum age = 19 years.

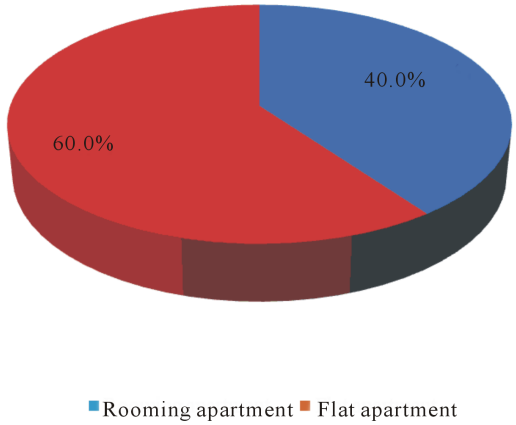

Figure 1. Type of house apartment used among participants.

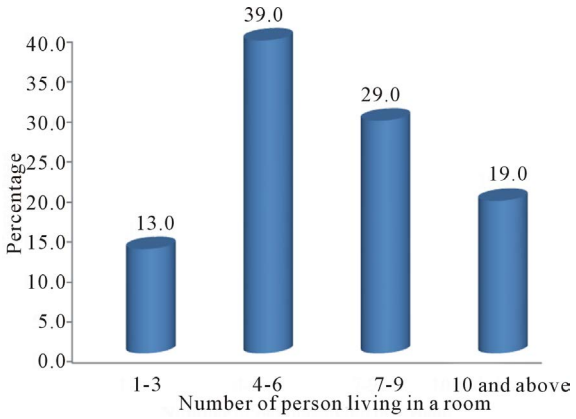

Figure 2. Number of persons living in a room. Mean ± SD = 7.0 ± 3.5, Minimum = 1, Maximum = 15.

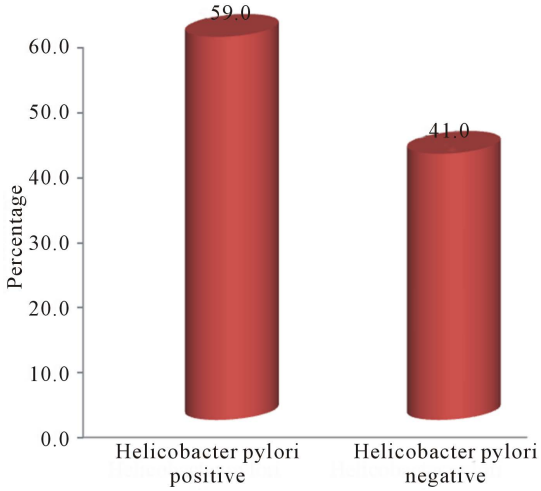

Figure 3. Positivity of *Helicobacter pylori* among students.

pylori compared to 35.6% of those who were under 14 years old with no significant difference. More females (62.7%) were tested positive to *H. pylori* infection compared to 37.3% of their male colleagues with no significant difference. Respondents' father and mothers educational qualification did not show any significant difference on the positivity of *H. pylori* infection as presented in **Table 2**.

3.3. Effect of Housing Condition, Sources of Drinking Water and Hygiene Practices on *H. pylori* Positivity

Table 3 presents the housing condition of the participants. It was revealed that slightly more than half (52.5%) of those infected with *H. pylori* lived in flat apartment compared to those who were living in rooming apartment with no significant difference. Also, 50.8% of the students reported that 4 - 6 persons were sleeping in a room, this proportion were tested positive of *H. pylori*. Association between number of person living in a room and *H. pylori* positivity was not statistically significant. About half (50.8%) of students living in poorly ventilated room *H. pylori* positive compared to those who lived in well ventilated room, this was not statistically significant ($p > 0.05$).

Sources of drinking water and hygiene practices of the participants are shown in **Table 4**. Equal proportion (38.9%) of those infected with *H. pylori* drank boiled and tap water respectively while boiled (36.6%) and filtered (31.7%) water were the main sources for drinking for those who were negative to *H. pylori* test. No significant association existed between respondent sources of water and *H. pylori* positivity. Majority (83.1%) of those positive for *H. pylori* used water only for cleaning-up after defecation while 68.3% of those with negative *H. pylori*

Table 2. Comparison of socio-demographic characteristics and *Helicobacter pylori* positivity.

