



## ANTI-HELICOBACTER PYLORI ANTIBODY IN ADOLESCENTS WITH FUNCTIONAL DYSPEPSIA

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**ABSTRACT** Abdominal pain is a common paediatric complaint. Adolescent with abdominal pain have several causative factors like anxiety, stress, depression, altered GI motility, visceral hypersensitivity and important cause being H. pylori infection. H. pylori in adults have been widely studied while less studies are available on H. pylori infection among adolescents. Despite the high prevalence of H. pylori infection and its potential link to functional dyspepsia, there is a paucity of data on the prevalence and impact of H. pylori infection among adolescents in India. Diagnosing or screening H. pylori infection in adolescents with functional dyspepsia is critical for developing targeted interventions and management strategies. If a significant association between H. pylori infection and functional dyspepsia is identified, it could lead to the implementation of screening and treatment protocols for H. pylori infection in adolescents presenting with dyspeptic symptoms.

**Objectives:**

1. To estimate the prevalence of anti-H. pylori IgG antibody in adolescents with functional dyspepsia.
2. To study the correlates of H. pylori infection like gender, age, education, hygiene, type of drinking water, type of diet, socioeconomic history, habits, lifestyle, parasitic infestation (h/o worms in stools, h/o deworming) in adolescence.

**Methods:** Among 1500 adolescent presenting to OPD, 80 participants excluded as per exclusion criteria and 120 participants presenting with dyspeptic complaints and satisfying Rome IV Diagnostic Criteria for functional dyspepsia were included and blood samples were taken for anti-H. pylori IgG antibody testing. Participants were treated symptomatically and followed up after 4 weeks. Those with persistence of symptoms were referred to Gastroenterologist for Endoscopy + Rapid Urease Test + Histopathological examination. **Results:** In our study, of the 120 adolescents screened, 51(42.50%) were females and 69(57.50%) were males. Among them anti-H. pylori IgG antibody test was Positive in 79(65.83%) and Negative in 41(34.2%). Correlation of seropositivity was tested with various parameters. There was significant correlation with the presenting complaint of moderate degree of epigastric pain at presentation with the seropositivity for anti-H. pylori IgG antibody. Higher rates of seropositivity were found in male population in the age group of 10-12 yrs belonging to lower middle class, consuming non-veg diet.

**KEYWORDS :** Adolescents; Anti-H. pylori IgG antibody; Functional dyspepsia;

**INTRODUCTION**

Abdominal pain is a common paediatric complaint. Adolescent with abdominal pain have several causative factors like anxiety, stress, depression, altered GI motility, visceral hypersensitivity and important cause being H. pylori infection.

Dyspepsia can be broadly categorized into functional and organic types, with functional dyspepsia being more prevalent. Functional dyspepsia, also called non-ulcer dyspepsia, is characterized by presence of dyspeptic symptoms without any identifiable structural or biochemical abnormalities. The aetiology of functional dyspepsia is multifactorial, involving genetic, environmental, and psychological factors.

There is paucity of data is seen on the prevalence and correlates of infection with *Helicobacter pylori* among adolescents in India. Most studies have focused on adult populations, leaving a lacuna in our understanding of how *Helicobacter pylori* affect younger individuals.

This study aims to compensate for the lacunae by investigating the occurrence of anti-*Helicobacter pylori* IgM or IgG antibodies in adolescents with functional dyspepsia and identifying conditions predisposing for H. pylori infection in this age group. By focusing on adolescents, valuable insights have been provided by this study into the correlates associated with *Helicobacter pylori* infection in a cohort of population which were underrepresented in previous research.

H. pylori in adults has been widely studied while less studies are available on H. pylori infection among adolescents. Diagnosing or screening H. pylori infection in adolescents with functional dyspepsia is critical for implementation of screening and treatment protocols for H. pylori infection in adolescents presenting with dyspeptic symptoms.

Finally, the study intends to evaluate non-invasive investigations such as serology for *Helicobacter pylori* infection in adolescents as they are

widely accepted by patients, making it easier to screen and treat affected individuals.

