Fecoprevalence and determinants of \textit{Helicobacter pylori} infection among asymptomatic children in Myanmar

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\textbf{ABSTRACT}

\textbf{Objective:} The aim of this study was to determine fecoprevalence of \textit{Helicobacter pylori} infection and find out association between \textit{Helicobacter pylori} infection and its determinants among asymptomatic 6 - 12 years old school children. \textbf{Methods:} This study was a school-based cross-sectional analytic study involving 90 asymptomatic 6 - 12 years old school children in No. (2) Basic Education High School (BEHS), Chan-Aye-Thar-San township, Mandalay. Age, gender distribution and determinants of \textit{Helicobacter pylori} infection were studied. Detection of \textit{H. pylori} stool antigen was performed by using monoclonal stool antigen test kit (SD BIOLINE, Korea). The fecoprevalence of \textit{H. pylori} infection was enumerated. Association between \textit{Helicobacter pylori} infection and its determinants was analysed. \textbf{Results:} Overall fecoprevalence of \textit{Helicobacter pylori} infection among asymptomatic school children was 17.8\%. The most prevalent age group was 6-8 years (24.2\%) followed by >10-12 years (18.8\%) and >8-10 years (8\%). There was no significant gender preponderance in all age groups. Higher frequency of fecopositivity in children living in overcrowded houses and those who drink non-purified water were noted (p<0.001). Eleven (28.9\%) from low socioeconomic status and 5 (9.6\%) from middle socioeconomic status were noted to be fecopositive. There was no significant association between domestic water source and \textit{H. pylori} infection. \textbf{Conclusion:} \textit{Helicobacter pylori} infection is prevalent in asymptomatic school children in this study. Low socioeconomic status, overcrowding and drinking non-purified water were significant determinants of \textit{H. pylori} fecoprevalence. This findings may lead to key insights into the transmission of \textit{H. pylori} infection in developing countries and method of reducing rates of transmission of infection.

\textbf{Key words:} \textit{Helicobacter pylori} infection and its determinants, \textit{Helicobacter pylori} stool antigen (HpSA) test, Fecoprevalence

\textbf{INTRODUCTION}

\textit{Helicobacter pylori} infection is one of the most common chronic bacterial infections among human worldwide. It plays a major etiologic factor in the pathogenesis of chronic gastritis, peptic ulcer (PU), gastric adenocarcinoma and mucosa associated lymphoid tissue lymphoma. However, most of the infected subjects remain asymptomatic. World Health Organization (WHO) estimates indicated that approximately 50\% of the world’s population is infected with \textit{H. pylori}. As high rates of \textit{H. pylori} infection are associated with low socioeconomic status and educational levels, poor housing and personal hygiene, overcrowding and unhygienic sources of drinking water, it’s prevalence is significantly higher in the developing countries than in the developed countries.\textsuperscript{1}

\textit{H. pylori} infection is also prevalent in Myanmar. The prevalence of \textit{H. pylori} infection in periurban community in Yangon by using IgG ELISA was 68.8\%. This appeared to be similar to findings from nearby developing south-east Asian countries, although higher than reports of infection rates in Thailand (prevalence of 75\%) and Taiwan (overall prevalence of 54.4\%). It indicated that there may be a relationship between \textit{H. pylori} infection and water supply, large number of siblings in a
household. It also provided strong evidence for the importance of intrafamilial contact for acquisition of *H. pylori* infection in a developing country.²

Number of siblings, type of family, socioeconomic status, educational level, family income and water supply were significant determinants of *H. pylori* infection.¹

Many modes of transmission have been discussed. However, person to person transmission including both fecal-oral and oral-oral routes of transmission early in life have been suggested. Early detection and eradication of the organism can lead to long-term healing of all *H. pylori*-related diseases.¹

Various methods are available for detecting *H. pylori*, but all have limitations. At present there are several techniques available for the detection of *H. pylori*. Advantages and disadvantages of each test have to be weighed against the reliability and patient acceptability and safety.³

The urea breath test (UBT) is considered the screening test of choice. However, the use of UBT is time consuming and not easy to perform on infants and false-positive results may occur in young children. Serum antibodies to *H. pylori* are frequently at a normal level in very young children with ongoing infection, thus limiting the use of these tests. *Helicobacter pylori* stool antigen test (HpSA) provide a non-invasive method for the detection of *H. pylori*. The HpSA is an accurate test for the detection of *H. pylori* infection in all age groups of children.⁴

