



# *Helicobacter pylori* Seroprevalence among Students: A Case Study of the Higher Institute of Medical Techniques of Lubumbashi and the University of Lubumbashi

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## Abstract

The WHO lists *H. pylori* as one of the 20 pathogens that pose the greatest threat to human health due to their antibiotic resistance and classifies it as a Group 1 gastric carcinogen, directly linked to stomach cancer. This study aimed to determine the prevalence of *H. pylori* infection among students in Lubumbashi and to test the associations between serological results and sex, age, and the presence of gastritis attack. This was a descriptive cross-sectional study conducted from March 14, 2024, to July 25, 2025, among 485 students from UNILU and ISTM in Lubumbashi. We included students with or without gastritis attack and those not receiving any antibiotic therapy, regardless of age or sex. Data were entered into Excel 2016 and processed using SPSS 23 software. Serological analyses were performed using Accurate's *H. pylori* Ab Rapid Test Strip (One Step Dipstick Test), a 50-kit sample. The female sex had a slight predominance over the male sex at 52.99%, representing a sex ratio of 0.887. The subjects' ages varied between 19 and 45 years, with an average of  $25 \pm 5$  years. The prevalence of *H. pylori* infection was 77.94%, where 15.46% of cases did not have a gastritis attack. None statistically significant association was found between *H. pylori* test results and sex, Pearson's chi-squared = 0.024 ( $p = 0.878$ ) and Fisher's exact test = 0.913; between *H. pylori* tests and gastritis attack, Pearson's chi-squared = 0.344 ( $p = 0.558$ ) and Fisher's exact test = 0.587; nor between the positive tests and age, with binary logistic regression (OR = 0.978, [95% CI: 0.943 - 1.015],  $p = 0.235$ ). Congolese students in general, and those in Lubumbashi in particular, face several constraints during their studies, including stress, dietary imbalance, self-medication, overcrowding, etc., which

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are also factors that promote *H. pylori* infection.

## Subject Areas

Microbiology, Immunoserology

## Keywords

Seroprevalence, *Helicobacter pylori*, Students, Lubumbashi

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## 1. Introduction

*Helicobacter pylori* (*H. pylori*) infection is a public health problem according to the World Health Organization (WHO) [1]. The WHO lists it as one of the 20 pathogens that pose the greatest threat to human health due to their antibiotic resistance [2] and classifies it as a Group 1 gastric carcinogen, meaning it has a direct link to stomach cancer [3]. *H. pylori* colonizes the human stomach and has received increasing attention over the past 40 years [4]. This bacterium was discovered by Marshall and Warren in 1982. It is a Gram-negative, curved, micro-aerophilic bacterium [5]. *H. pylori* infection has a prevalence of 80% to 90% in some populations [4]; 37.1% in the United States [6] 7% in Europe, 85% in America, 94% in Asia and 23% in Oceania [3], 44.2% in China continental [7] and 91% in Africa and 74% in the Democratic Republic of Congo [3]. Transmission occurs via the oral-oral and fecal-oral routes, either directly or indirectly through saliva, food bolus, and contaminated drinking water, with an interhuman and interfamilial character favored by promiscuity, a worrying socioeconomic level, and very precarious hygienic conditions [8]. The infection is usually contracted very early in childhood but it generates complications during adulthood, as the bacterium can remain asymptomatic for decades [9]. According to the 2010 Maastricht consensus conference on *Helicobacter pylori*, it manifests itself through epigastric pain, dyspepsia, vomiting (sometimes persistent), chest heaviness making the differential diagnosis with Gastroesophageal Reflux Disease (GERD), Hiatal Hernia, weight loss, fever, night sweats, progressive dysphagia, odynophagia, hematuria and melena. It is complicated by anemia, jaundice, lymphadenopathy, unexplained abdominal mass, either gastric, duodenal or gastroduodenal ulcer, either gastric, duodenal or gastroduodenal cancer, upper gastrointestinal bleeding, unexplained iron deficiency anemia, idiopathic thrombocytopenic purpura and growth retardation in children [3]. The study was initiated following reports of gastric attacks among students during classes. Therefore, this study aims to determine the prevalence of *H. pylori* infection among students in Lubumbashi and to test the associations between serological results and sex, age, and the severity of gastritis attacks.