**METHODOLOGY**

**Study Design:** Cross-sectional study.

**Duration Of Study:** 18 months (July 2022 – December 2023.)

**Source Of Data:** Adolescents aged 10-18 years in school and who presented to M S Ramaiah Hospital during the study period.

**Inclusion criteria:** All children between age of 10 to 18yrs were included presenting with dyspeptic complaints and satisfying Rome IV Diagnostic Criteria for functional dyspepsia i.e.,

Presence of 1 or more of:

- 1) Postprandial fullness (3 days per week)
- 2) Early satiety (3 days per week)
- 3) Epigastric pain (1 day per week)
- 4) Epigastric burning (1 day per week)

And

5) No evidence of structural disease (complaints present for at least past 3 months, with symptoms starting at least 6 months before diagnosis).

**Exclusion Criteria:**

- 1) Those on antibiotic therapy in the last one month,
- 2) Those on Proton pump inhibitor therapy in the last 3 months,
- 3) On treatment for malignancy,
- 4) On immunosuppressant therapy,
- 5) Previously treated for H. pylori infection (with duration),
- 6) With complaints not satisfying Rome IV diagnostic criteria for functional dyspepsia.

**Methods Of Collecting Data:**

- Informed written Parental consent were obtained for the

participants of <18 years.

- Assent was taken from adolescents between 12-18 years.
- A total of 120 participants fulfilling the inclusion criteria were enrolled in the study.
- Participants were explained about the need for the study, the long term effects of infection, selected as per Rome IV Diagnostic criteria for functional dyspepsia, graded as per Dyspepsia Severity Assessment Score, age, gender and educational details noted, hygiene (tooth brushing, washing hands after using toilet, washing hands before eating and washing hands with soap) is assessed, type of drinking water is noted (filtered water vs well water), diet veg vs non-veg), socioeconomic classification (based on Modified Kuppuswamy scale), asked about their habits (smoking, alcohol) and lifestyle (outside eating, exercise), associated illness and the procedure of detecting the infection was explained and the implications of study result in screening of adolescents was stressed.
- HEADSSS assessment was done.
- Detailed general physical examination and systemic examination was done.
- Anthropometry- Height, weight, BMI was noted.
- SMR – sexual maturity rating using Tanner staging, grading 1-5 for boys and girls. Staging based on breast development and pubic hair growth in female, genitalia development in male.
- Laboratory investigations – CBC, CRP, Vitamin B12, Serum Iron levels, Stool routine, Endoscopy, RU, HPE reports were collected.
- With due aseptic precautions, samples were collected in a single prick.
- 6ml of venous blood collected and analysed on weekly basis using Anti-helicobacter pylori IgG antibody detection kit by ELISA technique in the Central Research Laboratory at Tertiary hospital) and followed up after 4 weeks for persistence of symptoms. Those with persistence of symptoms were referred to Gastroenterologist for Endoscopy +Rapid Urease Test+ Histopathological examination for definitive treatment.

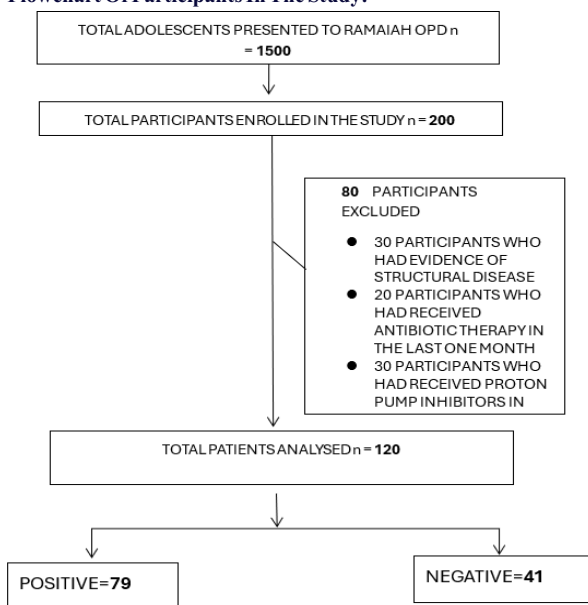
#### Sample Size:

From literature review study by Darnindro et al (2015), in the present study, expecting similar result, the study required a minimum of 120 subjects.