Socio-demographic characteristics	*Helicobacter pylori*		χ^2 (p Value)
	Negative (%)	Positive (%)	
Age (years)*			
≤14 years	19 (46.3)	21 (35.6)	0.173
≥15 years	22 (53.7)	38 (64.4)	(0.13)
Sex			
Male	19 (46.3)	22 (37.3)	0.268 (0.89)
Female	22 (53.7)	37 (62.7)	
Fathers educational status			
No formal education	3 (7.3)	2 (3.4)	0.764 (0.46)
Primary school education	10 (24.4)	23 (39.0)	
Secondary school education	28 (68.3)	34 (57.6)	
Tertiary education	0 (0.0)	0 (0.0)	
Mothers educational status			
No formal education	2 (4.9)	2 (3.4)	0.653 (0.51)
Primary school education	10 (24.4)	33 (55.9)	
Secondary school education	29 (70.7)	24 (40.7)	
Tertiary education	0 (0.0)	0 (0.0)	

Table 3. Housing condition and *H. pylori* positivity.

Housing condition	*Helicobacter pylori*		χ^2 (p Value)
	Negative (%)	Positive (%)	
Type of House			
Room apartment	12 (29.3)	28 (47.5)	0.483 (0.74)
Flat apartment	29 (70.7)	31 (52.5)	
Number of persons living/room			
1 - 3	7 (17.1)	6 (10.2)	1.412 (0.24)
4 - 6	9 (21.9)	30 (50.8)	
7 - 9	13 (31.7)	16 (27.1)	
10 and above	12 (29.3)	7 (11.9)	
Ventilation of rooms			
Poorly ventilated	11 (26.8)	30 (50.8)	1.081 (0.28)
Well ventilated	30 (73.2)	29 (49.2)	

used same with no significant difference. High proportion (84.7%) of students who had *H. pylori* and 92.7% who were tested negative practiced hand washing after defecation with water and soap, this was not statistically significant. About 72.9% of those who were positive to *H. pylori* test and 75.6% of those tested negative practiced hand washing everyday while 8.5% did not do so among those who were *H. pylori* positive. Association

between frequency of hand washing after defecation and *H. pylori* positive.

3.4. *H. pylori* Infection and Perceived Symptoms

H. pylori infection and perceived symptoms were compared as shown in Table 5. There was no significant association between experience of pain in the upper abdomen in the previous 4 weeks and *H. pylori* positivity. About similar proportion, 57.6% of those tested positive and 56.1% who were tested negative did not experience pain in the upper abdomen in the previous 4 weeks. Moreover, among those who experienced pain in the upper abdomen in the previous 4 weeks, 64.0% of those tested positive and 66.7% of those who were negative did not do so frequently ($p > 0.05$).

4. DISCUSSION

This study documents the prevalence of *H. pylori* among public secondary school students in Ikeja Local Government, Lagos state, Nigeria. Data from this study revealed the *H. pylori* positivity ratio of 59.0% (59/100). This finding is similar to Tayfun, *et al*. [21] in a study conducted among students detected H. pylori positivity at quite a high rate (63%). However, Özden, *et al*., [22] had emphasized that *H. pylori* positivity ratio has been

Table 4. Sources of drinking water, hygiene practices and *H. pylori* positivity.

Sources of drinking water and hygiene practices	*Helicobacter pylori*		χ^2 (p Value)
	Negative (%)	Positive (%)	
Sources of drinking water			
Boiled water	15 (36.6)	23 (38.9)	0.065 (0.79)
Filtered water	13 (31.7)	7 (12.0)	
Tap water	11 (26.8)	23 (38.9)	
Borehole	2 (4.9)	6 (10.2)	
Clean-up behavior after defecation			
Water only	28 (68.3)	49 (83.1)	0.735 (0.39)
Toilet paper	12 (29.3)	9 (15.3)	
Scrap paper	1 (2.4)	1 (1.6)	
Hand washing behavior after defecation			
With water and soap	38 (92.7)	50 (84.7)	0.464 (0.64)
With water only	3 (7.3)	9 (15.3)	
Frequency of Hand washing after defecation			
Every time	31 (75.6)	43 (72.9)	0.146 (0.88)
Sometimes	9 (22.0)	11 (18.6)	
Never	1 (2.4)	5 (8.5)	

Table 5. Comparison of *H. pylori* infection and perceived symptoms.