## 2. Materials and Methods

This was a descriptive cross-sectional study conducted from March 14, 2024, to

July 25, 2025, among students at the University of Lubumbashi (UNILU) and the Higher Institute of Medical Techniques of Lubumbashi (ISTM/Lubumbashi). The sampling method was convenience sampling, with 485 blood samples collected from students who agreed to participate in the study, with or without gastric attacks and without any antibiotic treatment, across all ages and sexes. Anonymity and confidentiality were guaranteed. Data were entered into Excel 2016 and processed using SPSS 23 software, with descriptive data analysis performed. The chi-square test was used to compare qualitative variables, and binary logistic regression was used for qualitative and quantitative variables with a significance level of  $p < 0.05$ . Data on sex, age, origin, and gastric crisis status were collected from pre-established forms. Serological analyses were performed at the ISTM/Lubumbashi Application Laboratory using Accurate's *H. pylori* Ab Rapid Test Strip (One Step Dipstick Test), 50-kit pack. Batch: 20231220; EXP: 20261219.

The *H. pylori* Ab Rapid Test Strip (whole Blood/Serum/Plasma) is a rapid chromatographic immunoassay for the qualitative detection of antibodies to *H. pylori* in whole blood, serum or plasma to aid in the diagnosis of *H. pylori* infection. The *H. pylori* Ab Rapid Test Strip (whole Blood/Serum/Plasma) is a qualitative membrane device based immunoassay for the detection of *H. pylori* antibodies in whole blood, serum or plasma. In this test, specimen or specimen followed by buffer is added to the specimen well of the Test Strip. The specimen migrates chromatographically along the length of the test strip container within the device and interacts with the reagents on the strip. If the specimen contains *H. pylori* antibodies, a colored line appear in the test line region indicating a positive result. The presence of this colored band indicates a positive result, while its absence indicates a negative result. If the specimen does not contain *H. pylori* antibodies, a colored line will not appear in this region indicating a negative result. To serve as a procedural control, a colored line will always appear at the control line region indicating that the proper volume of specimen has been added and membrane wicking has occurred. Procedure: Allow the Test Strip, specimen, buffer, and/or controls to equilibrate to room temperature (15°C - 30°C) prior to testing. Remove the Test Strip from the foil pouch and use it as soon as possible. Best results will be obtained if the assay is performed within one hour. Place the Test Strip on a clean and level surface. Hold the dropper vertically and transfer 2 drops of serum or plasma or 3 drops of whole blood to the specimen pad of the test strip, the add 1 drop of buffer and start the timer. Wait for the red line (s) to appear. The result should be read at 10 minutes. Do not interpret the result after 20 minutes.

Interpretation of results: Positive result: A colored band appears in the control band region (C) and another colored band appears in the T band region. Negative result: One colored band appears in the control band region (C). No band appears in the test band region (T). Invalid result: Control band fails to appear. Results from any test which has not produced a control band at the specified reading time must be discarded. Please review the procedure and repeat with a new test. If the problem persists, discontinue using the kit immediately and contact your local

distributor. Limitations of the test: The *H. pylori* Ab Rapid Test Strip (whole Blood/Serum/Plasma) is for in vitro diagnostic use only. The test should be used for the detection of *H. pylori* antibodies in whole blood, serum or plasma specimens only. Neither the quantitative value nor the rate of increase in *H. pylori* antibody concentration can be determined by this quantitative test. The *H. pylori* Ab Rapid Test Strip (whole Blood/Serum/Plasma) will only indicate the presence of *H. pylori* antibodies in the specimen and should not be used as the sole criteria for the diagnosis of *H. pylori* infection. As with all diagnostic tests, all results must be interpreted together with other clinical information available to the physician. If the test result is negative and clinical symptoms persist, additional testing using other clinical methods is recommended. A negative result does not at any time preclude the possibility of *H. pylori* infection. Performance characteristics at 95% Confidence Interval: Relative sensitivity: >95.0 % (90.0% - 97.9%). Relative specificity: >95.7% (92.3% - 97.9%). Overall Agreement: >95.4% (92.8% - 97.3%). Conservation: 2°C - 30°C (36°F - 86°F) [10]-[17].

### 3. Results

The female sex had a slight predominance over the male sex of 52.99% (257 cases); *i.e.* a sex ratio of 0.887 (n = 485) (Figure 1).