#### RESULTS:

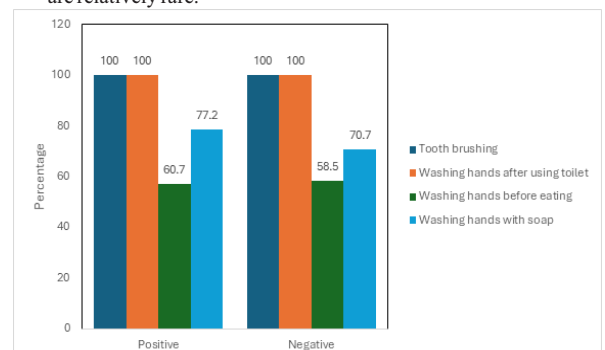
The study was conducted in Tertiary Hospital between July 2022 to December 2023. A total of 1500 adolescents presented to Ramaiah OPD, out of which 200 adolescents had dyspeptic symptoms were enrolled in the study. However, 80 participants were excluded which included 30 participants who had evidence of structural disease, 20 participants who had received antibiotic therapy in the last one month and 30 participants who had received Proton pump inhibitors in last three months. Finally, the 120 participants remaining were analysed and given symptomatic treatment.

#### Flowchart Of Participants In The Study:



Among the 120 participants in the study, serology for anti H. pylori IgG antibody was **Positive** for 79 (65.83%) participants and **Negative** for 41(34.16%) participants indicating a **Seroprevalence rate of 65.83%**. More than 50% of the screened population with dyspeptic symptoms were positive for H. pylori infection.

- The study population comprised 69 males (57.5%) and 51 females (42.5%)
- The **positive category** shows the highest percentage in the **16-18 years** age group (35.4%), indicating that this age group has a relatively higher proportion of positive cases, the 10-12 years age group follows with 34.2% and the lowest percentage is in the 13-15 years age group (30.4%).
- 78.3% participants reported **epigastric pain** followed by 20.8% with early satiety.
- Educationally, 55% of participants were noted in **middle school**.
- Socioeconomically, 46.7% were **lower middle class**.
- All participants practiced good hygiene, with 100% brushing teeth and washing hands after using the toilet (Figure 1).
- Filtered water was consumed by 90%, and 85% had a **non-vegetarian diet**.
- 2.5% of the participants smoked, while none consumed alcohol.
- The majority consumed outside food **twice a week** (44.2%) and rarely exercised (94.2%).
- Most participants (97.5%) had undergone deworming (Table 1).
- **Early satiety** is most frequently associated with positive results (18 cases), followed by negative (7 cases), indicating it is **more common in positive outcomes**.
- **Epigastric burning** is primarily seen in **positive results** (5 cases) and no occurrences in negative results.
- **Epigastric pain** is the most commonly reported complaint across all categories, **predominantly associated with positive results** (100 cases) and by negative (34 cases) results, highlighting its significance among individuals with positive outcomes.
- **Nausea** is reported in all categories, with the **highest frequency in positive results** (17 cases) and negative cases (6 cases), suggesting it is a common symptom.
- **Vomiting** is most frequently associated with **positive results** (32 cases) and negative cases (12 cases).
- Retrosternal pain is rare, with 2 cases in positive results (1 case each) and none in negative results.
- **Regurgitation** is reported only once in the negative category, indicating its **rarity**.
- Postprandial fullness is infrequently reported, with slightly higher occurrences in positive results (2 cases) compared to negative (1 case) results.
- Dysphagia and loose stools are each reported only once in the positive category, indicating their rarity among participants.
- Overall, **epigastric pain, early satiety, and vomiting are the most prevalent presenting complaints**, especially in positive results, while other complaints like retrosternal pain, regurgitation, postprandial fullness, dysphagia, and loose stools are relatively rare.