Therefore the non-invasive HpSA test would be particularly important for children. The HpSA test detects *H. pylori* antigen present in human stools. Stool enzyme immunoassay based on monoclonal antibodies showed excellent results with very high sensitivity and specificity. The inter observer agreement was excellent (better inter observer agreement 100%). It has sensitivity (98.3%) and specificity (100%).⁵

In this study, *H. pylori* stool antigen immunochromatography kit had been used to detect *H. pylori* infection in asymptomatic school children and determinants of *H. pylori* infection in children were also identified.

**METHODOLOGY**

Study design was school-based cross-sectional analytic study over one year. The students from Basic Education High School (BEHS) No. (2) at Mandalay in Myanmar were selected. All children meeting the inclusion criteria were recruited by systematic random sampling.

After taking consents from parents, thorough explanation for the study was done.

Demographic characteristics and determinants were obtained by using questionnaire including type of family, number of siblings, socioeconomic status score adapted from modified Kuppuswamy’s socioeconomic status scale⁵, domestic water and drinking water.

Stool samples were collected from 90 asymptomatic school children. Each stool sample was tested for the presence of *H. pylori* antigen using standard stool antigen test kit (BIOLINE, Korea) according to manufacturer’s instructions.

**RESULTS**

In this study, stool samples were taken from 90 asymptomatic school children of age 6 – 12 years. Three groups of age stratification were done. Thirty-three children (36.7%) were between 6 to 8 years, 25 children (27.8%) were between > 8- 10 years and 32 children (35.6%) were between > 10-12 years. The age of eldest children was 11 years and 6 months and the youngest one was 6 years. Mean age was 8.94 +/- 1.71.

Out of 90 children, 16 children (17.8%) were HpSA test positive and 74 (82.2%) were negative. Prevalence of *H. pylori* infection is shown in figure 1.

**Figure 1. Fecoprevalence of *H.pylori* infection**

The most common age group among HpSA test positive was between 6-8 years group (8 children i.e., 24.2%). Two children (8.0%) were between >8-10 years group and 6 children (18.8%) were between >10-12 years group.

In regard of gender distribution, 46 children (51.1%) were boys and 44 (48.9%) were girls. Among 46 boys, 9 (19.6%) were HpSA test positive and 37 (80.4%) were negative. Among 44 girls, 7 (15.9%) were positive and 37 (84.1%) were negative.

All infected children were found in three generation and extended family types (37.2%). There was significant association between type of family and *H. pylori* fecopositivity (p=0.001).

The highest proportions of infected children (37.5%) were found in houses where there was three or more siblings. There was significant statistical association between number of siblings and *H. pylori* fecopositivity (p<0.001).

Significant difference between positive fecoprevalence in regards of socioeconomic status scoring was noted (p=0.018). There was no upper class in studied population. *H. pylori* fecopositivity showed statistically significant difference between children from low socioeconomic status (28.9%) and middle socioeconomic status (9.6%). Prevalence of the infection was inversely related to the socioeconomic status (95%CI=0.082-0.831).
No statistical association was demonstrated between the two groups regarding domestic water.

Only one child who drinks purified water was found to be infected. Thus, there was significant statistical association between source of drinking water and H. pylori fecopositivity (p<0.001). There was 60% HpSA test positivity among children who drink non-purified water.