Overall, 36.91% (179 cases) of cases came from the Kampemba commune and 20% (97 cases) from the Annexe commune (n = 485) (Figure 2).

Overall, the subjects' age groups from 19 to 45 years, with an average of  $25 \pm 5$  years. 54.64% (265 cases) of subjects were in the age groups ranging from 19 to 24 years and 29.69% (144 cases) in those ranging from 25 to 30 years (n = 485) (Figure 3).

Many subjects exhibited gastritis attack at 79.59% (386 cases) (n = 485) (Figure 4).

The prevalence of *H. pylori* infection was 77.94% (378 cases) (n = 485) (Figure 5).

Among the positive *H. pylori* cases, females were slightly more numerous than males at 41.4% (201 cases), with a sex ratio of 0.88. Pearson's chi-squared = 0.024 (p = 0.878) and Fisher's exact test = 0.913. Therefore, there was no statistically significant association between *H. pylori* test results and sex (n = 485) (Figure 6).

Among those who tested positive for *H. pylori*, 62.5% (303 cases) experienced a gastritis attack, while 15.46% (75 cases) did not. Pearson's chi-squared value was 0.344 (p = 0.558), and Fisher's exact test was 0.587. Therefore, there was no statistically significant association between *H. pylori* test results and gastritis attacks (n = 485) (Figure 7).

Positive tests were observed across all age groups, but the 19 - 24 and 25 - 30 age groups were disproportionately affected. Binary logistic regression revealed no statistically significant association between *H. pylori* test results and the age of the respondents (OR = 0.978, [95% CI: 0.943 - 1.015], p = 0.235) (n = 485) (Figure 8).

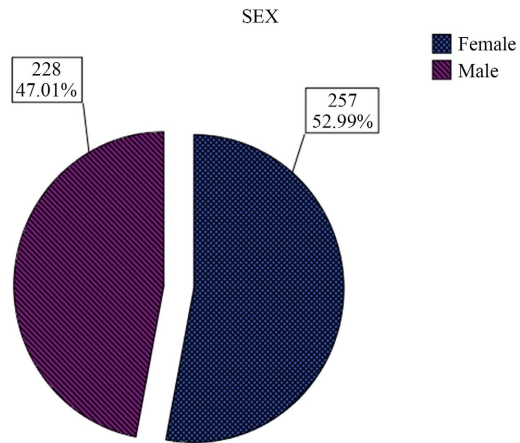


Figure 1. Distribution by sex.

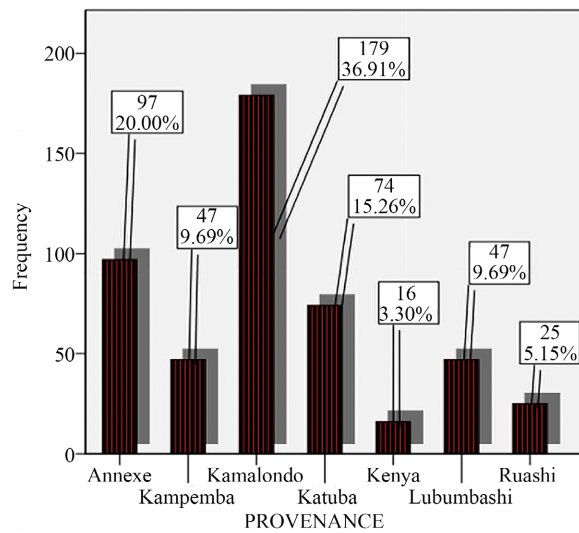


Figure 2. Distribution by provenance.

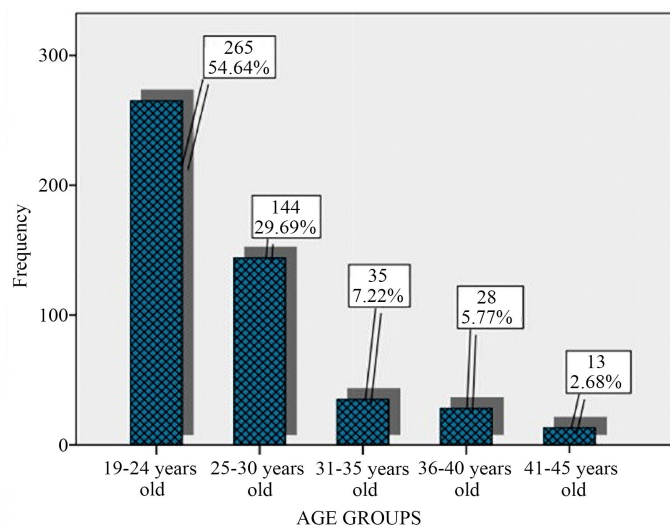


Figure 3. Distribution by age groups.