**Figure 1:** Association of results of anti-H. pylori antibodies with the daily routine habits among the study participants (N=120)

**Table 1:** Association Of Results Of Anti-h. Pylori Antibodies With Type Of Drinking Water, Diet, Personal Habits, Frequency Of Outside Food Consumption, Exercise And Deworming Among The Study Participants (N=120)

| Sl no | Type of drinking water | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
|-------|------------------------|-----------------|-----------------|------------------------|
| 1     | Filtered               | 71 (89.8)       | 37 (90.2)       | 0.004 (1)              |
| 2     | Well                   | 8(10.1)         | 4 (9.8)         | 0.94                   |

| Sl no | Type of diet                          | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
|-------|---------------------------------------|-----------------|-----------------|------------------------|
| 1     | Non veg                               | 67 (84.8)       | 36 (87.8)       | 0.35 (1)               |
| 2     | Veg                                   | 13 (16.4)       | 5 (12.2)        | 0.55                   |
| Sl no | Personal habits                       | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
| 1     | Yes                                   | 3 (3.7)         | 0 (0)           | 1.5 (1)                |
| 2     | No                                    | 76(96.2)        | 41 (100)        | 0.20                   |
| Sl no | Frequency of outside food consumption | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
| 1     | Once a week                           | 22(27.8)        | 9 (22)          | 13.43 (4)              |
| 2     | Twice a week                          | 35 (44.3)       | 20 (48.8)       | 0.009                  |
| 3     | Thrice a week                         | 27(34.1)        | 10 (24.4)       |                        |
| 4     | Four times a week                     | 0 (0)           | 1 (2.4)         |                        |
| 5     | Monthly once                          | 1 (1.2)         | 1 (2.4)         |                        |
| Sl no | Exercise                              | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
| 1     | Yes                                   | 3 (3.7)         | 3 (4.2)         | 0.70 (1)               |
| 2     | No                                    | 76(96.2)        | 38 (92.7)       | 0.40                   |
| Sl no | Deworming                             | Positive (n=79) | Negative (n=41) | X <sup>2</sup> (Df), p |
| 1     | Yes                                   | 76 (96.2)       | 41 (100)        | 6.16 (1)               |
| 2     | No                                    | 12 (15.1)       | 0 (0)           | 0.01                   |

The data in Table 2 shows that participants with **moderate epigastric pain and very mild upper abdominal discomfort** were the most common in all groups, particularly in the **positive result** group.

**Table 2: Association Of Results Of Anti-h. Pylori Antibodies With Likert's Dyspepsia Scale Score Of Dyspeptic Symptoms Among The Study Participants (N=120)**