**DETERMINANTS OF HELICOBACTER PYLORI INFECTION AMONG ASYMPTOMATIC CHILDREN**

<table>
<thead>
<tr>
<th>Type of family</th>
<th>H. pylori stool antigen test</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Nuclear type</td>
<td>0</td>
<td>47 (100%)</td>
</tr>
<tr>
<td>3 generation and Extended type</td>
<td>16 (37.2%)</td>
<td>27 (62.8%)</td>
</tr>
<tr>
<td>Number of siblings</td>
<td>&lt; 3 siblings</td>
<td>1 (2%)</td>
</tr>
<tr>
<td></td>
<td>&gt; 3 siblings</td>
<td>15 (37.5%)</td>
</tr>
<tr>
<td>Socioeconomic Status</td>
<td>Middle Class</td>
<td>5 (9.6%)</td>
</tr>
<tr>
<td></td>
<td>Lower Class</td>
<td>11 (28.9%)</td>
</tr>
<tr>
<td>Domestic Water Supply</td>
<td>Town water</td>
<td>9 (15.5%)</td>
</tr>
<tr>
<td></td>
<td>Deep well and shallow well water</td>
<td>7 (21.9%)</td>
</tr>
<tr>
<td></td>
<td>Drinking water</td>
<td>1 (1.5%)</td>
</tr>
<tr>
<td></td>
<td>Purified water</td>
<td>15 (60%)</td>
</tr>
<tr>
<td></td>
<td>Non-purified water</td>
<td>9 (23.1%)</td>
</tr>
</tbody>
</table>

p <0.05 is considered statistically significant

**DISCUSSION**

*Helicobacter pylori* plays a major etiologic factor in the pathogenesis of chronic gastritis, peptic ulcer disease, gastric adenocarcinoma, and mucosa associated lymphoid tissue lymphoma. However, most of the infected persons remain asymptomatic. Its prevalence is significantly higher in the developing countries than in the developed countries. Number of siblings, type of family, socioeconomic status, educational level, family income and water supply were significant determinants of *H. pylori* infection. Early detection and eradication of the organism can lead to long-term healing of all *H. pylori*-related disease. Diagnostic test for *H. pylori* are either non-invasive or invasive by endoscopic biopsy of gastric mucosa. Selection of appropriate test depends on the clinical setting. Non invasive methods include urea breath test (UBT), serological test and *H. pylori* stool antigen test. Among them, endoscopic culture is the gold standard test for *H. pylori* infection. It is highly specific but expensive and experience and expertises are required. Currently, it is not available in our clinical practice. UBT has high sensitivity and specificity but it is expensive and it requires special equipment. Serology test has low specificity and it cannot be used in active infection. HpSA test is the most simple and less expensive non-invasive test. Therefore, in this study, HpSA test was used to determine the prevalence of *H. pylori* infection among different pediatric age groups (6-12 years) of asymptomatic school children and to identify the most common determinants for this infection.

**Age Distribution of H. pylori Infection among Studied Children**

In this study, three age groups were stratified. Unequal age distribution was found because some parents or guardians did not give informed consent and there was stool sample collection errors.

In this study, age group between 6-8 years was most common group among HpSA test positive. Eight children among 16 test positive ones (24.2%) were between this age group. The differences in the positivity of *H. pylori* among different age groups was not significant. In this study, there was no significant relation between *H. pylori* positivity and rising age because of unequal age distribution and use of antibiotics in children for other diseases.

**Gender Distribution among HpSA Test Positive and Negative Groups**

Gender distribution among studied group was not equal because of errors in stool sample collection and difficulties in getting informed consent.

In this study, among 16 test positive children, 9 boys were HpSA test positive (19.6%) and 7 girls were test positive (15.9%). In accordance with many previous surveys, gender appears to have no effect on the acquisition of *H. pylori* in this study.

**Fecoprevalence of H. pylori Infection**

Out of 90 children, 16 children were HpSA test positive and 74 were negative. In this study, overall fecoprevalence was found to be 17.8%. Great variation exists in the prevalence of *H. pylori* infection among different countries and age groups. The infection is rare in developed countries once compared to developing countries. In the study performed in Turkey, fecoprevalence of *H. pylori* infection was 21%. In Cheng et al. study among children and young adults in Taiwan, the prevalence of *H. pylori* infection was higher than the 13.7% reported in *Cheng et al.* study among children and young adults in Taiwan. In Raguza et al., 2010, the *H. pylori* prevalence in Brazil (18.1%) was similar to this study. The prevalence of *H. pylori* infection found in this study (17.8%) was lower than that reported from other studies in Myanmar, such as 68.8% in Myo-Khin et al., 2002 and 41.2 % in Mya-Mya-Aye et al., 2005. Serological tests are less specific than HpSA test because HpSA test detects the specific antigens shed during active infections and less cross-reactivity than serological tests that
detect antibodies. Therefore, HpSA test is a valid method for primary screening for H. pylori infection in children. According to this study, it can be concluded that HpSA test is highly specific but less sensitive.