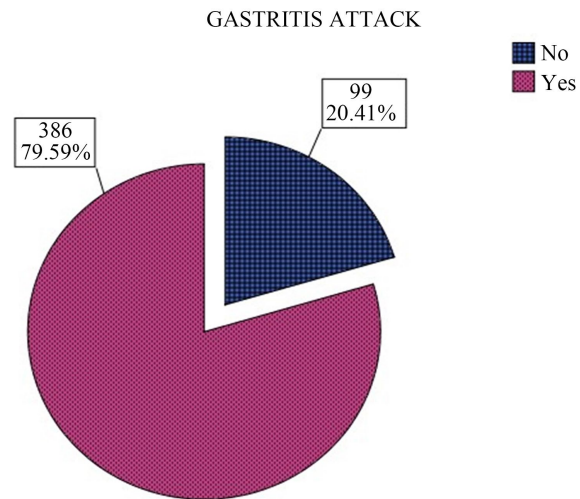


Figure 4. Distribution according to the gastritis attack.

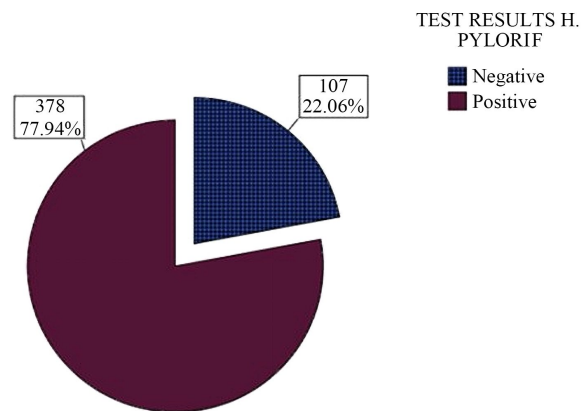


Figure 5. Distribution according test results *H. pylori*.

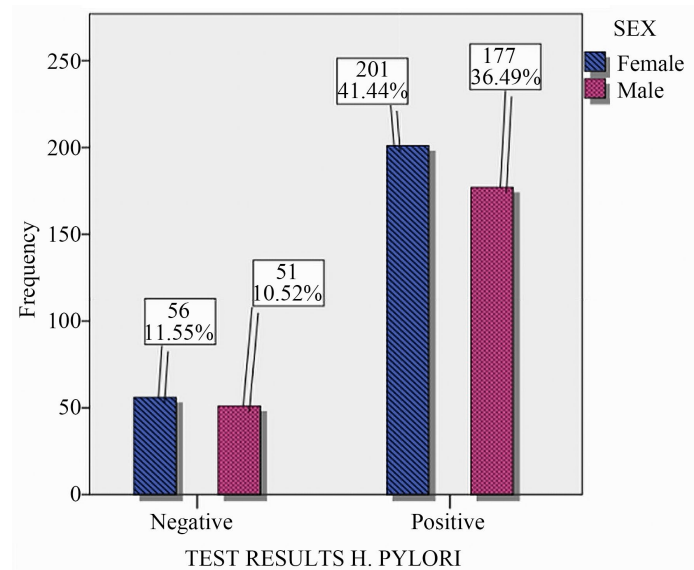


Figure 6. Expression of *H. pylori* test results according to sex.