| Likert Dyspepsia Scale Score                                                                                        | Positive (n=79) | Negative (n=41) | Total (n=120) |
|---------------------------------------------------------------------------------------------------------------------|-----------------|-----------------|---------------|
| Mild early satiety                                                                                                  | 4 (5%)          | 1 (2.4%)        | 5 (4.2%)      |
| Mild epigastric pain                                                                                                | 1 (1.2%)        | 1 (2.4%)        | 2 (1.7%)      |
| Mild epigastric pain, very mild belching, moderate nausea, very mild early satiety                                  | 1 (1.2%)        | 2 (4.9%)        | 3 (2.5%)      |
| Mild epigastric pain, very mild nausea                                                                              | 2 (1.5%)        | 1 (2.4%)        | 3 (2.5%)      |
| Mild epigastric pain, very mild retrosternal pyrosis                                                                | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |
| Mild PPF, moderate epigastric pain, moderate upper abdominal discomfort, mild retrosternal pyrosis, moderate nausea | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |
| Mild retrosternal pyrosis, very mild early satiety                                                                  | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |
| Moderate early satiety                                                                                              | 4 (5%)          | 2 (4.9%)        | 6 (5.0%)      |
| Moderate early satiety, mild nausea                                                                                 | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |
| Moderate early satiety, very mild nausea                                                                            | 2 (1.5%)        | 0 (0.0%)        | 2 (1.7%)      |
| Moderate epigastric pain                                                                                            | 7(8.8%)         | 4 (9.8%)        | 11 (9.2%)     |
| Moderate epigastric pain, mild retrosternal pyrosis, mild nausea                                                    | 4 (5%)          | 3 (7.3%)        | 7 (5.8%)      |
| Moderate epigastric pain, mild nausea                                                                               | 0 (0.0%)        | 2 (4.9%)        | 2 (1.7%)      |
| Moderate epigastric pain, mild retrosternal pyrosis                                                                 | 0 (0.0%)        | 1 (2.4%)        | 1 (0.8%)      |
| Moderate epigastric pain, mild upper abdominal discomfort, severe nausea                                            | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |
| Moderate epigastric pain, moderate nausea                                                                           | 6 (7.5%)        | 4 (9.8%)        | 10 (8.3%)     |
| Moderate epigastric pain, moderate nausea, mild retrosternal pyrosis                                                | 1 (1.2%)        | 1 (2.4%)        | 2 (1.7%)      |
| Moderate epigastric pain, very mild nausea                                                                          | 7(8.8%)         | 4 (9.8%)        | 11 (9.2%)     |
| Moderate epigastric pain, very mild retrosternal pyrosis, mild nausea                                               | 2 (1.5%)        | 0 (0.0%)        | 2 (1.7%)      |
| Moderate epigastric pain, very mild upper abdominal discomfort                                                      | 10 (12.6%)      | 4 (9.8%)        | 14 (11.7%)    |
| Moderate epigastric pain, mild upper abdominal discomfort, moderate early satiety                                   | 1 (1.2%)        | 0 (0.0%)        | 1 (0.8%)      |

|                                                                               |             |             |              |
|-------------------------------------------------------------------------------|-------------|-------------|--------------|
| Moderate epigastric pain, very mild upper abdominal discomfort                | 1 (1.2%)    | 0 (0.0%)    | 1 (0.8%)     |
| Severe epigastric pain                                                        | 1 (1.2%)    | 1 (2.4%)    | 2 (1.7%)     |
| Severe epigastric pain, moderate nausea                                       | 3 (3.7%)    | 0 (0.0%)    | 3 (2.5%)     |
| Very mild early satiety                                                       | 4 (5%)      | 1 (2.4%)    | 5 (4.2%)     |
| Very mild epigastric pain                                                     | 6 (7.5%)    | 7 (17.1%)   | 13 (10.8%)   |
| Very mild epigastric pain, very mild nausea                                   | 6 (7.5%)    | 0 (0.0%)    | 6 (5.0%)     |
| Very mild retrosternal pyrosis, mild nausea, moderate early satiety           | 1(1.2%)     | 1 (2.4%)    | 2 (1.7%)     |
| Very mild upper abdominal discomfort, moderate nausea, moderate early satiety | 0 (0.0%)    | 1 (2.4%)    | 1 (0.8%)     |
| Total                                                                         | 79 (100.0%) | 41 (100.0%) | 120 (100.0%) |
| X <sup>2</sup> =55.73 (58), p=0.56                                            |             |             |              |

The results of follow-up study conducted on participants after four weeks of symptomatic treatment. The participants are divided into two groups based on test results: Positive (n=79) and Negative (n=41) for H. pylori infection. The table outlines several outcomes observed after 4 weeks (Table 3):