Perceived symptoms	*Helicobacter pylori*		χ^2 (p Value)
	Negative (%)	Positive (%)	
Experience pain in the upper abdomen in the last 4 weeks			
Yes	18 (43.9)	25 (42.4)	0.232 (0.87)
No	23 (56.1)	34 (57.6)	
Frequency of pain in the upper abdomen			
Not frequent	12 (66.7)	16 (64.0)	0.111 (0.76)
Frequent	4 (22.2)	6 (24.0)	
Very frequent	2 (11.1)	3 (12.0)	

decreasing over the years. Previous study has documented the distribution of *H. pylori* (+) frequency according to age groups to be: 96% in the 7 - 12 age group; 83% in the 13 - 18 age group; 75% in the 19 - 24 age group; 96% in the 25 - 29 age group; 91% in the 30 - 34 age group; 83% in the 35 - 39 age group; and 94% in the 40 - 65 age group [23]. This study revealed that high proportion of participants (15 years and above) were infected with *H. pylori* compared to 35.6% of those who were less or equal to 14 years old with no significant difference. Also, our findings concur with Özden *et al*. [22] who noted a high proportion (78.5%) of *H. pylori* (+) cases in their studies and did not find a significant difference between age groups and gender distributions.

Moreover, in a study by Ito, *et al*., [15] indicated that males are at significant risk for the infection of *H. pylori* while Replogle *et al*., [18] noted that the infection risk is the same for males and females. This study found that, although not significantly difference, large percentage of female were tested positive to *H. pylori* infection compared to 37.3% of their male colleagues. Students father and mothers educational qualification did not show any significant difference on the positivity of *H. pylori* infection. This is an indication that respondents fathers and mothers educational status had no influence on the *H. pylori* positivity of their children. Data on the housing condition of the participants revealed that slightly more than half (52.5%) of those infected with *H. pylori* lived in flat apartment compared to those who were living in rooming apartment with no significant difference. These findings evidently show that living in either rooming or flat apartment has no influence on the positivity of *H. pylori* among the study participants. Barik [11] noted that in developing countries, overcrowded conditions that create closer contacts between mothers and children and between siblings sharing the same bed might be the main reason for the high infection rates reported. It was stressed further that spouse-to-spouse transmission has also a major role for *H. pylori* infection and continuous contact is required for the establishment of such infection. In this study however, 50.8%of the students reported that between 4 - 6 persons were sleeping in a room, this proportion was tested positive of *H. pylori.* Also, no significant association existed between 4 - 6 persons sleeping in a room and *H. pylori* positivity. This shows that 4 - 6 person living in a room did not translate into *H. pylori* positivity.

Information on the sources of drinking water revealed that several proportion of those infected with *H. pylori* drink tap water. This is similar to the findings of Alemayehu [3], that few participants use water source other than pipe and practice hand washing without soap and observed no significant association between these variables and *H. pylori* positivity. It was emphasized that it might be as a result of increased awareness about hygienic practices and environmental health conditions through health extension program throughout the country. Large percentage of those tested positive of *H. pylori* used water only for clean-up after defecation. This is an indication that high level of hygiene s being maintained by those tested with positive of *H. pylori*. Infection with *H. pylori* has been attributed to environmental factors such as hygiene practices and diet which may play key role in the acquisition of infection and the expression of clinical disease [19]. This study found that most of students who had *H. pylori* and 92.7% who were tested negative did hand washing after defecation with water and soap. This is an evident that the study population were aware of the menace caused by inadequate hygiene practices especially poor hand washing practice after visiting toilet [24]. noted that the initial acquisition of *H. pylori* infection causes acute gastritis with hypochlorhydria which may cause abdominal pain, nausea and vomiting that resolve within a few days. In this study, no significant association between experience of pain in the upper abdomen in the last 4 weeks and *H. pylori* positivity was observed. In addition, large proportion of participants who were tested positive of *H. pylori* infection did not experience pain in the upper abdomen in the last 4 weeks.

5. CONCLUSION

Prevalence of *Helicobacter pylori* and related environmental factors among public secondary school students in Ikeja Local Government Area, Lagos has been determined and *Helicobacter pylori* positivity is high among the participants. High proportion of the participants drink tap water, practice hand washing after visiting toilets and no association existed between water sources, hand washing after visiting toilet, number of person living in a room and *Helicobacter pylori* positivity. Also, most of the study participants who were tested positive to *Helicobacter pylori* did not experience abdominal pain in the last 4 weeks. Although, no environmental factor is associated with *H. pylori* positivity, routine examination of school students is required to detect *Helicobacter pylori* in order to commence treatment immediately. In addition, awareness about the menace which might occur from *H. pylori* infection through health extension program should be increased throughout secondary school. This will prevent occurrence of this infection among secondary school students.

6. LIMITATIONS

It was initially planned to include students from private secondary schools in this study but authorities from the private school refused their students to participate in

subjecting themselves to blood collection. Hence it was not possible to collect blood samples from the private school students regardless of showing the ethical clearance to the school authority. Also, despite having obtained approval from Ministry of Education, some parents in the public school held to certain superstitious beliefs about blood, refused signing consent forms and thus not allowing their children/wards to take part in the study. More so, cost of commercial kits was expensive.

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