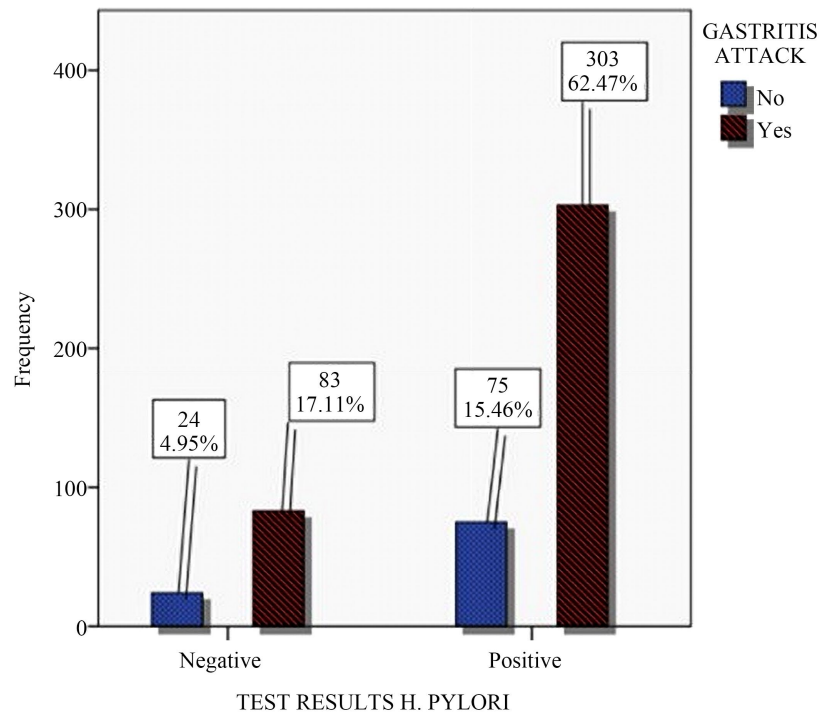


Figure 7. Expression of *H. pylori* test results according to gastritis attack.

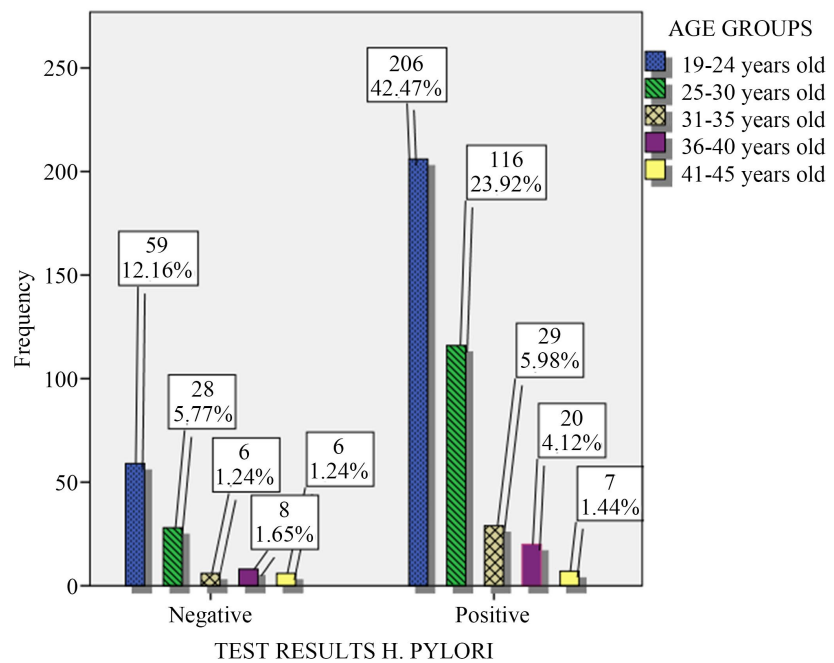


Figure 8. Expression of *H. pylori* test results according to age groups.

#### 4. Discussion

In this study, the 485 respondents came from all 7 communes of the city of Lubumbashi; however 36.91% came from the Kampemba commune and 20% from the Annexe commune; then followed the other communes (Figure 2). These two