1. Persistence of Symptoms: 29 participants in the positive group and 8 in the negative group continued to have symptoms. The difference is highly significant (**P value: 0.000**), suggesting that those who were positive had a higher likelihood of persistent symptoms.
2. Endoscopy Performed: Endoscopy was done in 16 positive and 8 negative participants. The **P value: 0.01** indicates a significant difference, with more endoscopies performed in positive cases.
3. Endoscopic Findings Suggestive of H. pylori like diffuse redness of fundic mucosa, mucosal swelling or antral erosions: Among the 24 participants who underwent endoscopy, 22 showed findings suggestive of H. pylori. The **P value: 0.02** shows a statistically significant association.
4. Among the 8 endoscopies performed in 8 participants who were serologically negative but with persistence of symptoms, all the 8 showed findings suggestive of H. pylori infection with a **P value of 0.296** suggesting no statistical significance. Therefore, adolescents with persistence of symptoms beyond 4 weeks will require an upper GI endoscopy as a part of the management irrespective of serological status.
5. Positive Rapid Urease Test: Only 5 participants in the positive group tested positive on the rapid urease test. The **P value: 0.04** indicates a significant finding.
6. Histopathological Examination (HPE) Suggestive of H. pylori Infection: 6 participants in the positive group had HPE results suggestive of H. pylori infection, with a **P value: 0.01** indicating a significant difference.

The findings suggest that participants with positive H. pylori serology results are more likely to show persistent symptoms, require endoscopy, and have endoscopic, urease test, or HPE evidence of H. pylori infection. Also, those with persistence of symptoms even if serology is negative can have endoscopic findings suggestive of H. pylori infection.

**Table 3: Follow-up Of The Participants After 4 Weeks Of Symptomatic Treatment**

| Sl no |                                                   | Positive (n=79) | Negative (n=41) | P value |
|-------|---------------------------------------------------|-----------------|-----------------|---------|
| 1     | Persistence of symptoms after 4 weeks(n=37)       | 29              | 8               | 0.000   |
| 2     | Endoscopy performed(n=24)                         | 16              | 8               | 0.01    |
| 3     | Endoscopic findings suggestive of H. pylori(n=22) | 14              | 8               | 0.02    |
| 4     | Positive Rapid Urease Test                        | 5               | 0               | 0.04    |
| 5     | HPE suggestive of H. pylori infection             | 6               | 0               | 0.01    |

## DISCUSSION:

**Seroprevalence of anti-H. pylori antibody in adolescents with functional dyspepsia:** In this study the seroprevalence was 65.8% which is significant. Studies available on Indian adolescents are very scarce; however adult studies in India and other countries have reported high seroprevalence rates of H. pylori, with Kazakhstan at 86%<sup>1</sup>, Vietnam at 74.6%<sup>2</sup>, Ethiopia at 83.3%<sup>3</sup>, and India at 80%<sup>4</sup>. These

findings indicate widespread prevalence across different regions.

**Presenting Complaints:** In our study, **epigastric pain** is the most commonly reported complaint, predominantly associated with **positive results** (89 cases), followed by negative (34 cases) and borderline positive results (11 cases). **Early satiety and vomiting** are also common among positive results. These findings align with the typical symptoms of gastrointestinal conditions. The high prevalence of epigastric pain and related symptoms in our study highlights the significance of these clinical features in diagnosing gastrointestinal conditions.

**Likert's dyspepsia scale score:** In our study, **Moderate epigastric pain** and **very mild upper abdominal discomfort** were most common in all groups, particularly in **positive** result group. Borderline positive group was observed to have moderate early satiety and severe epigastric pain with moderate nausea. In Negative results group predominantly very mild epigastric pain was noted suggesting that likelihood of positivity of anti H. pylori antibody correlates with the Likert's dyspepsia scale score.

In an article published by Canan O<sup>5</sup> done on 161 participants, it was noted that out of 93 patients who had an epigastric pain severity of 4 and 5 (namely, moderate to severe pain), 65 (70%) patients were in the Organic Dyspepsia group and 28 (30%) patients were in the Functional dyspepsia group. Of 68 patients who had an epigastric pain severity of 0-3 (no epigastric pain or mild pain), 33 (48.5%) were in the OD group and 35 (51.5%) were in the FD group, and the difference was statistically significant ( $P=0.042$ ).