**Association between H. pylori Infection and Type of Family**

In this study, significant association between H. pylori fecopositivity and type of family was noted (p<0.001). All infected children were found in three generations and extended family type (37.2%). This study demonstrated that type of family plays an important role in person to person transmission of H. pylori infection.

**Association between H. pylori Infection and Number of Siblings**

In this study, children who have three or more siblings were found to be infected with H. pylori (37.5%). Significant association between number of siblings and H. pylori fecopositivity was noted (p=0.001). There was a strong association between the number of siblings and the incidence of H. pylori infection among the children in this study.

**Association between H. pylori Infection and Socioeconomic Status Scoring**

In this study, among 90 children tested, 16 were H. pylori positive, with a total fecoprevalence of 17.8%. There was no upper socioeconomic status group in this study. Therefore, this study cannot compare between high and middle to lower socioeconomic standard groups. There was a statistically significant difference concerning H. pylori fecoprevalence between the low socioeconomic standards and middle socioeconomic standards (p=0.018). This result is in agreement with prior studies. This study proved that the socioeconomic status is an important risk factor linked to acquisition of H. pylori infection.

**Association between H. pylori Infection and Domestic Water**

In this study, there was no statistical association between domestic water and H. pylori infection. This study that water is a risk factor for H. pylori transmission in the study locality was not confirmed. This however does not rule out water as a vehicle of H. pylori transmission as any contamination during water collection or during storage allows H. pylori to infect its human hosts. Therefore, further studies should be done to detect possible sources of H. pylori infection especially domestic water supply.

**Association between H. pylori Infection and Drinking Water**

Significant statistical association between source of drinking water and H. pylori infection was noted in this study. Only one child drinking purified water was found to be H. pylori stool antigen test positive. This study showed that there is strong association between type of drinking water and H. pylori infection.

**CONCLUSIONS**

In this study, fecoprevalence of *Helicobacter pylori* infection among asymptomatic school children was 17.8%. The most common age group among HpSA positive was between 6-8 years group (24.2%). Gender appeared to have no effect on the acquisition of H. pylori infection in this study. A significant association (p<0.001) was found between H. pylori infection and overcrowding and type of drinking water.

The prevalence of H. pylori infection was higher in those of lower socioeconomic status whether accessed by income and education of both parents. In this study, 11 out of 16 fecopositive children (28.9%) were from low socioeconomic standards and 5 out of 16 fecopositive children (9.6%) were from middle socioeconomic standards. Although not statistically significant, the findings of the present study indicated that there may be a relationship between domestic water supply and infection for children.

This cross-sectional survey showed that *Helicobacter pylori* is prevalent in asymptomatic school aged children in Myanmar. Factors affecting the acquisition of H. pylori infection in childhood are still being elucidated. This study provided strong evidence for the importance of socioeconomic status, number of siblings, type of family and drinking water source for acquisition of H. pylori infection in a developing country. This study may raise the awareness of H. pylori infection in children. As this infection starts early in childhood, prevention is worthy by improving the levels of education, the standards of hygiene among families of low socioeconomic standards.

**RECOMMENDATIONS**

The findings of this study were more or less the same with previous studies. The transmission of H. pylori microorganism may be facilitated by low socioeconomic status, overcrowding and habits of drinking non-purified water. Children in this study may not be representative of the whole general population because of the small number of children and limited study settings. Large scale sample and multicenter studies are required for the fecoprevalence and determinants of *Helicobacter pylori* infection among asymptomatic children in Myanmar.

**LIMITATIONS OF THE STUDY**

Several limitations were recognized in this study. This was a unicenter study conducted in No. (2) Basic Education High School (BEHS), Chan-Aye-Thar-San township, Mandalay, Myanmar. Only 90 children among 6-12 years old school children were collected during one year period. As an epidemiological study must take place in a representative population, further large scale sample studies should be carried out in other schools in Mandalay.

Age and gender distribution was unequal in this study. This study showed the fecoprevalence of H. pylori infection and found out significant determinants of H. pylori infection such as
number of siblings, type of family, socioeconomic status, educational level, family income, domestic water and drinking water. However, many other associated factors for \textit{H. pylori} infection were not included in this study (e.g. practice of hand washing before meals and after toileting and number of siblings sharing bed). Further studies should be done to find out the other associated factors for more understanding of \textit{H. pylori} infection.

**REFERENCES**