communes had a high number of cases due to their size. Overall, females were in the majority at 52.99% compared to males at 47.01%; a sex ratio of 0.887 (**Figure 1**). This female predominance was also observed in studies carried out in the DRC by Bwira in Goma [3]; Kagoro *et al.* in Bunia and Mahagi commune [18] and Salumu in Bukavu [19]. And in studies carried out in some African countries, notably by Bignoumba *et al.* in Libreville, Gabon [1]; Ankouane *et al.* in Cameroon [20] and Essadik *et al.* in Morocco [21]. Our data differ from those found in Gaza, Palestine by Elmanama *et al.* [22], who found a male predominance, Mégraud *et al.* [17] and Replogle *et al.*, 1995 [23]. On the other hand, Ramamampmonjy *et al.* [24] had found 50% men and 50% women. The age of our subjects ranged from 19 to 45 years, with an average of  $25 \pm 5$  years. Many subjects were in the 19 - 24 age group (54.64%) and the 25 - 30 age group (29.69%). Positive tests were found across all age groups, but the 19 - 24 and 25 - 30 age groups were disproportionately affected (**Figure 3** and **Figure 8**). Various age groups and mean ages have been found in other studies, including a mean age of  $47.5 \pm 14.3$  years in Kinshasa [25]; the age groups 57.7% of 15 - 35 year olds in Bukavu [19]; from 31 to 50 years old at 74% in Goma [3] and between 21 to 68 years old, with an average of  $42.84 \pm 11.11$  years in Bunia [18] all in the Democratic Republic of Congo. The average age is 41.9 years in Gabon [1]; in Gaza, Palestine, the average age is 37.03 years, ranging from 13 to 77 years [22]. It should be noted that the age groups most affected in our study were the least infected in Ouagadougou, Burkina Faso [9]. In this study, 79.59% of subjects experienced a gastritis attack (**Figure 4**). This frequency fell between those found in Bukavu and Kinshasa, with respectively 64.95% [7] and 80.5% [25]. The prevalence of *H. pylori* infection in this study was 77.94% (**Figure 5**). This prevalence is close to that found by Birato *et al.* (77.8%) in Bukavu in the Democratic Republic of Congo [26]; Ankouane *et al.* in Cameroon (72.5%) [27] and Ntajirabiri *et al.* in Burundi (70.8%) [28]; Kpoussou *et al.* in Benin (75.4%) [29]; Olokoba *et al.* in Nigeria (80%) [30]. High frequencies were found by Atipo-Ibara (91%) in Congo Brazzaville [31] and Werme *et al.* (88.57%) in Ouagadougou [9]. Moderate frequencies were reported by Kagoro *et al.* (67.63%) in Bunia and Mahagi Commune [18] and Salumu (60.3%) in Bukavu [19], all in the Democratic Republic of Congo. Conversely, low frequencies were found by Bwira (11.5%) in Goma [3]; Bomba DME *et al.* (37%) in Kinshasa [25], all in the Democratic Republic of Congo; Bignoumba *et al.* (37.5%) in Libreville, Gabon [1]; and Etukudo *et al.* (30.8%) in Nigeria [32]; Ankouane *et al.* (39.8%) in Cameroon [20]; Elmanama *et al.* (48.3%) to Gaza in Palestine [22] and Hooi *et al.* (37.1%) in the United States [6]. It should be noted that the prevalence of 15.46% in this study was found among respondents without a gastritis attack (**Figure 7**). In contrast, Werme *et al.* [9] found 20% of patients with no gastric problems [9]. In this study, factors associated with *H. pylori* infection revealed no statistically significant association between *H. pylori* test results and sex (**Figure 6**), with a Pearson chi-square statistic of 0.024 ( $p = 0.878$ ) and Fisher's exact test of 0.913; even less so between *H. pylori* tests and gastritis (**Figure 7**), with a Pearson chi-

square statistic of 0.344 ( $p = 0.558$ ) and Fisher's exact test of 0.587. Finally, no association was found between *H. pylori* tests and the age of the participants (**Figure 8**), with a binary logistic regression (OR = 0.978, [95% CI: 0.943 - 1.015],  $p = 0.235$ ). These authors also found no significant association between *H. pylori* tests and the age of the participants. No statistically significant association was found between *H. pylori* infection and sex [1] [20] [29] [33]. In contrast, Ankouame *et al.* in Cameroon found a statistically significant association between *H. pylori* infection and age [20].

## 5. Conclusion

The study included 485 students, and the overall prevalence of *H. pylori* infection was 77.94%. However, the prevalence of 15.46% was attributed to students without a gastritis attack. No statistically significant association was found between *H. pylori* test results and the sex, presence of a gastritis attack, or age of the participants. It should be noted that Congolese students in general, and those in Lubumbashi in particular, face several constraints during their studies, including stress, dietary imbalance, self-medication, overcrowding, etc., which are also factors that promote *H. pylori* infection.

## Authors' Contribution

All authors contributed identically to the different phases of the research.

## Conflicts of Interest

The authors declare no conflicts of interest.

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