#### Investigations for Helicobacter pylori infection:

In our study, on follow-up of participants treated symptomatically, 3 in borderline positive, 26 in positive and 8 in negative group had persistence of symptoms. Out of these, endoscopy was performed in 2 borderlines positive, 14 positive, 8 negative participants and findings suggestive of H. pylori infection was seen in 2 borderlines positive, 12 positive and 8 negative participants. Among these, confirmation of H. pylori infection by histopathological examination was in 6 among positive group. To conclude, serology test for H. pylori infection in our study showed 100% sensitivity, 44.44% specificity, 37.5 % Positive Predictive Value and 100% Negative Predictive Value.

Upper GI endoscopy facilitates the collection of biopsy specimens for urease testing which in the presence of pre-formed urease produced by the organism in a urea containing media, the enzyme releases ammonia (NH<sub>3</sub>), increasing the pH and resulting in a colour change of the medium.

The gold standard for detection of H. pylori remains examination of gastric mucosal biopsy specimens, with a sensitivity of 95% and a specificity of 98%. Few studies reported a high percentage (94%) of H. pylori detection with the standard haematoxylin-eosin staining, compared with special staining.

Serological studies for H. pylori infection are mainly used for epidemiological purpose. Serology tends to persist for a long period after the eradication of the organism, therefore it cannot be used to check eradication and also does not differentiate between an active and a chronic infection.

#### Age Distribution:

In our study, the **positive** category has the highest percentage in the **16-18 years** age group (37.1%), suggesting a higher prevalence of positive results in older adolescents. The **negative** category is most prevalent in the **10-12 years** age group (43.9%). This suggests a significant age-related pattern in H. pylori seroprevalence, similar to the trends observed in the aforementioned studies.

In a study done by Malaty HM<sup>6</sup> on age of acquisition of H. pylori infection; it was found that 8% of children acquire infection at 1-3 yrs and seroprevalence is 24.5% by 18 yrs. Additionally, a study conducted across five major islands in Indonesia found a higher proportion of H. pylori in two specific age groups: under 29 years old and 50-59 years old.

#### Gender Distribution:

In our study a **higher proportion of males** in all result categories was noted. The Chi-square analysis shows no significant association between gender and the results ( $p=0.84$ ). In a study done by Belay AS<sup>7</sup>,

reported a higher proportion of females (54.3%) compared to males (45.7%). These variations suggest that gender distribution may differ based on the study population and the condition being investigated or may require a larger population sample.

#### Educational Qualification:

Educational qualification in our study shows no significant correlation with the results ( $p=0.92$ ). The **positive** category has a higher proportion of participants with higher education levels (**High school and PUC**). In comparison, Belay AS<sup>7</sup> found that 39.9% of respondents were not able to write and read, highlighting educational disparities in different populations.

#### Socioeconomic Status:

Socioeconomic status in our study also shows no significant correlation with the results ( $p=0.11$ ). The **lower middle class** has the highest proportion in the positive category (attributable to Berksonian bias as our study was done in a tertiary care hospital), while the upper middle class is more prevalent in the negative category (46.3%). The mentioned findings suggest that socioeconomic status as a factor varies among different populations and studies.

An Indian review article by Singh A<sup>8</sup> suggest the reasons behind the commonness of this infection and lower age of acquisition in India are poverty, overcrowding, poor sanitation and contaminated water supply. This is a massive challenge from the administrative point of view to improve the general health; hygiene and sanitation and supply of good drinking water for the prevention of this infection.

#### Type of Drinking Water:

In our study, drinking water type does not show significant association with the results ( $p=0.99$ ). In both Kazakhstan and India<sup>4</sup>, it was noted that clean water index and Helicobacter pylori infection rates show a significant correlation. Specifically, lower clean water indices correlated with higher proportions of H. pylori, with odds ratios of 14 (95% CI: 4.8 to 40) and 13.9 (95% CI: 6.9 to 27.7), respectively.

#### Type of Diet:

In an Indian study done by Thirumurthi S<sup>9</sup> on H. pylori infection in India stated tropical diets with more vegetables and certain seasonal fruits round the year promote antral predominant non-atrophic gastritis and duodenal ulcer disease. Seasonal diets when fresh fruits and vegetables were not available during the winter or dry season and food usually preserved with salt promote pangastritis, a lower incidence of duodenal ulcer and more gastric ulcers.

Diet type in our study shows no significant association with the results ( $p=0.74$ ). Non-vegetarian diet is more common across all categories. The prevalence of non-vegetarian diets in our study population highlights dietary patterns that may influence gastrointestinal health.

#### Personal Habits:

Personal habits, such as smoking or alcohol consumption, show no significant association with the results in our study ( $p=0.39$ ) as it is a paediatric population and most participants do not have these habits. In a study done by Ogihara A<sup>10</sup> showed 0.82 times more risk of seropositivity for H. pylori infection in those who smoke and 0.88 times more risk in those who drink alcohol.

#### Frequency of Outside Food Consumption:

A study by Ibrahim Z<sup>11</sup> showed excessive intake of ultra-processed food increases the predisposition to H. pylori infection. The frequency of outside food consumption shows no significant association with the results ( $p=0.55$ ). Most participants consume outside food once to thrice a week. The varying frequencies in our study highlight those different habits of eating affects health outcomes.

#### Exercise:

In a study by He S<sup>12</sup> showed no significant relationship between exercise and H. pylori infection. Exercise habits show no significant association with the results in our study ( $p=0.76$ ).

#### Deworming Practices:

A study by Addis Akilu<sup>13</sup> among Paediatric patients in Southern Ethiopia showed the prevalence of Helicobacter pylori and intestinal parasites was 14% ( $n=42$ ) and 37.1% ( $n=111$ ), respectively, whereas that of the co-infections with these pathogens was 6.4% ( $n=19$ ). Giardia lamblia was the most prevailing parasite, 21.4% ( $n=64$ ).

Informal maternal education and absence of hand washing habit were noted to be significantly associated with the extent of co-infections and concluded that nearly one in twenty children with GI symptoms had intestinal parasitic infections and *H. pylori* co-infections, representing a silent health problem that is to be addressed through effective control strategies. administrators should consider the importance of co-infections in clinical diagnosis and planning aimed at its prevention. Deworming practices show no significant association with the results in this study ( $p=0.33$ ). Most participants have undergone deworming.

## CONCLUSION

The seroprevalence of anti-*H. pylori* antibody was found to be 65.83% among adolescents who presented with functional dyspepsia which mandates regular screening of adolescents and to workup for *H. pylori* infection in adolescents presenting with functional dyspepsia to prevent the long-term conditions like gastritis, peptic ulcers, stomach cancer.

In the correlates of *H. pylori* infection, there was an increase in the number of cases with Epigastric pain (58.5%) with moderate severity as per Likert's dyspepsia scale score. 37.5% of the presenting participants belonged to the age group of 10-12 years highlighting the importance of implementing a screening test for *H. pylori* infection from this age group for those who present with functional dyspepsia. Majority of the participants belonged to Lower middle class of socioeconomic status. Good hygiene practices were universally followed. Other correlates like gender, education, type of drinking water, type of diet, habits, lifestyle, parasitic infestation were not significant.

Persistence of symptoms beyond 4 weeks among participants were predominantly seen in the positive group; Among the total endoscopies done, significant correlation of findings suggestive of *H. pylori* infection was seen in the positive group suggesting the requirement of upper GI endoscopy as a part of the management for those with persistence of dyspeptic symptoms.

## STRENGTHS:

The reliability of the screening test was increased as it was compared with the gold standard test.

Early initiation of definitive treatment for *H. pylori* infection was done in adolescents with functional dyspepsia.

## LIMITATION:

Endoscopy could not be done in all the adolescents with persistence of symptoms beyond 4 weeks.

IgG antibody levels were used for screening which may indicate a remote infection.

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